DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL FARM

INDIAN HEAD, SASK.

INTERIM REPORT OF THE SUPERINTENDENT

N. D. MACKENZIE, B.S.A.

FOR THE YEAR ENDING MARCH 31, 1921

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INTERIM REPORT OF THE SUPERINTENDENT, N. D. MACKENZIE, B.S.A.

FOR THE YEAR ENDING MARCH 31, 1921

SEASONAL NOTES

The crop year of 1920 was not a favourable one in this district. The spring was backward and work on the land did not commence until the last week of April and was not general until the first week in May. The late seeding was followed by high winds, and, after the first week in June, by hot weather until the 19th of July when the drought was broken by an extremely heavy rain which assisted materially in helping the crop to fill. A frost on August 20 stopped the growth of the corn crop and seriously injured sunflowers. As most of the grain was cut at this time, only very late crops were affected and that only slightly. Fall rains brought the yield of roots well up to average and also made a large amount of pasture available in the stubble. October being an exceptionally fine month, a great deal of fall ploughing was done.

METEOROLOGICAL RECORDS

Month	Temperature F.					Rainfall		Snowfall	Sunshine
	Maximum		Minimum		Mean	Days	Inches	Inches	Hours
	Date	°	Date	°	°				
1920									
April	19	53	4	−10	26·63	1	0·12	5·25	137·6
May	21	82	1	30	51·09	4	1·46	.....	221·0
June	30	87	2	32	58·50	6	2·10	.....	241·0
July	18	100	10	39	65·06	3	5·24	.....	299·8
August	25	95	20	30	64·48	7	1·42	.....	265·7
September	20	88	28	2	53·13	3	2·17	.....	171·5
October	7	84	26	20	42·80	5	1·67	.....	138·0
November	3	48	9	−8	50·40	1	0·27	2·75	49·5
December	1	36	27	−25	11·77	.....	.....	7·50	31·6
1921									
January	25	31	16	−26	8·35	.....	.....	1·75	47·5
February	27	45	19	−33	12·64	.....	.....	13·50	80·7
March	31	51	8	−15	18·25	.....	.....	8·0	149·4
	.....	.....	.....	.....	.....	30	14·45	38·75	1,833·3

Reckoning 10 inches snow as equivalent to 1 inch of rainfall, the total precipitation for the year ending March 31, 1921, was 18·33 inches.

ANIMAL HUSBANDRY

HORSES

All of the thirty-four horses on the Farm are of Clydesdale type and seventeen of them are pure-bred Clydesdale mares and fillies. The remainder, with the exception of a promising yearling Clydesdale stallion of our own raising, are work-horses and grade colts.

TREATMENT FOR NAVEL ILL

The pure-bred mares of breeding age have been used for working and also for raising foals. As navel ill has been a limiting factor in successfully raising foals, an experiment was commenced during the year to study the effect of inoculation with suitable serums for the prevention of this disease. Four of the pure-bred mares and two grade mares which were bred for use in this experiment proving to be in foal, the following treatment was given: The four pure-bred mares were inoculated with serum at the eighth month of the period of gestation and again after a lapse of three weeks; the grade mares were not inoculated at all. At foaling time all foals were inoculated within five hours after being dropped and the serums used were, in every case, mixed bacterial ones manufactured by the Lederle Laboratories. The results of the experiment are as follows:—

TREATMENT FOR NAVEL-ILL

No. of Mares	Treatment	No. of foals dropped	Treatment	No. of foals raised	Foals raised per cent
4	Inoculated	4	Inoculated	4	100
2	Not inoculated	2	Inoculated	1	50

The results for this year are fairly definite in that none of the foals whose dams were inoculated showed any signs of navel ill while one of the foals which were inoculated but whose dams were not inoculated developed a very typical case of the disease and, in spite of repeated injections of serum, died when less than three weeks old. In the case of the pure-bred mares, none of them, as far as the records show, had previously lost foals from navel ill. With regard to the grade mares no previous records are available, these being the first foals they have had, while on this Farm. The results indicate the value of the serum, particularly when the mare is treated. Further work along similar lines is needed, however, before a definite statement as to the exact value of the treatment can be made.

COST OF FEEDING

Careful records have been kept of the amounts of feed necessary to keep horses in good working condition throughout the year; also for horses worked steadily during the summer and wintered outside in the corral and shed and only worked occasionally as required; the amounts of feed used in feeding a foal from weaning to one year of age; the feed required to feed a colt from one year to two years and also from two years to three years. The following table gives the amounts of these feeds in detail and the costs have been determined by the average market value of the feeds in this district during the year:—

HORSES—COST OF FEEDING

Description of Animal	Amounts of feed eaten during year					Total cost of feed
	Hay	Straw	Bran	Oats	Pasture	
	lb.	lb.	lb.	lb.	Months (nights only)	
Mature horse worked regularly all year	2,666	3,500	1,300	3,429	3	133·57
Mature horse worked in summer, idle most of winter	2,129	3,022	1,039	3,057	3	113·84
Two-year-old, growing till three years old	1,500	2,500	600	1,720	5½	79·03
Yearling to two years old	1,250	2,530	898	1,422	5½	75·91
Foal from weaning to one year	2,000	.....	326	1,453	.....	58·97

Values used in calculating cost of feeds:—

Hay, $25 per ton.
Straw, $4 per ton.
Bran, $38 per ton.
Oats, 65 cents per bushel.
Pasture, $2 per month.
Pasture, nights only, $1 per month.

CATTLE

The breeding herd consists of sixty-eight pure-bred Shorthorns. The objective of the breeding work has been to produce animals of superior beef conformation and, at the same time, retain a good flow of milk as one of the requisites of a breeding cow. The senior herd sire is "King Edward"=91030=bred by T. C. McAvoy & Sons, Balsam, Ont., and he has been highly successful as a sire of big, smooth cows with good milk production. Four of his daughters out of different dams have qualified in the Canadian Record of Performance in milk production. This has admitted him to the record for sires. The majority of the younger cows in the herd are sired by this bull. The four-year-old bull "Butterfly Marquis" bred on the Brandon Experimental Farm and out of the exceptionally fine cow "Ottawa Marchioness 5th" with with a record of 12,800 pounds of milk in a year, is also in use. He is a thick, low-set bull of strong masculinity and his heifers, which are just coming into milk, give promise of being excellent producers. The junior herd sire is the imported Kilblean Beauty bull "Merryman"=134531=, an exceptionally well-fleshed, thick, low-set bull, whose first calves are showing excellent promise. He should become a very valuable sire and one whose produce will be in great demand.

All surplus stock from the herd finds ready sale to farmers who are desirous of improving their cattle.

EXPERIMENT IN FEEDING SILAGE

In order to compare the feeding value of corn and sunflower silage for milking cows, a feeding test covering a period of eight weeks was made. Eight cows were used in the experiment, the method used being as follows: Four of the cows were fed sunflower silage for the first four weeks and corn silage the second four weeks; the other group of four were fed corn silage the first four weeks and sunflower silage the second four weeks. The ration fed during the entire test was silage 40 pounds, cut oat straw 15 pounds per cow per day and one pound of meal (oat chop 1 part, bran 1 part, barley chop 1 part), for every three pounds of milk given by each cow.

The following table gives the result of this test in detail:—

EXPERIMENT IN FEEDING SILAGE

—	Lot 1 Corn silage, straw and meal	Lot 2 Sunflower silage, straw and meal
Number of cows in experiment	8	*8
Number of pounds of milk produced in 28 days	3,394·8	2,945
Weight of cows at beginning of experiment	11,955	11,970
Weight of cows at end of experiment	12,135	12,155
Total gain in weight	180	185
Average gain per cow	22½	23½
Amount of meal fed at 1½c. per lb	1,165	981
Amount of oat straw fed at $4 per ton	3,360	3,360
Amount of silage fed at $5 per ton	8,960	8,960
Total cost of feed for period	$50 92	$47 54
Cost to produce 100 pounds milk	1 50	1 61
Pounds of silage per 100 pounds of milk	lb. 263	lb. 304

It will be seen from the figures given above that the cows gained slightly more in flesh on the ration fed when sunflower silage was part of the roughage than they did on the corn silage. The flow of milk was heavier on corn silage and cost less per hundred pounds to produce but in this connection it should be noted that the cows which were fed corn silage the first four weeks and then went on to sunflower silage were producing more heavily at the start of the experiment than those fed sunflower silage first and corn silage the second period. Considering this fact, the difference of 11 cents per hundred in cost of production may be cut down slightly. As regards palatability, the two silages were practically equal, both being very highly relished by the cattle. Only one undesirable feature of sunflower silage was noticeable in this experiment and that was the fact that it was highly stimulating to the kidneys, fully one-third more liquid manure being in the gutters when the cows were on sunflower silage.

The results of this experiment would indicate that, pound for pound, sunflower silage was almost equal to corn silage in the production of milk.

At the same time as the previous experiment was being carried on, another group of twelve cows were fed in a similar manner. These cows were merely being fed a good maintenance ration as none of them was milking and all were due to freshen within a month of the close of the experiment, the idea being to ascertain the comparative feeding value of the two silages in a maintenance ration. The following table will give the result of the experiment in detail:—

CORN SILAGE vs. SUNFLOWER SILAGE AS A MAINTENANCE RATION

——	Lot 1 Corn silage, straw and meal	Lot 2 Sunflower silage, straw and meal
Number of cows in test	12	12
Total weight at beginning of experiment	17,660	17,640
Average weight per cow at beginning of experiment	1,471⅔	1,470
Total weight at end of experiment	17,965	18,035
Average weight at end of experiment	1,497	1,503
Total gain in 28 days (lbs.)	305	395
Average gain per cow (lbs.)	25⅓	33
Total cost of feed consumed	$50 38	$50 38
Cost per pound gain (cents)	16·5	12·75

Owing to the state of pregnancy of these cows, the results of the foregoing experiment cannot be regarded as being entirely definite, as some of the cows may have required a greater proportion of their feed for maintenance at one time than another. Taken, however, in conjunction with the experiment with cows in milk, it may be regarded as further indicating that (1) the feeding value of the sunflower silage is slightly lower than corn silage for the production of milk; (2) its feeding value in the maintenance of dry, pregnant cows is fully equal to, and probably better than, corn silage; (3) as regards palatability, sunflower silage is fully equal to corn silage; (4) the only limiting factor observed in connection with these experiments was the stimulating action of sunflower silage on the kidneys.

STEER FEEDING EXPERIMENT

In addition to the breeding herd of cattle, twenty good-type steers were purchased during the fall for experimental work during the winter. These steers were two-year-olds and were carried through the winter in the corrals and sheds outside. After the steers reached the Farm, they were first placed on preliminary feed for three weeks so as to get them in as uniform condition as possible. The ration during the preliminary feed was 30 pounds silage, 10 pounds oat straw and 2 pounds of meal per day per steer. At the end of the preliminary feed, all steers being in good thrifty

condition, they were divided into two equal lots and started on experimental feeding. The object of the experiment was to compare ground Grade A screenings and ground barley as the main part of the meal ration for fattening steers. The steers of both lots received 30 pounds of silage and 10 pounds of cut straw per day per head and at the start of the experiment 6 pounds of meal per day, the meal ration being gradually increased until at the eighth week, the steers were on a full feed of 14 pounds of meal per day. The meal, silage and cut straw were thoroughly mixed together a day before being fed and, as a result, no feed was wasted. The meal ration of lot 1 was ground barley 3 parts, bran 1 part, while for lot 2 it was ground screenings 3 parts and bran 1 part.

The following table will give the result of the experiment in detail:—

STEER FEEDING EXPERIMENT

——	Lot 1. Barley	Lot 2 Screenings
	lb.	lb.
Number of steers in experiment	10	10
Number of days in experiment	77	77
Total weight at beginning of experiment	12,110	12,000
Average weight at beginning of experiment	1,211	1,200
Total weight at end of experiment	13,790	13,370
Average weight at end of experiment	1,379	1,337
Total gain during experiment	1,680	1,370
Average gain during experiment	168	137
Daily gain per head	2·181	1·779
Amount of barley eaten	6,237·5	.....
Amount of screening eaten	.....	6,237·5
Amount of bran eaten	2,085	2,085
Amount of silage and straw eaten	30,800	30,800
Cost of barley at $53.65 per ton	$167 32	.....
Cost of screenings at $44.50 per ton	.....	$138 78
Cost of bran at $40 per ton	41 70	41 70
Cost of silage and straw at $5 per ton	77 00	77 00
Total cost of feed for period	286 02	257 48
Cost per 1 pound gain (cents)	17·02	18·79

Remarks.—The following facts which affect the results as well should be noted: The gains of the steers on barley were more uniform throughout and did not vary from week to week as the gains of the steers on screenings did; as the daily grain ration increased toward the end of the experiment the steers on screenings were more or less affected by digestive trouble; the quality of the screenings was not uniform; two different lots of screenings were used in the experiment and a marked difference in quality was noted. A marked difference in the finish of the two lots of steers could be noted, the steers on barley being much more nearly finished than those on screenings.

The results of this experiment would indicate that barley at $53.65 per ton is cheaper and better as the bulk of the grain ration for finishing steers than screenings at $44.50 per ton. The difference in favour of the barley might not be so marked where less grain was being fed as it was only when on nearly a full feed of grain that the steers appeared to have trouble in digesting the screenings.

At the conclusion of the above experiment the steers were all placed on the same feed as the barley lot and at the end of three weeks, being all thriving, the corn silage of the one lot was replaced by sunflower silage so that lot 1 received 14 pounds of grain (barley 3, bran 1), 10 pounds of cut oat straw and 30 pounds of sunflower silage per steer per day, while lot 2 received 14 pounds of grain (barley 3, bran 1), 10 pounds of cut oat straw and 30 pounds of corn silage.

Owing to the scales being out of order at the end of three weeks when the sunflower silage was finished it was impossible to weigh the steers and definite figures regarding the short test of the silages cannot be given. The following observations

may be of value: The steers ate the sunflower silage fully as readily as the corn silage; no digestive disorders, whatever, were noted in either lot of steers; the steers on sunflower silage appeared to be gaining in flesh as well as those on corn silage; the thrifty appearance which both lots of steers had at the beginning was fully as well maintained by the steers receiving sunflower silage as by those receiving corn silage.

SHEEP

The flock of sheep numbers one hundred and five mature sheep and a number of early lambs. Of the mature sheep, ninety-five are breeding ewes. Thirty-one of these are pure-bred Shropshires, twenty-nine are grade Shropshires and thirty-five are grade Oxfords. Five pure-bred shearling ewes with four pure-bred Shropshire rams and one pure-bred Oxford ram complete the total of mature sheep.

GRADING-UP EXPERIMENT

The grading-up experiment which was commenced in 1914 has been carried on and the third generation has now been reached. The procedure followed in this experiment has been as follows: In 1914, a number of range ewe lambs were purchased as a foundation for a grade breeding flock. They were carried on until mature and then divided into two equal lots. One lot was mated to a good type Shropshire ram and the second lot to a good type Oxford ram; the resultant progeny, constituting the first cross from the range ewes, were in turn mated to other rams of the respective breeds which produced them. The process was repeated with the resultant progeny until the third cross has now been reached. Unfortunately, the weights of the foundation ewes were only taken when purchased as lambs but as similar ewes average in weight 115 pounds this has been taken as the average weight of the foundation ewes in tabulating the results of the experiment. The following tables will summarize the results of the experiment to date:—

AVERAGE WEIGHT OF LAMBS AT BIRTH

OXFORD GRADES

1st cross	2nd cross	3rd cross
8·5 lb.	12·2 lb.	10·37 lb.

SHROPSHIRE GRADES

9·39 lb.	8·8 lb.	9·4 lb.

AVERAGE WEIGHT OF LAMBS, NOVEMBER 1ST.

OXFORD GRADES

Foundation Ewes when purchased as lambs	1st cross	2nd cross	3rd cross
59 lb.	75·4 lb.	78·5 lb.	79·5 lb.

SHROPSHIRE GRADES

59 lb.	70·5 lb.	73·7 lb.	75 lb.

WEIGHTS OF MATURE EWES

OXFORD GRADES

Foundation Ewes	1st cross	2nd cross
115 lb.	139 lb.	138 lb.

SHROPSHIRE GRADES

115 lb.	129·5 lb.	138·7 lb.

WEIGHT OF WOOL

OXFORD GRADES

Foundation Ewes	1st cross	2nd cross
8·57 lb.	8·86 lb.	9·6 lb.

SHROPSHIRE GRADES

8·5 lb.	9·33 lb.	9·97 lb.

It should also be noted that, in addition to increasing both the size of the animals at all periods and also the weight of wool, a marked increase in suitability type and quality has also been observed in both lots of grades. The lambs and sheep increase in their resemblance to pure-breds. As the successive crosses are made the progeny becomes shorter in the leg and neck and carries much greater proportion of their weight in the high priced cuts in the second and third generations than did the foundation stock. A marked improvement in the length of the staple of the wool has been noted but the quality and density of the wool has not been noticeably improved. The individuality of the sires used is a factor which, apparently, has a great influence on the resultant progeny and the greatest care which can be used in this connection is fully repaid by the results obtained. The third cross lambs in both breeds very closely resemble pure-breds and in many cases are practically indistinguishable from them.

EXPERIMENT IN FINISHING LAMBS

An experiment in finishing lambs for the market was also conducted during the year. Owing to the rush of lambs to the market during September and October, the price is usually low at that time and the idea of the experiment was to determine the margin of profit to be obtained if the lambs were held and well finished before being marketed. Two equal lots of lambs were put on feed on October 15; one lot was fed for two months so as to be ready for the Christmas market and the second lot was fed for the Easter market. Both lots of lambs were housed in a single board shed and had the run of a small yard. The lambs fattened for the Christmas trade received all the pea straw they would eat and were started at one-half pound of meal per lamb per day which was increased until, when marketed, they were receiving two pounds per lamb per day. The lot finished for the Easter market received all the pea straw they would eat and one-half pound of grain per day until January 1, and then the grain ration was gradually increased until, at the end of February, they were receiving two

pounds of grain per lamb per day. After January 1 this lot of lambs received oat straw and one and three-quarters pound of alfalfa hay per lamb per day. At the time these lambs were put on feed, similar lambs were selling at 7 cents per pound locally, but it should also be noted that at the time these lambs were put on feed they were of a better grade and more nearly finished than the average lambs going on the market and, consequently, the spread between their value at the time they were put on feed and their selling price was not as great as would have been the case with lambs which were not so well fleshed at the time of going on feed. The following table will give the results of the experiment in detail and it will be noted that the lambs fed for the Christmas market were relatively much more profitable than those carried over until the Easter market.

MARKETING LAMBS AT CHRISTMAS AND AT EASTER

—	Lot 1 Marketed at Christmas	Lot 2 Marketed at Easter
Number of lambs in experiment	15	15
Average weight, October 15	70 lb.	70 lb.
Value at beginning of experiment at 7c	$4 90	$4 90
Average weight at end of experiment	81¾ lb	104 lb.
Average selling price per lamb	$6 94	$10 40
Increase in value per lamb	2 04	5 50
Value of hay eaten per lamb, at $25 per ton	.....	1 40 (112 lb.)
Value of straw per lamb, at $5 per ton	14c. (56 lb.)	32 (126 lb.)
Value of meal eaten per lamb, at 1½c. per lb	51c. (34 lb.)	1 84 (123 lb.)
Total cost of feed per lamb	$ 65	$3 56
Profit per lamb over original value and cost of feed	1 39	1 94

Careful records of the amounts of feed eaten by sheep of various ages have been kept during the year as such records as are valuable in estimating the requirements of a flock of sheep can be readily ascertained from them.

The amounts of feed necessary to raise a lamb from weaning to one year, a shearling to two years and to feed an aged ewe are given in the following table:—

FEEDS REQUIRED FOR LAMBS AND SHEEP

Type of Sheep	Feeds used						
	Hay	Straw	Bran	Oats	Screenings	Roots	Pasture
	lb.	lb.	lb.	lb.	lb.	lb.	Months
Lamb from weaning to 1 year	12	370	9	32	51	39	1
Shearling to 2 shear	217	241	43	63	104	40	5
Aged ewe for 1 year	217	241	43	63	104	150	5

SWINE

The breeding herd consists of one Yorkshire boar and nine sows and two Berkshire boars and twelve sows. The Berkshire sows were secured from the Farms at Brandon and Scott during the year and were not on the Indian Head Farm at farrowing time in the spring of 1920. In addition to the breeding herd sixty-seven feeders are also on hand.

BREEDING WORK

The breeding herd has, until this year, been free from hairlessness in the litters, but, in the spring of 1920, the litters were all badly affected. The sows were housed

outside in A-shaped cabins during the winter, the cabins being well covered with straw. The straw-covered cabins were located at some little distance from the feed troughs so as to force the sows to take exercise every day. The grain ration consisted of one pound ground oats, two pounds shorts, one pound barley and six ounces of tankage per sow per day. The sows were in moderately good flesh at farrowing time but in no case did one of them farrow a normal, healthy litter. The same sows were re-bred for fall litters and fed on the same feeds and in every case the litters were normal and healthy. The following table will give the data in regard to the litters.

BREEDING WORK—RECORDS OF LITTERS

Sow	Spring Litter		Fall Litter			
	Number farrowed	Number hairless	Number raised	Number farrowed	Number hairless	Number raised
1	11	11	None	12	None	9
2	11	11	"	10	"	7
3	6	6	"	4	"	4
4	8	8	"	8	"	8
5	9	9	"	8	"	6
6	7	7	"	7	"	5
7	7	7	"	6	"	5
Total, 7	59	59	"	55	"	44

These sows, together with some others, have been fed and housed in a similar manner during the past winter, with the exception that one lot has been receiving potassium Iodide while the others received only the grain ration and tankage, in a test to determine whether the feeding of potassium Iodide has any effect on the litter as regards hairlessness. As all the sows have not farrowed, the results of this test are not complete.

METHODS OF HOUSING

An experiment was undertaken to determine the most suitable method of housing fall pigs. Sixty pigs were divided into three equal lots on November 1. Lot 1 was housed in a rough shelter in a high board corral. The shelter was made by taking odds and ends of lumber and making a low frame work 12 feet by 12 feet and four feet high with a small opening on the south side. The entire frame work, except the opening, was covered with straw to a depth of four feet and a fence placed around the outside to prevent the pigs carrying away the straw. This, with the corral fence, constituted the shelter for lot 1. Lot 2 was placed in the ordinary pens of the piggery while lot 3 was also in the piggery but their pens were roofed over with a frame work and three feet of straw placed on top of it so as to give additional warmth and still allow for ventilation. The pigs were all fed the same grain ration which consisted of two parts ground barley, one part shorts and 10 per cent tankage. The results of the experiment are given in the following table:—

RESULTS OF HOUSING TESTS WITH SWINE

—	Cabin with open corral	Piggery without shelter	Piggery with shelter
Number of pigs in experiment	20	20	20
Weight at beginning of experiment	1,508 lb.	1,552 lb.	1,555 lb.
Average weight at beginning of experiment	75·4 lb.	W	77·75 lb
Weight at end of experiment	2,880 lb.	3,049 lb.	2,927 lb
Average weight at end of experiment	144 lb.	152·45 lb.	146·35 lb.
Total gain	1,372 lb.	1,497 lb.	1,372 lb.
Average gain	68·6 lb.	74·85 lb.	68·6 lb.
Amount of barley fed at 54c. per bushel	4,903 lb. $55 15	3,622·92 lb. $40 75	3,622·92 lb. $40 75
Amount of shorts fed at $42 per ton	2,222·90 lb. $46 68	1,722 lb. $36 16	1,722 lb. $36 16
Amount of tankage fed at $75 per ton	712·70 lb. $26 72	534·52 lb. $20 05	534·52 lb. $20 05
Total cost of feeding	$128 55	$ 96 96	$ 96 96
Cost per pound gain	9·3c.	6·5c.	7·1c.
Pounds of meal per 100 pounds of grain	571·3 lb.	392·8 lb.	428·5 lb
Percentage of cripples	None	15%	10%

The percentage of cripples found in lots 2 and 3 would offset the greater cost per pound gain of the outside lot. An expensive piggery would, therefore, seem to be unnecessary in the housing of fall pigs if they are farrowed in August and early September.

FIELD HUSBANDRY

ROTATIONS

The following rotations were started at this Farm between 1910 and 1912, so that the results of nine years' operations are now available.

Rotation "C" is similar to the average rotation practised throughout the district, namely, summerfallow followed by wheat, the stubble being fall ploughed and the ground sown to wheat the next year. This gives the largest possible area in grain and the returns per acre have been fair, particularly during the past few years when wheat has been high in price. The disadvantages of this rotation, however, are marked. It is almost impossible to free the land of weeds, which tend to increase from year to year. In addition, during the periods of high winds, this is about the only place on the farm where soil drifting occurs.

Rotation "R" is of nine years' duration, the crop sequence being wheat, oats, summer-fallow, wheat, oats seeded down to a mixture of alfalfa and western rye grass, hay, hay or pasture, hay one crop and breaking, corn. This gives four-ninths of the land in grain each year and is a rotation suitable for adoption over a large part of the province, as it allows for the keeping of a fair amount of stock and still has almost half the land growing cash crops. It has proven to be our most profitable rotation and is also comparatively free from weeds and shows no sign of bad drifting.

Rotation "P" is of eight years' duration and, until this year, the crop sequence has been wheat, wheat, summer-fallow, corn, barley seeded down, hay, hay or pasture, one crop of hay and breaking. Having found, however, by the results of previous years' work, that the year of summer-fallow previous to corn was unnecessary and expensive, the corn crop was moved up one year and oats were substituted for the second year wheat, making the rotation one suitable for a farm where live stock was a specialty. The crop sequence is now as follows: wheat, oats, stubble manured and fall ploughed, corn, barley seeded down, hay, hay or pasture, hay or pasture, hay one crop and broken.

Rotation "J".—This rotation has also been changed to make it more suitable to this part of the province. The original rotation was summer-fallow, wheat, wheat, oats seeded down, hay, pasture. It was found, however, that we were seldom successful in

getting a catch of grass, the seeding down being too far from summer-fallow and the rotation, consequently, was not as profitable as it should have been. As changed, the rotation is wheat, oats, corn or other summer-fallow substitute, wheat seeded down, hay, hay and breaking. This rotation, if proven profitable, should be suitable for general use as it has half the land in cash crops each year and yet permits the keeping of a fair amount of stock.

Rotations—Comparative and Actual Returns, 1920

The nine-year average results of these rotations as originally constituted from 1912 to 1920, inclusive, using pre-war valuations in all cases, are as follows:—

COMPARATIVE RETURNS

Rotation	Average cost per acre	Average revenue per acre	Average profit per acre
	$	$	$
"R"	11 64	16 94	5 30
"C"	9 63	14 07	4 44
"P"	11 83	16 25	4 42
"J"	8 78	13 11	4 33

The prices used in calculating the above results are as follows and, while not applicable in all cases as far as actual returns are concerned, are valuable in that standard values such as these give a much better comparison for experimental work than is possible when values fluctuate so widely as they have done during the past few years:—

Wheat, 1½ cents per pound, or 80 cents per bushel.
Oats, 1 cent per pound, or 34 cents per bushel.
Barley, 1 cent per pound, or 48 cents per bushel.
Mixed hay, $10 per ton.
Oat straw, $2 per ton.
Oats (green feed), $10 per ton.
Barley straw, $10 per ton.
Wheat straw, $1 per ton.
Corn ensilage, $3 per ton.
Rent to be charged at $2 per acre.
Manure to be charged at $1 per ton (spread over rotation).
Seed wheat to be charged at $1.50 per bushel.
Seed oats to be charged at $1 per bushel.
Seed rye to be charged at $1.75 per bushel.
Seed barley to be charged at $1 per bushel.
Grass and clover seed to be charged at actual cost, but charged over the number of years in hay and pasture.
Seed corn to be charged at $2 per bushel.
Twine, actual cost.
Machinery, 60 cents per acre.
Manual labour, 19 cents per hour.
Horse labour: 1 horse, 27 cents; 2 horses, 34 cents; 3 horses, 41 cents; 4 horses, 48 cents.
Work done by tractor to be converted into horse labour and charged accordingly.
Threshing: Charge work of teams hauling sheaves and of pitchers as horse and manual labour; handling threshed grain, straw, machine, gasoline, etc., are covered by the charge per bushel.
Wheat, 7 cents per bushel.
Oats, 4 cents per bushel.
Barley, 5 cents per bushel.

ACTUAL RETURNS

In addition to the standard costs the costs and profits of these rotations in 1920 were figured on actual costs and values in every case during 1920 and the results are given in the following tables. It will be noted that the actual values used very largely

increase the returns on Rotations "R" and "P" as compared with Rotation "C" even under the comparatively high price of wheat which prevailed during the year. The following are the prices which were used in calculating the returns:—

Wheat, $2 per bushel.
Oats, 80 cents per bushel.
Barley, $1.25 per bushel.
Mixed hay, $25 per ton.
Oat straw, $4 per ton.
Oats (green feed), $25 per ton.
Barley straw, $4 per ton.
Wheat straw, $2 per ton.
Corn ensilage, $6 per ton.
Rent to be charged at $4 per acre.
Manure to be charged at $1 per ton (spread over rotation).
Seed wheat to be charged at $2.75 per bushel.
Seed oats to be charged at $1.50 per bushel.
Seed barley to be charged at $2 per bushel.
Grass and clover seed to be charged at actual cost, but charged over the number of years in hay and pasture.
Seed corn to be charged at $4.20 per bushel.
Twine, actual cost.
Machinery, $1.20 per acre.
Manual labour, 35 cents per hour.
Horse labour: 1 horse, 50 cents; 2 horses, 65 cents; 3 horses, 80 cents; 4 horses, 95 cents.
Work done by tractor to be converted into horse labour and charged accordingly.
Threshing: Charge work of teams hauling sheaves and of pitchers as horse and manual labour; handling threshed grain, straw, machine, gasoline, etc., are covered by the charge per bushel.
Wheat, 12 cents per bushel.
Oats, 9 cents per bushel.
Barley, 10 cents per bushel.

COST OF PRODUCING FARM CROPS

A study of the rotation records gives accurate figures regarding the cost of producing various farm crops. The cost of production based on actual costs at 1920 prices is given herewith. It will be noted that in the costs of summer-fallow, followed by wheat, the cost of summer-fallow is charged to the wheat and that where corn was the previous crop no extra charge is made as the corn crop was profitable in itself:—

COST OF PRODUCING WHEAT AFTER SUMMER-FALLOW, 1920

Area of field—5·5 acres.	
Rent of land, 5·5 acres, 2 years at $4 per acre	$ 44 00
Use of machinery, 2 years at $1.20 per acre	13 20
Manure, 5·5 acres (12 tons per acre over 9 years), at $1 per ton	14 63
Ploughing, June, 1919, man and 3 horses, 18¼ hours at 80c	14 60
Cultivating, 1919, man and 3 horses, 21 hours at 80c	16 80
Cultivating, April, 1920, man and 3 horses, 6 hours at 80c	4 80
Harrowing, April, 1920, man and 3 horses, 2 hours at 80c	1 60
Seed, 7 bushels and 50 pounds wheat, at $2.75	21 54
Seeding, April, 1920, man and 3 horses, 3¾ hours at 80c	3 00
Cutting, August, 1920, man and 3 horses, 6 hours at 80c	4 80
Stooking, August, 1920, 1 man, 10 hours at 40c	4 00
Threshing, 162 bushels at 15c	24 30
Twine, 19 pounds at 19c	3 61
	$170 88
Total yield from 5·5 acres, 162 bushels.	
Yield per acre, 29 bushels and 27 pounds.	
Cost per acre	$31 05
Cost per bushel	1 06

COST OF PRODUCING WHEAT ON FALL PLOUGHED STUBBLE

Rent of land, 5·5 acres, 1 year at $4	$22 00
Manure, 5·5 acres (12 tons per acre over 9 years), at $1 per ton	7 32
Use of machinery, 1 year at $1.20 per acre	6 60
Cultivating, May 10, man and 3 horses, 4¼ hours at 80c	3 40
Harrowing, twice, man and 3 horses, 4 hours at 80c	3 20
Seed, 7 bushels and 50 pounds wheat, at $2.75	21 54

COST OF PRODUCING WHEAT ON FALL PLOUGHED STUBBLE—*Concluded*

Seeding, 1 man and 3 horses, 4¼ hours at 80c..	3 40
Cutting, man and 3 horses, 6 hours at 80c..	4 80
Twine, 14 pounds at 19c..	2 66
Stooking, 1 man, 4 hours at 40c..	1 60
Threshing, 116 bushels at 15c..	17 40
	$95 92
Total yield, 5·5 acres, 116 bushels and 10 pounds.	
Yield per acre, 21 bushels and 7 pounds.	
Cost per acre..	$17 44
Cost per bushel..	0 82

COST OF PRODUCING WHEAT ON FALL PLOUGHED LAND

Rent of land, 5⅝ acres, 1 year at $4 per acre..	$22 64
Use of machinery at $1.20 per acre..	6 79
Ploughing, September, 1919, man and 3 horses, 19 hours at 80c.. ..	15 20
Cultivating, 1920, man and 3 horses, 6½ hours at 80c..	5 20
Harrowing, 1920, man and 3 horses, 4 hours at 80c..	3 20
Seeding, man and 3 horses, 5 hours at 80c..	4 00
Seed, 370 pounds, at $2.75 per bushel..	16 96
Cutting, man and 3 horses, 4¾ hours at 80c..	3 60
Twine, 8 pounds at 19c..	1 52
Stooking, 1 man, 4 hours at 40c..	1 60
Threshing, 87½ bushels at 15c..	13 12
	$93 83
Total yield, 5⅝ acres, 87½ bushels.	
Yield per acre, 15 bushels and 27 pounds.	
Cost of production per acre..	$16 55
Cost of production per bushel..	1 07

COST OF PRODUCING OATS ON FALL PLOUGHED STUBBLE

Rent of land, 5·5 acres, 1 year at $4 per acre..	$ 22 00
Manure, 5·5 acres (12 tons per acre over 9 years), at $1 per ton..	7 32
Use of machinery, 1 year at $1.20 per acre..	6 60
Ploughing, September, 1919, man and 3 horses, 20 hours at 80c..	16 00
Cultivating, 1920, 1 man and 3 horses, 6 hours at 80c..	4 80
Harrowing, 1920, 1 man and 3 horses, 1¾ hours at 80c..	1 40
Seeding man and 3 horses, 4¼ hours at 80c..	3 40
Seed, 10 bushels, at $1.50..	15 00
Cutting, man and 3 horses, 7 hours at 80c..	5 60
Twine, 18 pounds at 19c..	3 42
Stooking, man, 8½ hours at 40c..	3 40
Threshing, 301½ bushels at 12c..	36 12
	$125 06
Total yield, 5·5 acres, 301½ bushels.	
Yield per acre, 54¾ bushels.	
Cost per acre..	$22 74
Cost per bushel..	0 41

ROTATION R.—NINE YEAR

Rotation Year	Crops: Last Year	Crops: This Year	Area	Items of Expense in Raising Crop: Rent and Manure	Seed, Twine and use of Machinery	Manual Labour: Hours Manual Labour	Manual Labour: Cost of Manual Labour	Horse Labour (Including Teamster): Hours: Single Horse	2 Horse Team	3 Horse Team	4 Horse Team	Value of Horse Labour	Cost of Threshing	Total Cost	Cost for 1 Acre	Cost for 1 Bushel	Cost for 1 Ton	Particulars of Crop: Weight: Grain	Straw	Hay	Hoed Crop	Total Value	Value of Crop per Acre	Profit or Loss per Acre
			acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	lb.	lb.	lb.	lb.	$ c.	$ c.	$ c.
1	Pasture	Corn	5·5	29·33	28·13	193	67·55	9¾	43¾	16¾	2	48·61	.....	173·62	31·56	.....	4·86	.....	.....	.....	71,500	214·50	39·00	7·44
2	Corn	Wheat	5·5	29·33	26·23	23	8·05	.....	7	25½	2	26·65	13·94	104·30	18·96	·90	.....	6,997	20,910	.....	.....	254·14	46·21	27·25
3	Wheat	Oats	5·5	29·33	25·16	21	7·35	.....	9¾	44½	2	43·83	18·13	123·80	22·51	·61	.....	6,850	20,550	.....	.....	202,28	36·78	14·27
4	Oats	Fallow	5·5	29·33	6·60	.....	.....	.....	.....	72½	1½	59·33	.....	95·26	17·32	.....	.....	.....	.....	.....	.....	.....	.....	17·32
5	Fallow	Wheat	5·5	29·33	35·78	34	11·90	.....	10	22½	2	26·40	19·44	122·85	22·34	·76	.....	9·720	29,160	.....	.....	353·16	64·21	41·87
6	Wheat	Oats, seeded down	5·5	29·33	27·63	18½	6·48	.....	10	44¼	1¾	43·68	16·67	123·79	22·51	·63	.....	6·630	19,890	.....	.....	195·78	35·57	13·06
7	Oats, seeded down	Hay	5·5	29·33	18·77	19½	6·82	.....	35	.....	.....	22·75	.....	77·67	14·12	.....	10·95	.....	.....	14,830	.....	185·38	33·75	19·63
8	Hay	Hay	5·5	29·33	18·77	19	6·65	2	35¼	.....	.....	23·91	.....	78·66	14·30	.....	9·32	.....	.....	17,150	.....	214·38	38·98	24·68
9	Hay	Pasture and fallow	5·5	29·33	18·77	55	19·25	.....	28 7/12	127¾	2¼	123·16	.....	190·51	34·64	.....	.....	.....	.....	14,070	.....	175·88	31·98	−2·66
	Aggregate		49·50	263·97	205·84	383	134·05	11½	179½	353 1/12	14¼	418·32	68·18	1090.46	.....	.....	.....	.....	.....	.....	.....	1795.50	.....	.....
	Average per acre 19		.....	5·33	4·16	7·74	2·71	·24	3·62	7·31	·28	½ 8·43	1·37	.....	22·03	.....	.....	.....	.....	.....	.....	.....	36·27	14·24
	Average per acre for ..... years		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ROTATION P.—EIGHT YEAR

Rotation Year	Crops: Last Year	Crops: This Year	Area	Items of Expense in Raising Crop: Rent and Manure	Seed, Twine and use of Machinery	Manual Labour: Hours Manual Labour	Manual Labour: Cost of Manual Labour	Horse Labour (Including Teamster): Hours: Single Horse	2 Horse Team	3 Horse Team	4 Horse Team	Value of Horse Labour	Cost of Threshing	Total Cost	Cost for 1 Acre	Cost for 1 Bushel	Cost for 1 Ton	Particulars of Crop: Weight: Grain	Straw	Hay	Hoed Crop	Total Value	Value of Crop per Acre	Profit or Loss per Acre
			acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	lb.	lb.	lb.	lb.	$ c.	$ c.	$ c.
1	Break and fallow	Wheat	6	33·00	34·14	40½	14·09	.....	13	21½	2½	28·03	19·56	128·82	21·47	·79	.....	9,780	29,340	.....	.....	355·34	59·22	37·75
2	Wheat	Oats	6	33·00	26·34	18	6·30	.....	6½	45½	2	42·56	15·72	123·92	20·65	·71	.....	5,940	17,820	.....	.....	175·40	29·23	8·58
3	Wheat	Corn	6	33·00	51·58	229	80·15	.....	57	48	1½	77·11	.....	241·84	40·14	.....	12·99	.....	.....	.....	37,230	111·69	18·32	21·82
4	Fallow	Barley, seeded	6	33·00	38·39	34	11·90	.....	12	23½	4½	30·72	17·46	131·47	21·91	·75	.....	8,380	25,140	.....	.....	268·50	44·75	22·84
5	Corn	Barley, seeded	6	33·00	38·44	20	7·00	.....	7	42½	4½	42·59	12·75	133·78	22·30	1·05	.....	6,120	18,360	.....	.....	196·10	32·68	10·38
6	Barley, seeded	Hay	6	33·00	19·88	18	6·30	.....	31	.....	.....	18·60	.....	77·78	12·98	.....	14·09	.....	.....	11,037	.....	137·96	22·99	10·01
7	Hay	Hay	6	33·00	19·88	42½	14·83	.....	31	.....	.....	18·60	.....	86·36	14·39	.....	12·32	.....	.....	14,020	.....	175·25	29·21	14·82
8	Pasture	Fallow	6	33·00	19·88	.....	.....	.....	.....	82½	.....	65·80	.....	118·68	19·78	.....	.....	.....	.....	.....	.....	.....	.....	-19·78
	Aggregate		48	264·00	248·53	401½	140·62	.....	157¼	263½	14⅛	324·01	65·48	104265	.....	.....	.....	.....	.....	.....	142024	.....	.....	.....
	Average per acre 19		.....	5·50	5·18	8·37	2·93	.....	3·28	5·49	·31	6·75	1·36	.....	21·72	.....	.....	.....	.....	.....	.....	.....	29·59	7·87
	Average per Acre for ..... years		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ROTATION J.—SIX YEAR

Rotation Year	Crops: Last Year	Crops: This Year	Area	Items of Expense in Raising Crop: Rent and Manure	Seed, Twine and use of Machinery	Manual Labour: Hours Manual Labour	Manual Labour: Cost of Manual Labour	Horse Labour (Including Teamster): Hours: Single Horse	2 Horse Team	3 Horse Team	4 Horse Team	Value of Horse Labour	Cost of Threshing	Total Cost	Cost for 1 Acre	Cost for 1 Bushel	Cost for 1 Ton	Particulars of Crop: Weight: Grain	Straw	Hay	Hoed Crop	Total Value	Value of Crop per Acre	Profit or Loss per Acre
			acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	lb.	lb.	lb.	lb.	$ c.	$ c.	$ c.
1	Wheat	Oats	5	20·00	21·56	18	6·30	.....	10	57¾	1¾	54·36	16·44	118·66	23·73	·65	.....	6,210	18,630	.....	.....	183·37	36·67	12·94
2	Wheat	Corn	5	20·00	29·75	183	64·05	2	33	36¼	1¾	52·61	.....	166·41	33·28	.....	19·41	.....	.....	.....	17,350	52·05	10·41	-12·87
3	Oats, seeded down	Fallow	5	20·00	6·00	.....	.....	.....	.....	50	.....	40·00	.....	66·00	13·20	.....	.....	.....	.....	.....	.....	.....	.....	-13·20
4	Hay	Green feed	5	20·00	18·99	8½	2·98	.....	5½	28	2	27·71	.....	69·68	13·94	.....	28·50	.....	.....	4,890 Green fed	.....	61·13	12·23	-1·71
5	Pasture	Green feed	5	20·00	18·99	8½	2·98	.....	5½	28	2	27·71	.....	69·68	13·94	.....	28·50	.....	.....	4,890	.....	61·13	12·23	-1·71
6	Fallow	Wheat	5	20·00	26·85	24	8·40	.....	8	54½	3	51·65	9·76	116·66	23·33	1·43	.....	48·80	146·40	.....	.....	177·31	35·46	12·13
	Aggregate		30	120·00	122·14	242	84·71	2	61½	254½	10½	254·04	26·20	607·09	.....	.....	.....	.....	.....	.....	.....	534·99	.....	.....
	Average per acre 19		.....	4·00	4·07	8	2·82	·07	2·05	8·48	·35	8·47	·87	.....	20·24	.....	.....	.....	.....	.....	.....	.....	17·83	-2·41
	Average per acre for ..... years		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ROTATION C.—THREE-YEAR

Rotation Year	Crops: Last Year	Crops: This Year	Area	Items of Expense in Raising Crop: Rent and Manure	Seed, Twine and use of Machinery	Manual Labour: Hours Manual Labour	Manual Labour: Cost of Manual Labour	Horse Labour (Including Teamster): Hours: Single Horse	2 Horse Team	3 Horse Team	4 Horse Team	Value of Horse Labour	Cost of Threshing	Total Cost	Cost for 1 Acre	Cost for 1 Bushel	Cost for 1 Ton	Particulars of Crop: Weight: Grain	Straw	Hay	Hoed Crop	Total Value	Value of Crop per Acre	Profit or Loss per Acre
			acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	lb.	lb.	lb.	lb.	$ c.	$ c.	$ c.
1	Wheat	Fallow	5·66	22·64	6·79	.....	.....	.....	.....	67½	.....	50·63	.....	80·06	14·14	.....	.....	.....	.....	.....	.....	.....	.....	14·14
2	Fallow	Wheat	5·66	22·64	31·36	31	21·90	.....	.....	42½	.....	31·83	16·58	114·36	20·20	·83	.....	8,200	24,870	.....	.....	288·77	51·02	30·82
3	Wheat	Wheat	5·66	22·64	26·03	19½	6·83	.....	.....	86½	.....	64·88	12·20	132·58	23·42	2·61	.....	3,050	9,150	.....	.....	110·82	19·58	3·84
	Aggregate		16·98	67·92	64·18	53½	18·73	.....	.....	196½	.....	147·39	28·78	327·00	.....	.....	.....	.....	.....	.....	.....	399·59	.....	.....
	Average per acre 19		.....	4·00	3·77	3·15	1·10	.....	.....	11·57	.....	8·68	1·69	.....	19·26	.....	.....	.....	.....	.....	.....	.....	23·53	4·27
	Average per acre for ..... years		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

CULTURAL EXPERIMENTS

DEPTH OF PLOUGHING

In this experiment three blocks of land are used, each block representing a year in the rotation: summer-fallow, wheat, oats.

Each block is subdivided into ten plots. The treatment given to these plots and the yields obtained are set out in the following tables.

Wheat stubble receives manure at the rate of 6 tons per acre and is ploughed in the fall. Plots 1 to 3, inclusive, are ploughed the same depth as in the fallow year while the remainder are ploughed five inches deep.

DEPTH OF PLOUGHING SUMMER-FALLOW

Plot	Work Done	Yield of Wheat after Summer-fallow				Yield of Oats the Following Season			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Plough three inches deep	27	20	32	03	33	08	54	25·1
2	Plough four inches deep	29	20	34	08	38	28	54	26·2
3	Plough five inches deep	30	..	35	14	41	26	55	3·3
4	Plough six inches deep	26	..	35	30	45	10	53	22·4
5	Plough seven inches deep	25	20	35	08	48	18	57	·8
6	Plough eight inches deep	28	..	36	15	57	02	63	2·4
7	Plough five inches, subsoil four inches	26	40	38	16	51	16	61	25·3
8	Plough six inches, subsoil four inches	29	20	37	48	55	10	65	25·3
9	Plough seven inches, subsoil four inches	30	40	38	50	58	18	68	20·2
10	Plough eight inches, subsoil four inches	30	..	39	31	54	14	73	29·3

The method of subsoiling in the above experiment was to loosen the subsoil by the use of a plough with mould board removed which, while it loosened the soil to the required depth, did not turn the subsoil up to the surface.

The results of the experiment as shown by the above table give a fairly uniform and definite increase in yield as the ploughing deepened. In considering the application of these results to the country generally it should be remembered that the soil on this farm is a fairly heavy clay and underlaid by an exceptionally rich subsoil to a depth of over three feet from the surface. Another factor which should be considered is that the cost of ploughing increases rapidly as the depth increases, owing to the extra power required. Considering the extra cost of ploughing it is doubtful if the deeper ploughings at seven and eight inches, accompanied by the subsoiling, would be profitable, particularly in districts not underlaid by such an excellent subsoil.

DEPTH OF PLOUGHING SOD

The sod is obtained by the seeding of a mixture of western rye grass, timothy, red clover and alfalfa, using oats as a nurse crop, in the four-year rotation—wheat, oats, hay, hay.

As soon as the second crop of hay has been removed the land is ploughed. The next spring wheat is seeded. After the wheat is harvested the land is ploughed in preparation for oats the next season.

DEPTH OF PLOUGHING SOD

Plot	Work done	Yield of Wheat				Yield of Oats After Wheat			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
11	Plough three inches deep on sod and three inches deep on following wheat stubble	20	40	30	57·7	71	06	70	..
12	Plough four inches deep on sod and four inches on following wheat stubble	18	50	29	45·5	84	04	79	05
13	Plough five inches deep on sod and five inches on following wheat stubble	14	..	29	35·5	75	30	77	30
14	Plough three inches deep on sod and six inches on following wheat stubble	12	20	27	56·6	58	28	70	14

The yield of oats following the wheat is greater on the four and five-inch ploughings than when the ploughing is shallower or deeper and is sufficiently marked to justify the statement that where wheat has followed sod the wheat stubble should be ploughed as nearly four inches in depth as possible.

SUMMER-FALLOW TREATMENT

Opinions differ as to the proper methods to use when summer-fallowing. The following experiment includes seventeen methods and the resulting yields of wheat are given for the past ten years.

The land to be summer-fallowed has previously produced a crop of oats.

Wheat stubble receives manure at the rate of 6 tons per acre and all plots are ploughed six inches deep in the fall.

SUMMER FALLOWING METHODS

Plot	Work Done	Yield of Wheat on Summer-fallow				Yield of Oats Second Season			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Plough four inches June, pack if necessary and practicable, cultivate as necessary	10	..	38	04	34	04	69	09
2	Plough six inches June, pack if necessary and practicable, cultivate as necessary	28	..	43	33	52	32	74	23
3	Plough eight inches June, pack if necessary and practicable, cultivate as necessary	32	40	42	35	56	16	81	23
4	Plough four inches June, cultivate, plough four inches September, harrow	32	40	44	08	43	18	77	10
5	Plough six inches June, cultivate, plough six inches September, harrow	26	40	41	02	52	32	71	30
6	Plough six inches June, cultivate, plough eight inches September, harrow	26	40	40	22	54	04	73	02
7	Plough six inches June, cultivate, plough four inches September, harrow	27	20	40	44	52	32	69	07
8	Plough four inches June, cultivate, plough six inches September, harrow	24	..	37	44	38	28	62	14
9	Plough four inches June, early as possible, cultivate, plough six inches September, leave untouched	26	40	37	51	54	24	68	24
10	Plough five inches June, seed to rape or other green forage crop and pasture off	6	..	31	33	30	20	67	14
11	Plough six inches May 15th, harrow and pack if necessary, cultivate as necessary	30	40	40	22	56	16	74	28
12	Plough six inches June 15th, harrow and pack if necessary, cultivate as necessary	27	20	40	08	42	12	68	17
13	Plough six inches July 15th, harrow and pack if necessary, cultivate as necessary	27	20	39	20	52	32	71	25
14	Fall cultivate before summer-fallowing, plough six inches June, harrow and pack if necessary, cultivate as necessary	27	20	40	44	44	24	62	09
15	Fall plough four inches before summer-fallowing, plough six inches June, harrow and pack if necessary, cultivate as necessary	30	40	40	04	63	18	69	25
16	Plough six inches June, pack, cultivate as necessary	30	40	38	35	61	06	67	32
17	Plough six inches June, no packing otherwise same as other plots	29	20	38	35	58	28	72	30

The results of this experiment lead to some definite conclusions. First, the earlier summer-fallowing is done the better the results, not only in crop yields but also in the destruction of weeds. The growing of a forage crop such as rape, to be pastured off, is shown to be a distinctly losing venture when sown, as has been done in this experiment, in rows only six inches apart. While the rape afforded considerable pasture yet the returns were not sufficient to compensate for the loss in the crop of grain the year following. The high cost of summer-fallowing, however, would justify further experimentation in this phase of the subject, with inter-tilled crops sown at wider distances apart. Fall cultivation or ploughing has not proven profitable as the increased cost has been great and no increase in yield has resulted. It has, however, assisted in the destruction of weeds. Twice ploughing of summer-fallow has not given sufficiently increased yields to offset the extra cost and is not to be recommended, except when necessary to destroy grass, weeds, etc.

These conclusions are borne out also in a study of the oat crop following the wheat, the results of which are given in the following table:—

STUBBLE TREATMENT

This experiment has been designed to learn the most economical treatment to be given to stubble land in preparation for another grain crop.

A three-year rotation is practised; summer-fallow, wheat, wheat on plots 1 to 10 and oats on plots 11 to 13. In the summer-fallow year all plots receive equal treatment. The following year wheat is seeded. The stubble from this crop receives the various treatments given in the table in preparation for a crop of wheat or oats.

TREATMENT OF WHEAT STUBBLE TO BE SOWN TO WHEAT

Plot	Work Done	Wheat	
		Yield 1920	Average Yield, 1911-20
		bush. lb.	bush. lb.
1	Plough four inches in autumn	9 20	19 40
2	Disc harrow, autumn	6 40	21 32
3	Burn stubble, disc harrow autumn	8 40	19 58
4	Burn stubble, plough four inches autumn	10 ..	18 55
5	Burn stubble in spring, seed at once	7 20	19 06
6	Plough four inches spring, seed at once	8 40	20 33
7	Disc at cutting time, plough four inches in spring	15 20	20 24
8	Disc at cutting time, plough four inches in autumn	14 ..	19 20
9	Plough four inches in autumn, subsurface pack at once	12 ..	22 25
10	Plough four inches in spring, seed, subsurface pack at once	12 40	22 08

TREATMENT OF WHEAT STUBBLE TO BE SOWN TO OATS

Plot	Work Done	Oats	
		Yield 1920	Average Yield, 1911-20
		bush. lb.	bush. lb.
11	Plough five inches in autumn, subsurface pack at once	30 20	57 18
12	Plough five inches in spring, seed, subsurface pack	21 06	60 18
13	Cultivate in autumn, plough five inches in spring, seed	30 20	62 10

The results of this experiment, as shown in the preceding tables, do not follow any definite or regular variation, so that it is rather hard to make any general deductions as to the treatment to be given the stubble where wheat is the crop following. In those plots where oats are the second crop, spring ploughing definitely gives larger returns than fall ploughing and ground cultivated in the fall and ploughed in the spring gives better yields than where no cultivation is given.

SEEDING TO GRASS AND CLOVER

This experiment comprises the seeding down of a mixture of western rye grass and red clover, with and without a nurse crop, on land prepared in different ways.

SEEDING TO GRASS AND CLOVER

Plot	Work Done	First Year Yields per acre		Second Year Yields per acre	
		Yield 1920	Average Yield, 1911-20	Yield 1920	Average Yield, 1911-20
		Tons lb.	Tons lb.	Tons lb.	Tons lb.
1	Seeding rye grass 10 lb., and red clover 10 lb., with nurse crop on summer-fallow	2 760	2 565	2 1,240	2 1,140
2	Seeding rye grass 10 lb., and red clover 10 lb., alone after summer-fallow	2 920	3 285	3 40	3 246
3	Seeding rye grass 10 lb., and red clover 10 lb., with nurse crop on first year after hoed crop	1 1,520	2 997	3 320	2 1,000
4	Seeding rye grass 10 lb., and red clover 10 lb., alone after hoed crop	2 480	2 1,295	2 1,520	2 366
5	Seeding rye grass 10 lb., and red clover 10 lb., with nurse crop on first year wheat stubble	1 440	1 1,380	2 1,600	2 246
6	Seeding rye grass 10 lb., and red clover 10 lb., alone after first year wheat	1 320	2 315	3 520	2 633
7	Seeding rye grass and clover with oats to cut green on first year wheat stubble	.. 1,680	1 1,410	2 1,120	2 400
8	Seeding rye grass 10 lb., and red clover 10 lb., alone on first year wheat stubble; manure 8 tons per acre, plough preceding fall	1 40	2 900	2 1,200	2 153
9	Seeding rye grass 10 lb., and red clover 10 lb., with nurse crop on second year wheat stubble	1 1,360	2 5	S. F.	S. F.
10	Seeding rye grass 10 lb., and red clover 10 lb., alone after second year grain (oats)	1 1,880	1 1,025	S. F.	S. F.
11	Seeding rye grass 10 lb., and red clover 10 lb., with nurse crop on second year after hoed crop	1 ..	1 1,450	2 1,080	1 1,266

The results of this experiment lead to several definite conclusions in regard to suitable methods of seeding down to grasses and clovers. While the yield of hay in every case is slightly increased by seeding alone, yet this increase in the hay crop is not sufficient to recompense for the resulting loss of a crop of grain. The results also demonstrate that, even in a district such as this where the average rainfall is fairly good, the only method giving a satisfactory catch is to seed down on land which has either been summer-fallowed recently or has grown a hoed crop the previous year. The farther away from summer-fallow the less satisfactory the catch is likely to be. Seeding down with oats to be cut for green feed has not proven satisfactory owing to the fact that the young grass and clover plants are injured by the hot sun and wind when the oats are cut.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS

The following grass mixture: western rye grass, 10 pounds, alfalfa, 3 pounds, red clover, 3 pounds per acre, is seeded without a nurse crop and, after being in hay for two years, the land is broken according to methods given in the table.

It will be noticed that plot 5 is broken and seeded at once to wheat; also that plots 6 and 7 are treated similarly but seeded to flax and peas, respectively. While all

plots are broken the same year, three are used to produce crops. The yields of these crops are not presented in the accompanying table, which gives the yields of wheat only from all plots the following year.

BREAKING SOD

Plot	Work Done	Yield 1920		Average Yield, 1915-20	
		bush.	lb.	bush.	lb.
1	Plough five inches July 20 to 30, pack and disc at once, disc in autumn	25	20	27	08
2	Plough five inches October, pack, disc harrow	22	..	17	06
3	Plough three inches early July, top work, backset September, cultivate as necessary	29	20	27	30
4	Stiff-tooth rip July, plough five inches September, cultivate as necessary	15	20	22	01
5	Plough five inches spring, seed same spring to wheat	8	40	17	06
6	Duplicate No. 5, sow flax	13	20	17	23
7	Repeat No. 5, sow peas	7	20	17	43
8	Plough May 15th, work as summer-fallow	16	..	28	56

The results obtained from the above experiment show definitely that the proper procedure in breaking sod from cultivated grasses and clovers is to take off the cutting of hay early and break immediately. Backsetting is not necessary if the first ploughing is well done. The increased yield of grain obtained by breaking in the spring and summer-fallowing the full year is not sufficient to compensate for the loss of a crop of hay. Breaking in the fall decreases the yield very markedly and breaking early and growing crops such as wheat and pease has not proven profitable. Flax is considerably more suitable for use in this manner than the other crops.

APPLICATION OF BARNYARD MANURE

In this experiment several different methods of applying barnyard manure on corn, wheat, barley and oats are compared.

APPLICATION OF BARNYARD MANURE FOR CORN

Plot	Work Done	Yield 1920		Average Yield, 1911-20	
		Tons	lb.	Tons	lb.
1	No manure, plough second year stubble in autumn	9	1,600	8	1,105
2	Apply in autumn after ploughing second year stubble, work in at once	12	600	10	220
3	Apply in spring on autumn ploughed second year stubble, work in at once	10	200	8	1,910
4	Apply in autumn on second year stubble, plough in autumn	11	...	8	1,605
5	Apply in spring on second year stubble, plough under in spring	11	1,200	8	1,685
6	Apply in winter on second year stubble, plough under in spring	11	600	9	1,456
7	Apply in winter unrotted manure (cut straw) on second year stubble, plough under in spring	12	400	8	1,533
8	Apply in winter unrotted manure (cut straw) on summer-fallow, disc in	12	400	9	365
9	Summer-fallow—hoed crop—wheat	12	800	10	675

The proper method of applying barnyard manure for corn is clearly demonstrated by the above table to be that of applying in the fall on fall ploughed land and working in at once. This method gives almost equally as good yields as where summer-fallow preceded the corn crop and clearly demonstrates that it is not necessary or profitable

to precede the corn crop by summer-fallow. The applying of manure to summer-fallow preceding a crop of corn is demonstrated as being decidedly unprofitable as it has tended to decrease rather than increase the yield.

APPLYING BARNYARD MANURE FOR WHEAT AFTER CORN

Plot	Work Done	Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.
1	No manure, plough second year stubble in autumn	20	40	27	44
2	Apply in autumn after ploughing second year stubble, work in at once	10	40	28	02
3	Apply in spring on autumn ploughed second year stubble, work in at once	7	20	26	41
4	Apply in autumn on second year stubble, plough under in autumn	9	20	25	22
5	Apply in spring on second year stubble, plough under in spring	16	..	27	07
6	Apply in winter on second year stubble, plough under in spring	17	20	29	26
7	Apply in winter unrotted manure (cut straw) on second year stubble, plough under in spring	16	40	28	22
8	Apply in winter unrotted manure (cut straw) on summer-fallow, disc in	26	40	33	31
9	Hoed crop, wheat, summer-fallow	24	40	35	13

The rotation for the above experiment for plots 1-7, inclusive, is hoed crop (for which manure is applied), wheat, wheat. For plots 8 and 9 the rotation is summer-fallow, hoed crop, wheat. The yield of wheat following the corn favours the applying of manure in the winter and ploughing it under in the spring. This is also closely followed in yield by applying in fall and ploughing in. The manured summer-fallow has not proven profitable in the wheat crop nor in the crop preceding it.

APPLYING BARNYARD MANURE FOR WHEAT AFTER WHEAT

Plot	Work Done	Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.
1	No manure, plough second year stubble in autumn	11	20	21	40
2	Apply in autumn after ploughing second year stubble, work in at once	15	20	23	16
3	Apply in spring on autumn ploughed second year stubble, work in at once	16	..	23	36
4	Apply in autumn on second year stubble, plough under in autumn	16	..	21	42
5	Apply in spring on second year stubble, plough under in spring	13	20	23	07
6	Apply in winter on second year stubble, plough under in spring	15	20	24	08
7	Apply in winter green manure (cut straw) on second year stubble, plough under in spring	17	20	23	41

The same methods of applying manure for corn have proved of benefit in the second wheat crop following the corn as in the first crop following the corn, namely, applying in winter and ploughing under in the spring.

APPLYING BARNYARD MANURE FOR WHEAT

Plot	Work Done	Year II				Year III			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Apply in winter unrotted manure (cut straw) on first year stubble, disc in..	6	40	34	48	12	..	21	20
2	Apply in winter unrotted manure (cut straw) on summer-fallow, disc in....	17	20	38	33	14	40	22	16
3	Top dress, with spreader, grain sown on first year stubble, plough in autumn	15	20	40	..	8	..	21	16
4	Top dress, with spreader, grain sown on summer-fallow.....	14	..	37	17	8	..	18	19
5	No manure, plough first year stubble in autumn.....	28	..	37	09	10	..	19	04
6	Apply on first year stubble, plough under in autumn.....	24	40	39	43	12	..	23	14
7	Apply on first year stubble, plough under in spring.....	24	40	39	42	10	..	21	38
8	No manure, plough first year stubble in autumn.....	29	20	36	37	13	20	19	44
9	No manure, burn first year stubble in autumn and plough.....	22	40	37	51	12	..	25	27

The rotation of crops on the above section of the experiment is wheat, wheat and summer-fallow and the methods of applying manure which have given the largest returns have been when the manure was applied on the top of the land immediately after seeding before the grain was up and this was closely followed in yield by the plot where the manure was applied on the summer-fallow and disced in. Ploughing in the manure, either in fall or spring, was the method which followed next in point of yield.

APPLYING BARNYARD MANURE FOR BARLEY

Plot	Work Done	Year II				Year III			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Apply in winter unrotted manure (cut straw) on first year stubble, disc in.	32	..	37	50	32	44	47	10
2	Apply in winter unrotted manure (cut straw) on summer-fallow, sow barley on fallow.....	44	08	49	28	49	14	71	06
3	Top dress, with spreader, barley sown on first year stubble.....	36	..	39	45	33	16	49	28
4	Top dress, with spreader, barley sown on summer-fallow.....	36	32	60	18	47	02	58	22
5	No manure, plough first year stubble in autumn.....	30	40	41	12	26	32	36	40
6	Apply on first year stubble, plough under in autumn.....	35	20	43	56	30	40	37	43·2
7	Apply on first year stubble, plough under in spring.....	33	20	42	52	15	..	35	28
8	No manure, plough first year stubble in autumn.....	26	40	38	52	27	24	33	12·2
9	No manure, burn first year stubble in autumn and plough.....	25	20	32	29	27	24	34	15

The top dressing of the barley immediately after sowing has proved the most profitable method of applying the manure closely followed by spreading unrotted manure on the stubble and discing it in.

APPLYING BARNYARD MANURE FOR OATS

Plot	Work Done	Year II				Year III			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Apply in winter green manure (cut straw) on first year stubble, disc in.	24	..	37	23	25	30	59	17
2	Apply in winter green manure (cut straw) on summer-fallow, sow oats on summer-fallow	61	06	89	06	20	..	35	17
3	Top dress, with spreader, oats sown on first year stubble	32	..	39	34	40	..	66	10
4	Top dress, with spreader, oats sown on summer-fallow	75	10	94	31	28	16	36	23
5	No manure, plough first year stubble in autumn	28	..	41	55	34	04	61	22
6	Apply on first year stubble, plough under in autumn	32	..	41	20	45	30	71	31
7	Apply on first year stubble, plough under in spring	28	..	41	50	28	08	64	12
8	No manure, plough first year stubble in autumn	24	40	39	01	31	26	61	..
9	No manure, burn first year stubble in autumn and plough	20	..	35	42	30	20	57	03

The best method of applying manure for oats varies from that of wheat and barley in that the best yields of oats are obtained when the manure is applied on the stubble and ploughed under in the fall and this is followed by top dressing the grain the same as in wheat and barley.

GREEN MANURING

In this experiment annual legume crops are ploughed under and comparisons made with plots summer-fallowed and treated with barnyard manure.

GREEN MANURING

Plot	Work Done	Year II				Year III			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Summer-fallow	24	40	35	42	32	02	55	01
2	Peas, 2 bushels Golden Vine (or other similar variety) per acre, ploughed under early in July	23	20	36	..	37	32	57	28
3	Peas, 2 bushels Golden Vine per acre, ploughed under when in blossom	24	40	31	33	31	26	56	06
4	Tares, 1 bushel per acre, ploughed under late in July	24	..	34	11	36	12	56	11
5	Summer-fallow, barnyard manure applied at rate of 12 tons per acre	28	40	38	..	48	28	64	28
6	Summer-fallow	24	..	34	39	35	20	55	16

The ploughing under of green manures as fertilizer is shown by the above experiment to be distinctly unprofitable from all points of view. The application of barnyard manure to the ground to be summer-fallowed is shown to be distinctly profitable both from the viewpoint of yield and also from that of the physical condition of the soil.

SEED-BED PREPARATION

Three grades of seedbed preparation are used in this experiment. A three year rotation—summer-fallow, wheat, oats—is practised. In the summer-fallow year all plots are treated alike. The treatment when seeding on summer-fallow land is such

as to merit the descriptive terms, poor, good, extraordinary. The stubble land receives uniform treatment in the fall and, in the following spring, similar treatment to that given for wheat.

SEED BED PREPARATION

Plot	Work Done	Wheat				Oats			
		Yield 1920		Average Yield, 1911-20		Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
1	Poor preparation	26	40	37	31	51	26	62	32
2	Good preparation	29	20	37	23	50	20	61	24
3	Extraordinary preparation	32	..	34	48	56	16	66	04

The figures in the above table indicate that the better the preparation of the seed-bed the better the results, but are not sufficiently conclusive to establish this to a point where any definite amount of work may be stated to be the maximum which it is profitable to give.

SOIL PACKERS

Three types of packer have been in use since 1911 with a view of obtaining information on the value of the packer, the best type, if any, and the proper time to pack.

The various types of packer are tested on summer-fallow land and also spring and fall ploughing.

SOIL PACKING FOR WHEAT SOWN ON SUMMER-FALLOW

Plot	Work Done	Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.
1	Harrow, seed	28	..	36	..
2	Harrow, seed, surface pack	26	40	37	13
3	Harrow, seed, surface pack, harrow	27	20	38	52
4	Harrow, seed, subsurface pack	30	..	38	34
5	Harrow, seed, subsurface pack, harrow	29	20	39	28
6	Harrow, seed, combination pack	28	..	35	58
7	Harrow, seed, combination pack, harrow	28	..	37	48
8	Surface pack, seed, surface pack	26	40	37	57
9	Subsurface pack, seed, subsurface pack	26	40	35	54
10	Combination pack, seed, combination pack	25	20	41	11
11	Surface pack, harrow, seed	24	..	39	30
12	Subsurface pack, harrow, seed	23	20	36	38
13	Combination pack, harrow, seed	22	..	34	30
14	Harrow, seed	22	..	35	26
15	Plough for summer-fallow, surface pack, cultivate; next spring smoothing harrow, seed	21	20	37	06
16	Plough for summer-fallow, subsurface pack, cultivate; next spring smoothing harrow, seed	22	40	37	08
17	Plough for summer-fallow, combination pack, cultivate; next spring smoothing harrow, seed	22	40	37	20
18	Plough for summer-fallow, surface pack, cultivate; next spring smoothing harrow, seed, surface pack	24	40	37	26
19	Plough for summer-fallow, subsurface pack, cultivate; next spring smoothing harrow, seed, surface pack	20	..	41	51
20	Plough for summer-fallow, combination pack, cultivate; next spring smoothing harrow, seed, combination pack	22	..	39	40
21	Harrow, seed	21	20	39	24
22	Harrow, seed, harrow when six inches high	22	..	38	26
23	Harrow, seed, surface pack when six inches high	22	40	38	28
24	Harrow, seed, roll when six inches high	20	40	37	56
25	Harrow, seed	20	..	40	05

SOIL PACKING FOR WHEAT SOWN ON SPRING PLOUGHED WHEAT STUBBLE

Plot	Work Done	Yield 1920		Average Yield, 1911-20	
		bush.	lb.	bush.	lb.
1	Harrow, subsurface pack, harrow, seed	22	10	23	10
2	Harrow, surface pack, harrow, seed	20	..	27	04
3	Harrow, combination pack, harrow, seed	18	20	29	15
4	Harrow, subsurface pack, harrow, seed, subsurface pack	17	30	27	47
5	Harrow, surface pack, harrow, seed, surface pack	18	40	28	06
6	Harrow, combination pack, harrow, seed, combination pack	15	20	32	11
7	Harrow, seed, harrow	15	20	25	17
8	Harrow, seed, surface pack	15	30	24	43
9	Harrow, seed, subsurface pack	15	20	28	04
10	Harrow, seed, combination pack	16	..	27	35
11	Harrow, seed	11	40	23	46

SOIL PACKING FOR WHEAT SOWN ON AUTUMN PLOUGHED STUBBLE LAND

12	No packer, harrow, seed	12	..	26	40
13	Subsurface pack in fall, seed in spring	12	20	21	48
14	Subsurface pack in spring, then seed	10	30	20	42
15	Subsurface pack in spring, after seeding	11	..	22	02
16	Surface pack in fall, seed in spring	11	50	25	30
17	Surface pack in spring, seed	12	10	22	41
18	Surface pack in spring, after seeding	12	..	22	51
19	Combination pack in fall, seed in spring	13	..	26	51
20	Combination pack in spring, then seed	15	30	27	01
21	Combination pack after seeding	15	10	27	30
22	No packer, harrow, seed	15	40	25	06
23	Surface pack in fall, seed, surface pack	12	50	25	12
24	Subsurface pack in fall, seed, subsurface pack	14	10	23	12
25	Combination pack in fall, seed, combination pack	12	50	22	56

The results of this experiment do not indicate that the packing of the ground can be recommended as an operation to be performed at any stated time during the season's operations. On well worked summer-fallow and fall ploughing the benefit of the packer is not sufficiently large to justify the purchase of the implement and its operation. On spring ploughing, on the other hand, the benefit of the packer is much more marked, the soil being loose and open as a result of the ploughing would explain the benefit derived as the packer would firm the soil and make a more desirable seed bed. The natural packing of the soil on the summer-fallow and fall ploughed ground would make a fairly firm seed-bed and would lessen the need of greater firmness. No consistent difference can be noted in the results obtained in the use of different types of packer.

COMMERCIAL FERTILIZERS

Sixteen plots are used in this experiment. A four-year rotation is followed consisting of wheat, oats, hay, corn. The fertilizers are applied only once in four years, that is, preceding the crop. They are applied on the surface in spring and worked in just before seeding the corn. The year that the plots are in hay, plots 12 and 13 are in clover, while the rest are in grass. This is to test the fertilizing effect of clover on the after crops.

COMMERCIAL FERTILIZERS

Plot —	Average Oats 3 Years	Average Hay 2 Years	Corn 1 Year	Average Wheat 3 Years
	bush. lb.	Tons lb.	Tons lb.	bush. lb.
1 Check—no fertilizer	78 28	1 900	7 1,200	37 23
2 Nitrate of soda at rate of 160 pounds per acre	76 29	1 900	8 1,600	35 26
3 Superphosphate at rate of 300 pounds per acre	74 30	1 1,000	9 1,200	41 51
4 Muriate of potash at rate of 100 pounds per acre	68 21	1 600	8 1,600	35 20
5 Check—no fertilizer	74 05	1 800	8 400	36 56
6 Nitrate of soda 160 pounds per acre; superphosphate 300 pounds per acre; muriate of potash 100 pounds per acre.	78 01	1 1,700	10 400	44 16
7 Nitrate of soda 160 pounds per acre; superphosphate 300 pounds per acre	74 17	1 1,700	9 .	43 33
8 Nitrate of soda 160 pounds per acre; muriate of potash 100 pounds per acre.	72 31	1 700	8 800	39 26
9 Superphosphate 300 pounds per acre; muriate of potash 100 pounds per acre.	73 24	1 400	7 ..	43 30
10 Check—no fertilizer	78 ..	1 1,100	6 400	34 13
11 Basic slag 500 pounds per acre	69 14	1 1,200	6 1,600	40 56
12 Clover in place of grass	66 09	1 1,000	5 1,600	35 33
13 Clover in place of grass	61 21	1 1,000	6 800	35 03
14 Barnyard manure 16 tons per acre	61 18	1 1,600	6 1,200	39 40
15 Barnyard manure 8 tons per acre	60 28	1 1,200	6 400	37 23
16 Check—no fertilizer	67 15	1 640	4 1,600	36 16

A study of the results of this experiment, which was designed to ascertain the benefit of commercial fertilizers on the various crops commonly grown, indicates that on fertile soils, such as are common throughout the West, while the yield on some of the crops may be raised slightly by the application of commercial fertilizers, yet the increase in yield is not sufficient to warrant the purchase and application of such fertilizers for the growing of the common crops of the prairies. This does not detract in any way from the value of such fertilizers for specialized crops such as garden stuffs. One fact which is noticeable in all the fertilized plots is that the potassic fertilizers give the least benefit of any of the fertilizers applied and it may be safely concluded that the supply of potassium in our soil is sufficient for the needs of the crops though there may be benefit obtained from the use of nitrates and phosphoric acid.

DEPTH OF SEEDING WHEAT

Plot —	Yield 1920	Average Yield, 1911-20
	bush. lb.	bush. lb.
1 Sowing one inch deep	20 40	37 10
2 Sowing two inches deep	28 ..	37 34
3 Sowing 3 inches deep	29 20	38 40
4 Sowing four inches deep	26 40	38 22

DEPTH OF SEEDING OATS

1 Sowing one inch deep	54 04	65 11
2 Sowing two inches deep	35 10	64 12
3 Sowing three inches deep	44 24	65 24
4 Sowing four inches deep	48 08	65 26

A study of the results of the above experiment indicates that no stated depth of seeding can be given as the best. Very little variation is noticeable in the yield of the various plots and, as the variation is not regular, the results would indicate that the amount of moisture present in the soil at seeding time would govern the depth to which the seed should be placed.

UNDERDRAINAGE

The purpose of this experiment is to determine the advisability of underdrainage.

In many sections of Eastern Canada the yields from tile drained land have been considerably higher than those from similar land undrained.

The results given below prove that underdrainage is not a profitable venture in the West as increased yields are not obtained.

UNDER DRAINAGE

Plot		Yield 1919	Average Yield, 1911-19
		bush. lb.	bush. lb.
1	No drainage	Summer-fallow	30 10
2	No drainage	1919. There	29 50
3	Drain three feet deep	was no crop in	31 40
4	No drainage	1918, the straw	34 40
5	No drainage	being so short	33 43
6	No drainage	as to make it	32 10
7	Drain four feet deep	impossible to	30 46
8	No drainage	be cut.	30 16
9	No drainage		31 ..

HORTICULTURE

The season of 1920 has been nearly an average Saskatchewan season. The principal departure from average conditions was in the rainfall, which was very light during the first three weeks of July. This, with hot south winds, checked all crops considerably, but 4.96 inches of rain received on July 22 and 23 brought vegetables on with a rush and a good crop was harvested.

Annual and perennial flowers were checked by the hot winds but, latterly, came on well, with a good show of bloom.

Fruit trees and bushes had a good show of bloom but the dry weather affected the fruit so that a very poor crop was obtained.

Insect pests were prevalent during the season and were only kept under control by the constant use of insecticides.

POTATOES

Twenty-nine varieties were planted in uniform test rows on May 21 and dug on October 2. Several varieties gave a very poor germination and, consequently, the yields were very low.

The yields are calculated from 100-foot rows, 30 inches apart with sets 12 inches apart in the row.

POTATOES—TEST OF VARIETIES

Variety	Form	Colour	Yield	
			bush.	lb.
Moulton Rose	Oval	Red	481	24
Early Ohio (selected)	Oval	Red	420	30
Morgan Seedling	Round	Light pink	411	48
New London	Long	Red	408	54
Early Bovee	Long	Pink and white	408	54
Money Maker	Long	White	406	..
New Queen	Oval	Pink and white	394	24
Morey Seedling	Long	Pink	388	36
Late Puritan	Oval	White	382	48
Irish Cobbler	Round	White	359	36
Bermuda Early	Oval	Red	353	48
Carman No. 1	Oval	White	350	54
Early Northern	Long	Red	324	48
Vick Extra Early	Oval	Pink and white	319	..
Gold Coin	Oval	White	316	06
Wee MacGregor	Oval	White	310	18
Dalmeny Beauty	Oval	White	301	36
Dreer Standard	Oval	White	284	12
King George V	Round	White	275	30
Rawling Kidney	Long	White	269	42
Green Mountain	Round	White	266	48
Empire State	Long	White	255	12
Early Hebron	Oval	Pink and white	211	42
Eureka Extra Early	Oval	White	200	06
Early Six Weeks	Round	Red	194	18
Manitoba Wonder	Long	Red	104	24
Table Talk	Long	White	89	54
Everett	Oval	White	63	48
King Seedling (poor germination)	Long	White	46	24

CULTURAL EXPERIMENTS WITH POTATOES ON 1-20-ACRE PLOTS

Variety	Nature of Experiment	Yield per acre 1920		Average Yield for 5 Years	
		bush.	lb.	bush.	lb.
Early Ohio	Rows 36" apart, sets 12" in row	172	20	341	41
Early Ohio	Rows 36" apart, sets 14" in row	173	20	331	22
Early Ohio	Rows 30" apart, sets 14" in row	242	20	361	52
Early Ohio	Rows 30" apart, sets 12" in row	265	20	384	12
Early Ohio	Cultivate twice and hilled	261	40	346	10
Early Ohio	Flat cultivation	259	40	345	10
Early Ohio	Cultivate three times and hill	275	40	334	..
Early Ohio	Cultivate six times and hill	253	40	348	08

Experiment in Sprouting Seed Before Planting

For several years, an experiment has been carried on in sprouting potato seed before planting. Whole potatoes averaging about three ounces each have been used. These are placed in shallow boxes and exposed to the sunshine until the sprouts are about three inches long. They are then planted, care being taken not to injure the shoot, which should be partly above ground after planting. This plan is only practical where only a small plot or kitchen garden is required but the greatly increased yield and earliness recommends its trial.

Variety	Sprouted		Unsprouted		Average Yield 5 Years Sprouted		Average Yield 5 Years Unsprouted	
	bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
Vick Extra Early	600	18	350	54	598	48	312	09
Early Bovee (3 years)	373	37	325	24	357	07	325	24
King Seedling (3 years)	329	40	291	20	330	..	296	22

ASPARAGUS

A medium crop was obtained from the young beds of Barr Mammoth, Conover Colossal and Palmetto. The first cutting was made on May 12.

BEANS

Twenty varieties were sown in the garden on June 3rd and all ripened before frost came. Seed grown at this farm compared favourably with that received from the different seedsmen. Calculated from 50-foot row.

BEANS—TEST OF VARIETIES

Variety	In Bloom	Ready for Use	Remarks
Wardwell Kidney Wax	July 16	July 26	Medium crop.
Vermont Kidney	" 16	" 28	Good crop.
Early Red Valentine	" 16	Aug. 3	Fair crop.
Stringless Green Pod	" 16	July 30	Medium crop.
Plentiful French	" 16	" 28	Good crop.
Pencil Pod	" 16	" 28	Small crop.
Refugee	Aug. 3	Aug. 16	Small crop.
Pencil Pod Black Wax	July 16	July 28	Small crop.
Masterpiece, 0-8955	" 16	" 30	Good crop.
Wardwell Kidney Wax (McD.)	" 16	" 30	Light crop.
Plentiful French, 0-8957	" 16	" 30	Heavy crop.
Davis White Wax	" 16	Aug. 3	Very light crop.
Round Pod Kidney Wax	" 16	" 3	Small crop.
Grennell Rustless Wax	" 16	July 30	Small crop.
Bountiful Green Bush	" 16	" 30	Large crop.
Hodson Long Pod	Aug. 3	Aug. 16	Light crop.
Stringless Green Pod	July 16	July 30	Light crop.
Extra Early Valentine	" 24	Aug. 3	Good crop.
Kentucky Wonder Pole	" 28	" 14	Very light crop.
Fordhook Favourite	" 16	July 23	Small crop.

BEETS

Eight varieties were sown in the garden on May 29 and taken up on September 27. The yield was heavy but roots were somewhat oversized owing to the rapid growth of July and August. Yields were computed from the crop grown on a 50-foot row.

BEETS—TEST OF VARIETIES

Variety	In Use	Yield per acre	Remarks on Crop
		bush. lb.	
Eclipse	Aug. 5	1,566 ..	Extra heavy yield; roots oversized and rough.
Early Wonder	" 5	812 ..	Good crop; roots medium sized and smooth.
Crimson Globe	" 5	1,160 ..	Large crop; roots over-sized and rough.
Crosby Egyptian	" 5	1,073 ..	Good crop; roots medium sized and smooth.
Detroit Dark Red, B.O.-8886	" 5	1,392 ..	Large crop; roots rough and oversized.
Early Model	" 5	1,643 20	Extra large yield; roots oversized and rough.
Black Ball Red	" 5	1,024 40	Good crop; roots smooth and medium sized.

THINNING EXPERIMENT WITH BEETS

Variety	Thinned	Date Sown	Ready for Use	Taken Up	Yield per acre	Remarks
					bush. lb.	
Detroit Dark Red	2 inches	May 29	Aug. 5	Sept. 27	836 ..	Heavy crop medium size and smooth.
Detroit Dark Red	3 inches	" 29	" 5	" 27	1,041 20	Extra heavy yield; very good quality.
Detroit Dark Red	4 inches	" 29	" 5	" 27	770 ..	Rough and oversized roots.

BRUSSELS SPROUTS

Three varieties, Amager Market, Paris Market and Dalkeith, were sown in the hot-house on April 9 and transplanted into the garden on June 9. Owing to the extremely dry weather during July the plants were severely checked and a poor crop resulted. Years of tests with this vegetable have proven it very unsatisfactory for this climate.

CABBAGE

Eight varieties were sown in the hot-house on April 10 and transplanted into the garden on June 9. The crop obtained was well up to the average. The later varieties were exceptionally good.

CABBAGE—TEST OF VARIETIES

Variety	Ready for Use	Average Weight per Head	Remarks
		lb.	
Extra Amager Danish Ballhead, 0-9257	Oct. 7	9	Good quality.
Fottler Improved Brunswick	Aug. 28	9	Extra good quality
Early Jersey Wakefield	July 28	5	Good early variety.
Enkhuizen Glory	Aug. 3	10	Extra quality.
Marblehead Mammoth	Sept. 10	8	Medium quality.
Copenhagen Market	July 28	10	Extra fine early variety.
Savoy Perfection Drumhead	Sept. 10	7	Extra solid heads.
Delicatesse (red)	Oct. 7	6	Extra good quality.

CAULIFLOWER

Two varieties, Early Snowball and Extra Early Dwarf Erfurt, were sown in the hot-house on April 10 and transplanted into the garden on June 9. An average crop was obtained. The average weight per head of each variety was 4½ pounds. The Early Snowball variety has been under test for a number of seasons and is recommended for this climate.

CUCUMBER

Two varieties, Improved Long Green and Davis Perfect, were under test. The seed was sown on May 19 and the plants set out on June 30. Frost destroyed the vines before any fruit was matured.

CARROTS

Six varieties were sown on May 28 and the crop taken up on September 23. Improved Danvers and Chantenay 0-8885 produced the finest roots and most uniform in size. Below is shown a table giving the yield per acre.

CARROTS—TEST OF VARIETIES

Variety	Ready for Use	Yield per acre		Remarks
		bush.	lb.	
Chantenay 0-8885	July 24	870	20	Smooth and uniform size.
Chantenay (McDonald)	" 24	848	15	Quality very good.
Improved Danvers	" 31	841	..	Very fine quality.
Danvers (Kentville)	" 31	652	30	Medium quality.
Nantes Early Half Long Scarlet	" 24	565	30	Medium quality.
Early Scarlet Horn	" 24	551	..	Smooth roots; good keeper.

THINNING TEST:

For a number of years an experiment has been carried on in thinning carrots to different distances apart in the row. They are thinned to one and one-half inches, two inches and three inches. Those thinned to two inches have always given the smoothest roots while those thinned to three inches are invariably the lowest in yield, with a large percentage split and unfit for winter keeping.

CARROTS—THINNING EXPERIMENT

Variety	Yield at 1½ inches		Yield at 2 inches		Yield at 3 inches	
	bush.	lb.	bush.	lb.	bush.	lb.
Chantenay	616	15	478	30	391	30

CELERY

Five varieties were sown in the hot-house on March 26 and transplanted into the garden on July 5. The plants were set in trenches, in the bottom of which about

eight inches of well-rotted manure was placed, with six inches of good black loam on top. As the plants grew, the top earth was pulled in around the stalks in order to blanch them. Years of experiment have proved this the best method here.

Variety	Weight per 12 heads	Remarks on crop
	lb.	
White Plume	20	Well blanched; quality excellent
Winter Queen	19	Well blanched; quality excellent.
Paris Golden Yellow	18	Well blanched; quality excellent.
Giant Pascal	14	Medium quality; slightly stringy.
Evans Triumph	14	Quality good; medium stalks.

One variety, Paris Golden Yellow, was used in a test to determine the best method of blanching. The first lot was set in a trench and stalks hilled up with earth, giving a yield of 20 pounds per 12 heads. The second lot was planted on the level and a twelve-inch board set on edge on each side of the row leaving about 3½ to 4 inches space between. This produced only a medium quality as the stalks were inclined to be tough and stringy. The yield was 15 pounds to 12 heads. The third lot was planted on the level and the earth hilled up as the stalks grew. This gave celery of good quality but low yield. The weight of 12 heads was 13½ pounds. This crop required artificial watering to such an extent that it is not recommended unless an abundance of good water is available.

GARDEN CORN

Fourteen varieties were planted on June 5 in rows 36 inches apart and hills 24 inches apart in the row. The different strains of the Squaw sorts gave good early cobs. Below is given the results.

GARDEN CORN—TEST OF VARIETIES

Variety	Size of cob	Ready for use	Remarks on crop
Early Sweet Kloochman	Small	Aug. 16	Good quality and flavour.
Early Sweet Otta	Medium	" 28	Good quality and flavour.
Pickaninny	Small	" 14	Quality good; sweet flavour.
Early Sweet Squaw	Medium	" 25	Good quality; flavour good.
Country Gentleman	.....	.....	Did not mature.
Will's Green	Large	" 30	Fair quality.
Early Malcolm	Medium	" 28	Quality very good.
Pocahontas	.....	.....	Did not mature.
Extra Early Cory	.....	.....	Did not mature.
Early Mayflower	Medium	" 30	Medium quality.
Golden Bantam	.....	.....	Did not mature.
Stowell Evergreen	.....	.....	Did not mature.
Square Deal	Medium	Aug. 30	Fair quality and flavour.
Golden Tom Thumb (pop-corn)	Medium	" 24	Good uniform cobs.

LETTUCE

There were eight varieties under test. The seed was sown in the garden on May 29 in rows 18 inches apart. The cabbage sorts were thinned to six inches apart while the loose leaf types were left unthinned.

LETTUCE—TEST OF VARIETIES

Variety	Type	Ready for use	Remarks on crop
Hanson	Loose leaf	July 22	Good quality.
Simpson Black Seeded	Cabbage	" 24	Medium quality.
Grand Rapids, 0–9512	Loose leaf	" 15	A good early variety.
Salamander	Cabbage	" 30	Medium quality.
Iceberg	Cabbage	" 22	Large crisp heads.
Grand Rapids (Summerland)	Loose leaf	" 15	Good early variety.
Earliest Way-ahead	Cabbage	" 22	Large crisp heads.
Cos Trianon	Cos	" 24	Good crisp heads.

ONIONS

Twelve varieties were under test this past season. The seed was sown in the garden on May 25, and the crop taken up on September 25. The yields obtained were good and the quality well up to the average. An experiment was also carried on in growing onion sets. The seed was sown extra thickly and the plants allowed to grow without thinning. The sets found most suitable for growing a crop are those from one-quarter to one-half in diameter. Over that size, the onions are liable to go to seed and also produce a large perecentage of thick necks. Below is shown a table giving the yields of the varieties under test.

ONIONS—TEST OF VARIETIES

Variety	Yield per acre		Remarks on crop
	bush.	lb.	
Ailsa Craig	510	20	Yield and quality excellent.
Giant Prize Taker	440	40	Good yield; quality very good.
Large Red Wethersfield, 0–9518	440	40	Good yield; quality good.
Southport Yellow Globe	440	40	Good yield; medium quality.
Southport White Globe	429	10	Good yield; quality fair.
Extra Early Flat Red	371	10	Medium yield; quality medium.
Yellow Globe Danvers, 0–9290	371	10	Medium yield; quality good.
Yellow Globe Danvers (Graham)	348	..	Medium yield; quality fair.
Southport Red Globe	348	..	Medium yield; quality medium.
Mammoth Silver King	348	..	Medium yield; quality good.
Australian Brown	290	..	Light yields; good keeper.
White Barletta (pickling)	139	10	Yield and quality good.

The Ailsa Craig is a large, mild-flavoured onion but not a good keeper. The same might be said of Giant Prize Taker and Red Wethersfield. Yellow Globe Danvers is a good yielder and a good winter keeper. Australian Brown does not yield heavily but is a well shaped onion of medium size and the best winter keeper yet tested here.

PARSNIPS

One variety, Hollow Crown 0-9335, was sown in the garden on May 29, and the crop taken up on October 6. The crop was very heavy, yielding 1092 bushels and 20 pounds per acre. The seed was sown in rows 24 inches apart and the plants thinned to three inches apart in the row.

A test was also made in thinning parsnips to different distances in the row. The variety sown was Hollow Crown 0-9335. Below is a table showing the result of the test.

—	Yield per acre	Remarks on crop
	bush. lb.	
Thinned to two inches	1,010 06	Large yield; smooth roots.
Thinned to three inches	999 ..	Large yield; smooth roots.
Thinned to four inches	1,067 ..	Large size; considerable size roots.

PARSLEY

Four varieties, Champion Moss Curled, Triple Curled, Extra Curled and Double Curled 0-9273, were sown in the garden on May 29. The first three gave equally good results. Double Curled 0-9273 germinated poorly.

PEPPERS

Two varieties, Neapolitan and Harris Early, were started in the hot-house on April 12, and transplanted into the garden on June 15. Neapolitan produced a large crop of green fruit and a few ripened by September 10. Harris Early gave a lighter crop of green fruit with a small percentage ripe by September 10.

PUMPKINS

Three varieties, King of the Mammoth, Small Sugar and Connecticut Field, were sown in the hot-house on May 19, and the plants set into the garden on June 30. The first-named did not mature before frost. Connecticut Field and Small Sugar produced a medium crop.

GARDEN PEAS

Fifteen varieties were under test. The seed was planted on June 4 in rows 36 inches apart and most sorts gave an average yield. As in past seasons, the seed produced at Indian Head gave the heaviest crop in several varieties.

GARDEN PEAS—TEST OF VARIETIES

Variety	In use	Ripe	Remarks
English Wonder	July 30	Sept. 2	Medium crop.
Eight Weeks	" 20	Aug. 24	Medium crop.
Little Marvel	" 26	Sept. 2	Good crop.
Gradus	" 23	" 10	Light crop.
Laxtonian	" 26	" 2	Light crop.
Thos. Laxton	" 24	Aug. 24	Light crop.
Sutton Excelsior	" 28	Sept. 2	Medium crop.
Stratagem	" 24	" 10	Medium crop.
Thos. Laxton	" 24	Aug. 24	Light crop.
Sutton Excelsior	" 28	Sept. 2	Medium crop.
Stratagem (I. H. Seed)	" 24	Aug. 14	Light crop.
Thos. Laxton (I. H. Seed)	" 24	" 24	Light crop.
Gregory Surprise (I. H. Seed)	" 24	Sept. 2	Extra heavy crop.
English Wonder (I. H. Seed)	" 26	" 2	Extra heavy crop.
American Wonder (Carter)	" 26	" 6	Large crop.

RADISH

One variety, Early Scarlet White Tipped, from different seedsmen, was sown in the garden on May 29. All gave an excellent crop. The Indian Head seed did not germinate as well as the others.

SQUASH

Four varieties, Long White Bush Marrow, Golden Hubbard, Delicious and Hubbard, were planted in the hot-house on May 29, and the plants set out into the garden on June 30. None matured before frost.

SALSIFY

Three varieties, Mammoth Sandwich Island 0-9271, Long White and Long White 0-8891, were sown in the garden on May 29, and the crop taken up on October 6. The crop was heavy but the quality of the roots only medium.

Variety	Weight on 35 ft. row	Remarks on crop
	lb.	
Mammoth Sandwich Island, 0-9271	44	Large yield but roots too prongy.
Long White	39	Fair yield but roots too prongy.
Long White, 0-8891	17	Light crop; roots forked and too small for use.

SPINACH

One variety, Victoria 0-8910, was sown in the garden on May 29, and the first picking was made on July 3. It grew rapidly and went to seed about July 22.

GARDEN TURNIPS

Four varieties, Early Snowball, Red Top Strapleaf, Extra Early Purple Top Milan and Golden Ball, were sown on May 29, and were ready for use by July 17. All produced large yields but the roots were very strong and bitter.

TOMATOES

Ten varieties were sown in the hot-house on March 29, and transplanted into the garden on June 10. All varieties produced a heavy crop of well-ripened fruit by September 8 when the semi-ripe and green fruit was picked to save it from frost. The outstanding varieties tested were Burbank Early 0-8679, Earlibell, Alacrity A-1 and John Baer. Several years of experiments with this crop have shown that to produce ripe fruit in our short season the plants must be pruned to one stem and trained on stakes. When this plan is followed, ripe fruit may be produced from the middle of August up to frost. In the test of varieties, plants were pruned to one stem and staked.

TOMATOES—TEST OF VARIETIES

Variety	Date of first picking	Yield from 5 plants ripe fruit	Yield of green fruit	Total crop from 5 plants
		lb.	lb.	lb.
Burbank Early, 0-8679	Aug. 18	22½	34	56½
Earlibell	" 20	22	21	43
Langdon Earliana	" 14	16½	32	48½
Chalk Jewel	" 18	19	29	48
Bonny Best	" 14	19	36	55
Danish Export, 0-8697	" 7	17½	38	55½
Red Head	" 18	14	26	40
John Baer	" 18	25	30	55
Alacrity A-1	" 7	30½	27	57½
Prosperity	" 7	27½	31	58½

CULTURAL METHODS WITH TOMATOES

Two varieties, Alacrity and Bonny Best, were used in this test. The weights were taken from the fruit grown on five plants set 2 feet apart in the row with rows 4 feet apart. As will be seen from the table below, the plants that were left unpruned produced the largest crop of green fruit, while the plants pruned to one and two stems and those with foliage partly removed ripened a large percentage of the fruit.

Alacrity.

Cultural Method	Set out in garden	First ripe	Weight ripe fruit	Weight green fruit	Total weight from 5 plants
			lbs.	lbs.	lb.
Unpruned	June 10	July 30	16	89	105
One stem, tied to stakes	" 10	" 30	34	18	52
Two stems, tied to wire	" 10	" 30	47	20	67
One-half foliage removed	" 10	Aug. 20	51	8	59
Foliage left on, tied to wire	" 10	" 20	53	19	72
Transplanted twice in hot-house—from 5 to 10 inch pots—roots undisturbed when transplanted to garden	" 10	July 30	60	15	75

Bonny Best

Cultural Methods	Set out in garden	First ripe	Weight ripe fruit	Weight green fruit	Total weight from 5 plants
			lb	lb.	lb.
Unpruned	June 10	July 30	22	80	102
One stem, tied to stakes	" 10	" 30	16	16	32
Two stems, tied to wire	" 10	" 30	30	24	54
One half foliage removed	" 10	" 30	31	20	51
Foliage left on, tied to wire	" 10	" 30	35	28	63
Transplanted twice from 5 to 10 inch pots in hot-house, roots undisturbed when set out in garden	" 10	Aug. 6	52	26	78

RHUBARB

Three varieties, Victoria, Tobolsk and Strawberry, were under test. Victoria is undoubtedly the most desirable sort for this part of the province owing to its earliness and rapid growth.

ORNAMENTAL GARDENING

TREES, SHRUBS AND HEDGES

All trees made a good growth during the season but were severely checked by insect pests. The larvæ of the fall canker worm defoliated the maple and elm trees in June and were followed by the green aphis later in the season on the maples. Spraying with arsenate of lead checked the canker worm and the trees leafed out again by the end of June.

Flowering shrubs had a good show of bloom, with the exception of lilacs which were not up to the average.

The specimen hedges were kept trimmed during the summer in order to show their suitability for ornamental work. A few of the Buckthorns and Spiræa hedges were cut out owing to their poor condition. Among the best shrubs for western planting are *Caragana arborescens, Caragana pygmaea,* Common lilac (*Syringa vulgaris*), *Syringa japonica, Syringa villosa, spiraea arguta, Lonicera Albertii, Lonicera tatarica, Cytisus biflorus, Cotoneaster tomentosa, Cornus alba sibirica.*

The most suitable shrubs and trees for ornamental hedging are *Caragana arborescens,* Common lilac (*Syringa vulgaris*), Native Choke Cherry (*Prunus virginiana*), Box Elder (*Acer Negundo*), Japanese Lilac (*Syringa japonica*), Dogwood (*Cormus alba sibirica*), Cotoneaster, Blue Spruce, White Spruce and Balsam Fir are also suitable where a high hedge is required.

HERBACEOUS PERENNIALS

Perennials made a good showing during the season. Outstanding varieties are Pæonies, Delphinium, German Iris, Aquilegia, Scarlet Lychnis, Perennial Pyrethrum and Bleeding Heart.

Protection should be given perennial beds where they are liable to be bare of snow during the winter months. The best way to do this is to cover the beds late in November with a good coating of stable manure. In the spring this should be taken off and the beds dug over, care being taken not to injure the crown of the plants.

BULBS

The bulbs arrived too late as the ground was frozen solid and those planted were placed in holes made with a crow-bar, which resulted in a very small percentage even showing above the ground the following spring. Where single early tulips are set out in October they are always a success here.

ANNUAL FLOWERS

Forty-seven kinds of annual flowers were grown this season. The seed was started in the hot-house on April 22 and set out in the beds on June 22. All gave a good show of bloom up till September 28 when all were cut down by frost. Varieties recommended for the home garden are Petunias, Asters, Sweet Peas, Verbena, Pansy, Antirrhinium, Cosmea, Annual Larkspur and Phlox.

FRUITS

STRAWBERRIES

Senator Dunlap and Beder Wood have proven the most suitable varieties here. The best results have been obtained from plants that were allowed to form matted rows. Where the plants are kept thinned out and cultivated, the damage from wind and heavy rains is most detrimental to the fruit.

The ever-bearing varieties, Progressive, Americus and Superb, were set out last year and, while very little data were obtained in the one season, yet there is no doubt from the observations made that this fruit will be a valuable addition to the gardens in this part of the province.

TREE FRUITS

Apples.—Very little success has, as yet, been attained in growing standard apples at this farm. The cross-bred varieties are perfectly hardy and bear fruit almost every season. Charles, Prince, Eve, Columbia and Tony produce fruit from one to one and one-half inches in diameter which is quite suitable for preserving.

Plums.—Selections from the native plum and cross-bred varieties produced by Professor Hansen have given good results here. Assiniboine, Winnipeg, Owanka and Topa produce large fruit of very good flavour. No weight of fruit was taken of either plums or cross-bred apples on account of the orchards being visited by large flocks of crows which destroyed practically all the crop in a very short time.

SMALL FRUITS

With the exception of gooseberries, nearly all bush fruits are quite hardy at this farm. Gooseberries and raspberries require winter protection and when given this produce good returns. Raspberry canes should be bent down and covered with a few inches of earth, which is quite sufficient to protect them. Gooseberries should have some brush placed around them in order to catch snow as it is impossible to cover with earth, and if straw is used, mice usually ruin the bush.

The following are the outstanding varieties here:—

Raspberries.—Sunbeam, Cuthbert, Early King, Ohta and Golden Queen.

Black Currants.—Tokay, Magnus, Dominion, Climax and Saunders.

Red Currants.—Red Grape, Rankin Red, Red Dutch and Victoria Red.

White Currants.—White Imperial, White Grape, White Cherry, and Verrieres White.

Gooseberries.—Smith Improved and Houghton.

On account of the dry weather in June and the forepart of July, the crop of small fruits was almost a failure and the birds destroyed what little fruit came on after the rains late in July. For the above reasons no weights were procured.

CEREALS

THE SEASON

The outstanding characteristic of the growing season of 1920 was the high winds which prevailed. Shortly after seeding was completed, fifteen days of extremely windy weather was experienced and a great deal of damage was done to the young grain. Then, June was notable for extremely hot, dry weather which continued with very light rainfall until July 19 and 20 when a very heavy rain fell, almost 5¼ inches in two days. This helped the late-sown grain considerably, but was too late to benefit materially early maturing varieties. On August 20, a frost occurred which injured some of the later grain. The season of 1920, therefore, may be considered as one of the worst this district has experienced in many years.

Spring Wheat

In 1920, twenty-three varieties of spring wheat were grown, the greater number of these being numbered varieties produced by the Dominion cerealist at Ottawa, and as yet unnamed.

All plots were grown on summer-fallow and on stubble land. The plots were one-fortieth acre each and were all seeded on May 10.

SPRING WHEAT ON FALLOW—1920

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lbs.	lb.
Kitchener	106	41	10	47	20	62·6
Marquis	98	38	8	36	20	63·9
Red Bobs	98	40	5	36	..	63·8
Red Fife	106	34	7	34	..	62·1
Ruby	95	36	5	31	20	62·2
Pioneer	98	38	5	26	20	62·3
Prelude	93	32	5	20	40	60·0

SPRING WHEAT ON STUBBLE—1920

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Kitchener	106	39	10	35	20	63·1
Red Bobs	98	34	5	31	20	63·2
Pioneer	98	36	5	30	40	62·9
Red Fife	106	32	5	29	20	62·5
Ruby	95	27	5	29	20	62·6
Marquis	98	35	5	28	..	63·1
Prelude	95	31	7	25	20	61·2

Spring Wheat—Five-year Averages

Only five of these varieties have been grown for five years on both fallow and stubble. The average results for five years are reported upon herewith.

SPRING WHEAT ON FALLOW

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Marquis	109	35·6	9·0	43	12	64·2
Red Fife	118	36·0	9·4	37	28	61·4
Pioneer	110	34·8	5·8	34	40	63·2
Ruby	105	35·8	8·8	33	48	64·2
Prelude	101	33·2	7·8	26	04	63·9

SPRING WHEAT ON STUBBLE

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Red Fife	115	33·6	9·0	29	56	62·2
Marquis	108	32·0	7·6	27	52	63·9
Pioneer	109	34·0	6·2	27	48	63·9
Ruby	105	29·4	7·2	26	06	64·3
Prelude	99	29·8	7·4	20	36	63·7

From the above it will be seen that Marquis still holds the lead over Red Fife on fallow land although the latter is better on stubble, but, where earliness is essential, Marquis should be used on both fallow and stubble. Ruby, being earlier than either of the above, is to be recommended where there is special danger of early fall frosts. Marquis, Red Fife and Ruby are, of course, A.1 in milling qualities.

Oats

Nine varieties of oats were tested in 1920. The plots were one-fortieth acre in size and were grown both on summerfallow and stubble land. All plots were sown on May 14.

OATS ON FALLOW—1920

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Victory	102	36	10	96	16	43·8
Gold Rain	100	38	7	92	32	41·6
O. A. C. 72	101	37	9	89	14	36·0
Banner	100	38	7	88	08	38·1
Leader	100	35	10	84	24	38·2
Daubeney	88	36	7	65	30	37·0
Liberty	103	37	9	43	18	47·9

OATS ON STUBBLE—1920

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Victory	102	34	10	67	02	39·0
Gold Rain	97	26	7	62	12	38·1
O.A.C. 72	100	34	9	56	16	34·9
Banner	99	34	7	51	26	34·0
Leader	100	32	10	44	24	32·1
Daubeney	95	21	7	36	06	25·8
Liberty	104	33	7	30	20	46·9

Five-year Average

Seven varieties have been grown for five or more years on both fallow and stubble land. The average results for five years is reported upon.

OATS ON FALLOW

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Victory	105	40·0	9·8	107	03	41·6
Danish Island	105	39·8	10·0	106	16	39·0
O. A. C. 72	106	42·2	9·4	102	04	38·3
Gold Rain	106	40·2	8·6	102	02	41·9
Banner	104	37·6	8·8	97	14	39·8
Daubeney	98	37·0	8·4	85	23	36·2
Liberty	104	40·4	8·8	69	12	50·3

OATS ON STUBBLE

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Victory	105	35·2	9·6	76	32	40·6
O. A. C. 72	105	41·0	9·4	75	30	37·2
Gold Rain	104	36·2	8·8	75	06	41·0
Danish Island	105	36·6	9·2	74	24	38·4
Banner	105	36·0	8·8	66	08	37·8
Liberty	103	35·8	8·4	49	22	50·4

It will be seen that our heaviest yielding oats all ripen in about the same length of time. As an early oat, Daubeney is perhaps the best obtainable. Liberty is a hull-less oat which, when ground, makes an excellent feed for young live-stock. When comparing the yields of a hull-less and a hulled oat, it must be remembered that thirty per cent of the hulled oats (ordinary oats) is hull, whereas hull-less oats have no hull. Taking this into consideration, it will be seen, from the yields reported above, that Liberty ranks amongst the standard varieties in yield of "meat" per acre. It must be understood, of course, that hull-less oats have only a limited sphere on the farm and are not intended to replace the old standard varieties.

Barley

Fourteen varieties or strains of barley were tested in 1920. Many of them were yet unnamed sorts, originated by the Dominion Cerealist.

The results of six of the named varieties are given below. All plots were one-fortieth acre, and were sown on May 14 on both summerfallow and stubble land.

BARLEY ON FALLOW—1930

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Stella	92	34	10	47	04	49·0
Manchurian	92	39	10	44	28	51·4
O.A.C. 21	92	36	10	44	28	50·9
Himalayan†	88	26	06	42	04	61·8
Duckbill	93	30	7	39	08	52·3
Success*	82	31	77	14	28	46·1

BARLEY ON STUBBLE—1930

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured Bushel
		inches		bush.	lb.	lbs.
O.A.C. 21	92	25	10	30	40	51·1
Manchurian	92	26	10	30	..	51·5
Himalayan†	88	20	7	28	16	62·2
Stella	92	20	10	23	16	48·3
Duckbill	93	23	7	17	04	53·6
Success*	82	28	7	15	40	45·0

† Himalayan is a hull-less barley.
* Success is a hooded (or beardless) barley.

Five-year Average

Only four of the barley varieties have been under test for five years, the average results of which are given below.

BARLEY ON FALLOW

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Stella	95	32·5	9·0	55	20	50·8
O.A.C. 21	96	36·0	8·6	54	44	51·4
Manchurian	97	39·8	10·0	50	08	51·4
Success	86	32·8	8·2	24	40	46·6

BARLEY ON STUBBLE

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Stella	95	25·6	9·2	35	08	49·4
O.A.C. 21	98	26·8	9·2	33	44	50·3
Manchurian	99	27·2	9·4	31	32	50·7
Success	87	28·6	9·2	20	28	47·4

O.A.C. 21 does not shatter as readily as Manchurian and, from this standpoint, is more suited to districts where wind storms are prevalent.

Peas

Seven varieties of peas were tested in 1920. Only three of them were named varieties, which are reported upon below. All plots were one-fortieth acre, seeded on May 10 on both fallow and stubble land.

PEAS ON FALLOW—1920

Variety	Days to mature	Length of vine	Yield per acre	Weight per measured bushel
		inches	bush. lb.	lb.
MacKay	108	41	48 40	61·9
Arthur	106	38	47 20	63·8
Golden Vine	104	36	46 ..	64·4

PEAS ON STUBBLE—1920

Variety	Days to mature	Length of vine	Yield per acre	Weight per measured bushel
		inches	bush. lb.	lb.
MacKay	106	39	36 ..	62·0
Golden Vine	105	30	32 40	63·3
Arthur	106	34	32 ..	63·7

Five-year Average

The three named varieties above mentioned have been grown for five years, the results of which are given below:—

PEAS ON FALLOW

Variety	Days to mature	Length of vine	Yield per acre	Weight per measured bushel
		inches	bush. lb.	lb.
MacKay	119	47·4	45 28	63·5
Arthur	118	36·2	41 28	64·0
Golden Vine	117	34·4	41 12	64·8

PEAS ON STUBBLE

Variety	Days to mature	Length of vine	Yield per acre	Weight per measured bushel
		inches	bush. lb.	lb.
MacKay	117	41·6	37 40	63·8
Golden Vine	116	31·2	32 20	64·7
Arthur	116	33	29 40	64·3

In this district there is not a great difference in number of days maturing, but, as a rule, Arthur may be relied on to be slightly earlier than the other varieties of peas and should be the only pea for northern districts.

Flax

Three varieties of flax was grown in 1920 on fallow land only. All plots sown on May 29.

FLAX ON FALLOW

Variety	Days to mature	Length of straw	Yield per acre		Weight per measured bushel
		inches	bush.	lb.	lb.
Longstem†	66	32	12	28	54·7
Premost	67	14	11	53	54·5
Novelty	67	11	10	40	54·3

† Longstem is essentially a fibre flax.

Five-year Average

Two of the three varieties have been grown for five years, the average results for these years are given below.

FLAX ON FALLOW

Variety	Days to mature	Length of straw	Yield per acre		Weight per measured bushel
		inches	bush.	lb.	lb.
Novelty	112	19	20	34	54·3
Premost	109	18·6	18	51	55·7

Fall Rye

Three varieties of fall rye were sown on plots one-fortieth acre each, on September 9, 1919, and harvested August 2, 1920. These plots were grown on fallow land only.

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
No. 959	328	48	7	35	40	58·5
Saskatchewan	328	52	10	23	32	57·7
Common	328	48	7	23	02	57·7

THREE-YEAR AVERAGE

Variety	Days to mature	Length of straw	Strength of straw on a scale of 10 points	Yield per acre		Weight per measured bushel
		inches		bush.	lb.	lb.
Common	353	47	7·5	20	29	57·7
Saskatchewan	353	51	9	20	20	57·4

FORAGE CROPS

The season of 1920 was not favourable for the growth of corn, or heavy hay crops, owing to the drouth early in the summer and the frost on August 20. Late rains, however, were a great help to the root crops and fairly good yields of them were obtained.

ENSILAGE CORN

Eighteen varieties of corn were grown for fodder in 1920. They were planted on summer-fallowed land on May 31 and harvested August 28. The following table gives the result of the tests. Both yield and maturity were much affected by the frost on August 20.

ENSILAGE CORN—TEST OF VARIETIES

Variety	Average Height	Stage of maturity	Average yield	
	inches		Tons	lb.
Early Leaming	52	Cobs in silk	10	500
Improved Leaming	62	Cobs forming	10	..
Gehu	51	Cobs in milk	9	500
Compton's Early	59	Cobs in milk	9	..
Bailey	56	Cobs in silk	8	1,900
Wisconsin No. 7	60	Cobs in early silk	8	1,200
Minnesota No. 13	58	Cobs forming	8	700
Minnesota No. 13	51	Cobs forming	8	50
Longfellow	61	Cobs in early silk	7	1,850
North Western Dent (Indian Head seed)	66	Cobs well developed	7	1,350
Early Dent	53	Cobs forming	7	300
North Dakota	61	Cobs forming	7	200
Yellow Flint	62	Cobs forming	6	650
White Cape Yellow Dent	58	Cobs forming	6	650
Extra Early Red Dent	58	Cobs developed	6	250
Improved Squaw	53	Cobs developed	5	1,300
Pride of the North	59	Cobs developed	5	150
Twitchell's Pride	50	Cobs developed	2	200

Five of these varieties have been grown five years or more, and of these considering yield and quality of ensilage produced, the North Western Dent has given best results.

The average results for five years are as follows:—

INDIAN CORN—AVERAGE YIELD FOR FIVE YEARS

Variety	Stage of maturity when cut	Average yield per acre	
		Tons	lb.
Salzer's North Dakota	Cobs just forming	13	1,920
Longfellow	Very early milk	12	675
North Western Dent	Seed in dough stage	12	25
Bailey	Very early milk	10	1,040
White Cap Yellow Dent	Very early milk	9	1,115

SWEDE TURNIPS

Eighteen varieties of swede turnips were grown in test plots during the year and the following table gives the results of the tests. All plots were sown after summer-fallow and were one-hundredths acre in size.

SWEDE TURNIPS—TEST OF VARIETIES

Variety	Source of Seed	Average yield per acre		Notes on form and uniformity
		tons	lb.	
Ditmars	Experimental Farm, Kentville, N.S.	24	500	An excellent type of root and very uniform in shape.
Good Luck	Experimental Farm, Fredericton, N.B.	23	..	Uniform in colour but rough in shape.
Perfection	Steele, Briggs, Winnipeg, Man.	22	..	Poor type, varies considerably in both type and colour.
Derby Bronze Green Top	Wm. Rennie Co., Toronto, Ont.	21	1,500	Fairly uniform in shape. A good root to handle. Colour varies a great deal.
Irish King Bronze Top	Wm. Rennie Co., Toronto, Ont.	21	..	Practically all green. Good root and top.
Good Luck	Experimental Farm, St. Anne, Que.	20	500	Varies considerably in type. Rather inclined to too many roots
Purple Top	Harris McFayden, Winnipeg, Man.	19	1,750	Very poor root. Hard to handle. Bronze and green top.
Canadian Gem	Experimental Farm, Kentville, N.S.	19	..	Too many roots and tops. Some green tops.
Bangholm	A. E. McKenzie Co., Brandon, Man.	18	1,700	Poor roots and small.
Champion	Experimental Farm, Charlottetown, P.E.I.	18	1,500	Some variation, but fairly good tap-root. A little too large.
Canadian Gem	Wm. Rennie Co., Toronto, Ont.	18	500	Mostly bronze. Too much root.
Kangaroo	A. E. McKenzie Co., Brandon, Man.	18	300	Poor shape, too long. Fairly clean.
Canadian Gem	Steele, Briggs Co., Winnipeg, Man.	18	..	A little too much root and top, but clean. Varies slightly in colour.
Elephant	A. E. McKenzie Co., Brandon, Man.	17	1,000	Very poor roots. Poor shape. Bronze.
Hartley's Bronze	Wm. Rennie Co., Toronto, Ont.	17	50	More green than bronze. Too many roots.
Monarch	Experimental Farm, Nappan, N.S.	16	1,500	Hard to handle. Poor type. Too many roots. Uniform in colour.
Purple Top	Steele, Briggs Co., Winnipeg, Man.	16	750	Very poor roots. Too many roots and too much top. Very hard to handle. Varies considerably in colour.

MANGELS

Twenty varieties of mangels were tested during the year in uniform one-hundredth acre test plots.

MANGELS—TEST OF VARIETIES

Variety	Source of Seed	Average yield per acre		Notes on form and uniformity
		tons	lb.	
Giant Yellow Intermediate	Steele, Briggs Co., Winnipeg, Man.	25	1,750	Type of root varies considerably. Colour runs from red to lemon. Intermediate in type. More reds.
Perfection Mammoth Long Red.	Wm. Rennie Co., Toronto, Ont.	23	1,250	Some intermediate. Not a desirable variety. Hard to handle.
Half Long White..	Experimental Farm, Charlottetown, P.E.I. (O.)	23	650	Type varies from oval to long. Colour fairly uniform. A few rosy whites.
Yellow Leviathan	Experimental Farm, Agassiz, B.C. (O.)...	22	1,640	Fairly uniform in shape. Inclined to spread in roots. Colour from red to lemon.
Royal Giant.....	Steele, Briggs Co., Winnipeg, Man.	22	1,250	Intermediate in shape, tending to long . Varies from rose to white in colour.
Yellow Intermediate.	Experimental Farm, Charlottetown, P.E.I. (O.)	22	1,250	Fairly uniform in shape but varies greatly in colour, red to lemon and a few whites.
Giant White Feeding	Wm. Rennie Co., Toronto, Ont.	22	1,250	A number of rosy, 1 yellow—looks like sugar-beet. Too much waste. Hard to handle.
Yellow Leviathan	Wm. Rennie Co., Toronto, Ont.	22	1,200	Rather lemon in colour. Type varies from tankard to long.
Danish Sludstrup.	Experimental Farm, Kentville, N.S. (O.)	22	..	Type varies from nearly oval to long. Colour from deep orange to lemon.
Sludstrup.....	Dom. Experimental Farm, Ottawa, Ont.	21	1,800	Three whites. Shape varies from oval to intermediate. Some lemon in colour.
Select Yellow Globe	A. E. McKenzie Co., Brandon, Man.	21	1,000	Varies greatly in type, intermediate, long and round. Varies from lemon to orange—three red.
Giant White Sugar	Wm. Rennie Co., Toronto, Ont.	21	750	Intermediate in type. Fairly uniform. Not large enough.
Eclipse.....	A. E. McKenzie Co., Brandon, Man.	21	..	Varies in type from round to elongated tankard and white lemon is the prevailing colour. Some reds.
Giant Yellow Oval	Steele, Briggs Co., Winnipeg, Man.	21	..	Type of root varies considerably. Colour runs from red to lemon, 1 white rosy. Intermediate in type.
Yellow Intermediate	Dominion Experimental Farm, Ottawa, Ont.	20	1,750	Fairly uniform in type and colour. Type varies more than colour. About the best root of all.
Select Yellow Intermediate	Experimental Farm, Charlottetown, P.E.I.	20	1,750	Fairly uniform in shape but varies greatly in colour—red to lemon and a few white.
Giant Red Eckendorfer	Harris McFayden Co., Winnipeg, Man.	20	1,550	Some roots almost round. A few whites.
Giant White Sugar	Steele, Briggs Co., Winnipeg, Man.	20	350	A number of rose beets and some yellow. Vary in type from tankard to long.
Improved Tankard Cream.	Wm. Rennie Co., Toronto, Ont.	19	500	Some rosy, red tap-root. Short.
Select Prize Taker	A. E. McKenzie Co., Brandon, Man.	15	450	Fairly uniform in type and colour, but some variation from orange to lemon and one red.

FIELD CARROTS

Nine varieties of field carrots were tested during the year under the same conditions as the turnips and mangels with the following results:—

FIELD CARROTS—TEST OF VARIETIES

Variety	Source of seed	Average yield per acre		Notes on form and Uniformity
		tons	lb.	
Mammoth White Intermediate	Wm. Rennie Co., Toronto, Ont.	14	400	Some yellow and some red. Too long to lift readily.
White Intermediate	Experimental Station, Summerland, B.C.	13	1,250	Fairly uniform. Some too long. A few slightly yellow.
Half Long White..	Harris McFayden Co., Winnipeg, Man.	13	1,050	Fairly good. Some yellow and some red.
Mammoth Short White	Wm. Rennie Co., Toronto, Ont.	13	850	Good type and fairly uniform.
Improved Short White	Steele, Briggs Co., Winnipeg, Man.	13	650	Short to intermediate in shape. Fairly uniform.
Large White Belgian	Steele, Briggs Co., Winnipeg, Man.	13	450	Intermediate and fairly uniform.
Half Long White..	A. E. McKenzie Co., Brandon, Man.	11	850	Some yellow and some long. Fair.
Danish Champion	Dominion Experimental Farm, Ottawa, Ont.	11	450	Fairly uniform in shape. Colour varies slightly, a few greenish.
Long White Belgian.	A. E. McKenzie Co., Brandon, Man.	9	700	Some bronze. Bad type of root to handle.

In the case of all varieties of roots, and particularly with mangels, the results are so variable from year to year that definite recommendation as to varieties are rather hard to make. The half Sugar and Yellow Intermediate types of mangels are, however, to be generally recommended. They yield well both in total tonnage and nutritive constituents per acre, and as a rule are easy to harvest. Intermediate or half long types of field carrots are recommended due to the fact that they yield well and are easy to harvest.

POULTRY

During the year the flock of Barred Rocks which had previously been kept at this Farm was transferred to Brandon, and in future the breeding work here will be confined to White Wyandottes, as it is felt that better results can be obtained where the work is confined to one breed rather than where two breeds are kept as was formerly the case on this Farm.

By careful trap-nesting, selection and breeding, the flock has been raised to a high general standard in type and egg-laying ability. The flock in 1916 averaged 115 eggs per bird and the highest record was 220 eggs. During the past year the flock averaged 182·7 eggs per bird and the highest bird laid 287 eggs, with another following close behind with 279 eggs in her pullet year.

The value of the average number of eggs laid by each bird at the prices which were obtained for fresh eggs during the year was $7.30, the cost of feed per bird was $2.35, leaving a profit over cost of feed of $4.95 per bird. The demand for breeding stock and hatching eggs has continued to be much greater than our supply.

HATCHING RESULTS, 1920

The following table will show the results of the hatches according to the date the eggs were set in the spring except that after the chicks left the brooder it was not possible to keep them separate owing to the limited quarters available and the latter part of the record refers to the flock as a whole. The poor results obtained with the eggs set in April have not been met with here in other years.

HATCHING RESULTS FOR SETTINGS BY THE MONTH—1920

Time set	Total eggs set	No. fertile	Percent fertile	No. of chicks	Percent total eggs hatched	Percent fertile eggs hatched	No. chicks alive July 1	Percent chicks hatched alive July 1	Total eggs required for 1 chick hatched	Total fertile eggs for 1 chick hatched
March	1,723	1,222	69	450	32	55				
April	1,115	778	69	210	21	39	436	57·9	4·53	3·09
May	594	328	63	93	25	53				

The following table gives the result of the hatch by breeds as the two breeds mentioned above were kept on the Farm at that time. These results are only useful when taken in connection with the results of similar experiments carried on at other places, as no comparison of the two breeds should be made if only the results from two flocks are available. The average results covering a large number of flocks should be the only basis of such comparisons.

HATCHING RESULTS FROM THE VARIOUS BREEDS—1920

Varieties	Total eggs set	No. fertile	Percent fertile	No. of chicks	Percent total eggs hatched	Percent fertile eggs hatched	No. chicks alive July 1	Percent chicks hatched alive July 1	Total eggs required for 1 chick hatched	Total fertile eggs for 1 chick hatched
Rocks.....	1,805	1,285	71	368	20	29	188	51	4.90	3·40
Dottes.....	1,617	1,043	64	385	24	37	248	64	4·20	2·70

In our hatching records a comparison was also made of the eggs from hens and pullets and, in noting the results as shown in the following table, it should be borne in mind that the pullets whose eggs were used for hatching were all strong, vigorous birds which were hatched fairly early and were well developed before the beginning of winter. The pullets which were not exceptionally strong and vigorous were not used in the breeding pens and the good showing made by the pullets can be attributed partially to this. As a rule better results are obtained from hens than from pullets.

HATCHING RESULTS FROM HENS AND PULLETS—1920

Ages	Total eggs set	No. fertile	Percent fertile	No. of chicks	Percent total eggs hatched	Percent fertile eggs hatched	No. chicks alive July 1	Percent chicks hatched alive July 1	Total eggs required for 1 chick hatched	Total fertile eggs for 1 chick hatched
Hens.....	1,265	786	62	225	17	28·63	118	52·4	5·6	3·50
Pullets.....	2,157	1,542	71	528	24·50	34·11	318	60·52	4·0	2·19

HATCHING AND BROODING METHODS

All hatching was done in the one incubator—a 1,200-egg Buckeye—so that the comparisons made in the preceding tables are not influenced by various makes of machines. The generally poor results obtained were probably caused by a general lack of vitality in the birds due to the exceptionally long and severe winter accentuated by the fact that an epidemic of colds went through the flock in December and January.

The chicks were all brooded in the brooder house for the first month and then moved out to colony houses with coal brooders and gradually hardened off until ready to go into colony houses. The coal brooder has proved both more economical and satisfactory than the common, small coal-oil brooder. The temperature is kept much more uniform; sudden drops in temperature outside do not affect a colony house where these coal brooders are used to nearly the same extent as was the case when the coal-oil brooders were used.

SASKATCHEWAN EGG-LAYING CONTEST

The first Saskatchewan egg-laying contest was started on November 1, 1919 and, continuing for fifty-two weeks, concluded on October 29, 1920.

In all, nineteen breeders entered pens and, for the first year, the result may be considered very satisfactory. Each contestant was required to send in ten pullets of a standard breed and each bird typical of the breed and free from disqualifications. In case of death of a bird, substitution was allowed up to two for each pen. The birds were all housed in the same kind of house with glass-and-cotton front and uniform and unbiased care was given to all pens. The pens were all fed in the

same manner and received the same kind of feed. Mixed grain was fed night and morning in the litter, with dry mash in the hopper before them at all times. Green feed, grit, oyster shell, charcoal and beef scrap were also in hoppers and green bone was fed as well. All pens were trap-nested and individual as well as pen records kept. All birds laying one hundred and fifty or more eggs in fifty-two consecutive weeks were eligible for a certificate of Record of Performance AA and those laying 225 eggs in the same period were eligible for Advanced Record of Performance.

The following is a summary of the results of the contest at the close of the fifty-second week:—

EGG LAYING CONTEST SUMMARY

Pen	Owner and address	Breed	No. eggs laid	Cost feed per dozen eggs	No. hens qualifying for R. O. P.	No. hens qualifying for advanced R. O. P.
				cts.		
1	T. Gibbs, Moose Jaw.....	Black Leghorn.	1,192	28	2	0
2	S. Merkley, Moose Jaw.....	White Leghorn..	1,637	21	6	1
3	E. Anderson, Fleming.....	White Leghorn	931	34	0	0
4	F. J. Oliver, Shaunavon....	White Leghorn..	1,107	28	1	0
5	A. A. Moreton, Saskatoon..	White Leghorn..	857	36	1	0
6	S. Merkley, Moose Jaw....	Black Leghorn .	1,177	26	0	0
8	Northern Saskatchewan Orpington Club, Saskatoon	White Orpington	1,160	29	1	0
9	H. G. French, Moosomin....	Buff Wyandotte.	819	42	0	0
11	W. W. Ashley, Saskatoon...	Barred Rock....	688	41	1	0
12	L. H. Little, Dinsmore.....	Partridge Rock.	504	63	0	0
13	University of Saskatchewan, Saskatoon.....	Rhode Island Red.....	1,377	24	3	0
16	John McCheane, Borden...	White Wyandotte ...	1,234	28	4	0
17	H. Moon, Saskatoon.....	White Wyandotte....	934	37	2	0
18	A. G. Mitchell, Radisson....	White Wyandotte....	1,038	31	0	0
19	J. Beatty, Kerrobert.....	White Wyandotte....	828	41	0	0
20	Mrs. Hanson, Tessier.....	Rhode Island... Red.....	1,123	29	2	0

At the conclusion of the first contest, another was started and carried on throughout the year until the fifty-two weeks were completed. Summary will appear in the next Annual Report.

This feature of the poultry work should be of great benefit to the poultrymen of the province as it will enable unbiased records of breeders' flocks to be made and the information kept available to the poultry raisers of the province so that purchasers of breeding stock and hatching eggs will be able to secure these from flocks of known production.