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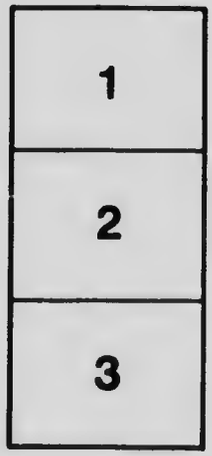

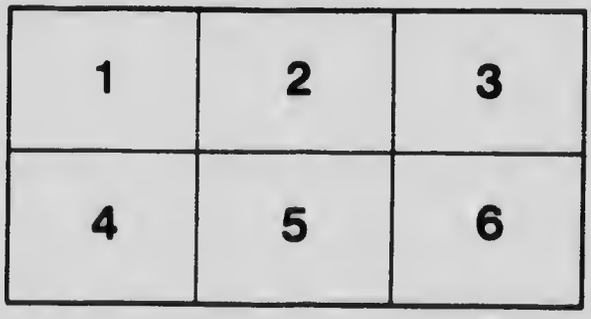

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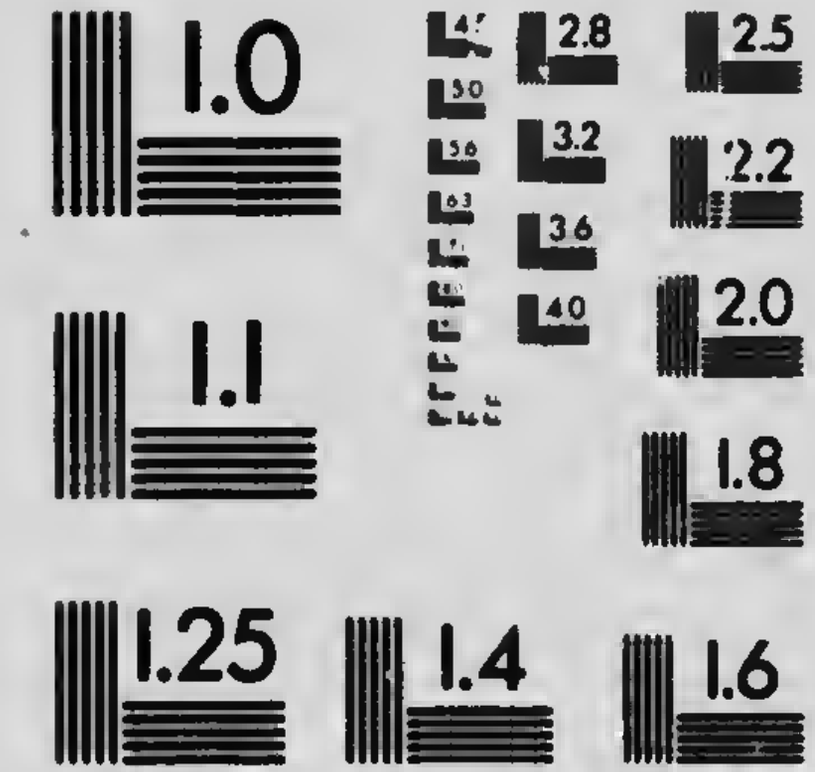

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS

DIVISION OF FIELD HUSBANDRY

SUMMARY OF RESULTS

FIELD HUSBANDRY

1913

PREPARED BY
O. C. WHITE, B.S.A.
Assistant Dominion Field Husbandman
AND THE
SUPERINTENDENTS OF THE BRANCH EXPERIMENTAL FARMS AND STATIONS

Bulletin No. 75
JANUARY, 1914.

by direction of the Hon. MARTIN BURRELL, Minister of Agriculture

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55007—1

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SIR,—I have the honour to submit herewith bulletin 75 of the regular series entitled " Division of Field Husbandry: Summary of Results, 1913."

Under the method it has been found necessary to follow in the issuing of the annual report of the Experimental Farms, results as secured from crop production and field experimental work do not reach the public until about eighteen months after they have been collected. It has been thought desirable, therefore, to begin a series of annual bulletins covering the above lines of work as dealt with by the Divisions of Cereals, Horticulture, Field Husbandry and Forage Plants.

In these bulletins, of which this is the second, the aim is to give the more important of the season's results in a summarized form. The details of the work will be dealt with in the annual report of the Experimental Farms, to be prepared, as usual, after the close of the fiscal year.

The plan in compiling these crop bulletins is similar to that now being pursued in the preparation of the annual report. The introductory matter and the account of the experiments on the Central Farm are prepared by the Dominion officer having charge of this branch of the work, in this case the Assistant Dominion Field Husbandman. The data from the various branch Farms and Stations are supplied by the officers in charge.

It is hoped that the Canadian farmer may be materially aided by these summaries of results and the recommendations based thereon. These will, it is hoped, reach him in time for him to profit by them in 1914.

I have the honour to be, sir,

Your obedient servant,

J. H. GRISDALE,

Director, Dominion Experimental Farms.

The Honourable
The Minister of Agriculture,
Ottawa.

OTTAWA, January 24, 1914.

DIVISION OF FIELD HUSBANDRY:

SUMMARY OF RESULTS, 1913.

PREPARED BY

O. C. WHITE, B.S.A., ASSISTANT DOMINION FIELD HUSBANDMAN.

AND THE

SUPERINTENDENTS OF THE BRANCH EXPERIMENTAL FARMS AND STATIONS

CENTRAL EXPERIMENTAL FARM, OTTAWA.

WEATHER CONDITIONS AND CROP NOTES.

The crop season of 1913 has been one of the worst in the history of the Ottawa valley.

Clovers, as a rule, were badly winter- and spring-killed, and the hay crop at the outset promised poorly. June and July were very dry. Hay made little growth, and in many cases was a failure. Corn suffered severely and yielded below the average. Straw was light, but the oats filled fairly well and harvested an average crop of grain. Mangels were greatly retarded at first but made a good late autumn growth and produced almost up to the average for this Farm. The few turnips grown germinated so poorly that they had to be re-seeded, and a fair crop only was taken off.

The crops grown under regular field conditions yielded approximately as follows:—

Hay, 2 tons per acre.
Corn, 12 tons per acre.
Mangels, 16 tons per acre.
Oats, 50 bushels per acre.
Potatoes, 216½ bushels per acre.

ROTATION OF CROPS.

For the past ten years, experiments have been carried on to determine the relative value of different rotations or successions of crops. The results distinctly point out the advantage of growing crops in such regular order that after each crop the land will be left in the best possible condition to receive the one following.

Before presenting the results of our experiments to date, brief mention may be made of the chief reasons why a systematic rotation of crops is more profitable than long-continued growing of the same, or similar crops, on the same soil.

1. Because different plants have different manurial requirements.
2. Because plants vary in their power to abstract certain foods from the soil.
3. Because all plants do not feed to the same depth in the soil.
4. Because all plants are not alike in the residues they leave behind.
5. Because a proper rotation aids in the conservation of soil moisture.
6. Because some plants tend to produce better tilth than others.
7. Because certain weeds may be more effectively controlled.
8. Because different plants vary in their resistance power to bacterial and fungous diseases and to insect enemies.
9. Because the employment of a variety of crops distributes labour requirements more evenly over the season.
10. Because it practically insures the farmer against complete loss of a season's harvest.

The line of farming engaged in must, however, determine to a great extent the kind and relative amounts of crops that shall be grown, and may, in some cases, prevent following to the letter the rotation that would provide the largest returns. In any case it may be said that a good rotation will include (1) meadow or pasture, (2) roots, corn or other hoed crop, and (3) some cereal crop. The results of our experiments go to show that for greatest profits these crops should follow each other in the order named.

The following rotations have been devised to meet different requirements. One or the other of them is likely to be found suitable for conditions that obtain on the average live stock farm in Eastern Ontario and Quebec.

ROTATION 'A' (FIVE YEARS' DURATION).

First year.—Hoed crops. When corn is the hoed crop used, manure is applied in spring at rate of 15 tons per acre and shallow ploughed shortly before planting time, turning under clover and manure. After the hoed crop is harvested, land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 8 pounds red clover, 2 pounds alsike and 10 pounds timothy per acre.

Third year.—Clover hay. Two crops expected. Top dressed in fall with manure at rate of 15 tons per acre.

Fourth year.—Timothy hay. Field ploughed in August, top worked and ribbed up in October.

Fifth year.—Grain. Seeded down with 10 pounds red clover, which is allowed to grow to be turned under following spring when the hoed crop is corn.

This rotation has proven an excellent one here. When carefully followed, and when cultural operations were well performed, weeds have been kept under fair control, and crop yields have been maintained. One-fifth of the land is in hoed crop, two-fifths in grain, one-fifth in clover hay and one-fifth in timothy hay or pasture.

It supplies a relatively larger proportion of grain to roots and hay than the ordinary three- or four-course rotation, and for that reason would be preferable where considerable grain is called for.

ROTATION 'B' (FIVE YEARS' DURATION).

First year.—Hoed crop. When corn is the hoed crop used, manure is applied in spring at rate of 15 tons per acre, and shallow ploughed shortly before planting time, turning under both clover and manure.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre.

Third year.—Hay. Ploughed late fall, manured at rate of 15 tons per acre.

Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre.

Fifth year.—Clover hay.

Though the arrangement is different, this rotation is very similar to 'A' in the relative amounts of the different crops it supplies. In 'A' both clover and timothy hay are provided, whereas in 'B' clover hay only is grown. 'B' has maintained crop yields, and has given profits equal to 'A' in the tests so far conducted, but, as indicated, does not answer the purpose where a certain proportion of timothy hay is called for. It can, however, be very easily extended into a six- or seven-year rotation to include timothy hay or pasture. As a seven-year rotation the crops would succeed each other in the following order:—

Hoed crop; grain, seeded down with clover and timothy; clover hay; timothy hay or pasture; grain, seeded down with clover and timothy; clover hay; timothy hay or pasture.

ROTATION 'C' (FOUR YEARS' DURATION.)

First year.—Hoed crops.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay. Field ploughed in August, manured at rate of 24 tons per acre, worked at intervals and ridged up in late fall in preparation for hoed crops.

This rotation is most satisfactory from all standpoints, except that it supplies a rather smaller proportion of grain than is often desired. Where live stock is the mainstay of the farm, this is, however, a very minor fault. The turning of a shallow furrow when ploughing sod in preparation for grain or corn has been found to be good practice here. In preparing for roots, deeper ploughing or the regular plough with subsoiler is to be advised.

ROTATION 'D' (THREE YEARS' DURATION.)

First year.—Hoed crop. For corn, manure is applied in spring at rate of 18 tons per acre, and shallow ploughed shortly before corn planting time, turning under both clover and manure. For roots, land should be ploughed previous fall.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay.

This would be a most excellent rotation to put into practice where sufficient rough land was available to serve as pasturage. It is the rotation that would supply the greatest amount of forage of the best description for dairying or beef production. It is better for heavy than for light soils.

ROTATION 'E' (THREE YEARS' DURATION.)

First year.—Corn. Manure applied in spring at rate of 18 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure.

Second year.—Peas and oats mixed. Cut green for cattle. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Cut green for cattle.

This is a rotation specially designed to supply soiling crops. Two years' records only have been kept.

If a careful examination of the above rotations be made there will be noted a few desirable characteristics common to all:—

1. Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the fifth year of rotation 'A'.

2. Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified them.

3. Hoed crops from a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.

4. No field is left in hay for more than two successive years. Our records show that the second crop almost always costs more per ton than the first, and that succeeding crops are very liable to be grown at a loss.

5. Barnyard manure is applied frequently, in comparatively small quantities rather than at long intervals, in large quantities.

In order that the net profits (profits after deducting cost of rent, all manual and horse labour, manure, seed, twine and use of machinery) as well as the yields of these rotations could be determined, careful records have been kept of all items chargeable against the rotations.

The season of 1913 was so extremely dry that many of our crops were grown at a loss. The returns are, therefore, very low as compared with the average returns for preceding years. A re-arrangement of the rotations was made in 1912, hence averages have been drawn for the preceding eight years only.

Costs, Returns and Net Profits of Rotations 'A', 'B', 'C', 'D', and 'R'.

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit or loss per acre, 1913.	Profit, average of 8 years 1904-11.
	$ cts.	$ cts.	$ cts.	$ cts.
A (Five years' duration).....	17 55	19 40	1 85	8 78
B (Five ").....	21 83	21 47	— 36	9 03
C (Four ").....	17 08	16 97	— 11	8 15
D (Three ").....	19 35	17 80	— 1 55	10 08
R (Three ").....	19 14	19 50	36*	

*Records kept for 1912-13 only.

COST OF PRODUCTION OF FIELD CROPS.

The following four-year rotation, on which have been grown corn, turnips, oats, clover hay (first year hay) and timothy hay (second year hay) has been in operation for the past ten years.

First year.—Hoed crop. Turnips were grown from 1904 to 1909 inclusive, and corn from 1910 to 1913 inclusive.

Second year.—Oats. Seeded down to clover and timothy.

Third year.—Clover hay (first year hay).

Fourth year.—Timothy hay (second year hay).

In this rotation, good farm practices have been followed, profitable crop production being the aim.

Charges against the crops include manual and horse labour, rent, manure, seed, twine and use of machinery, and in each case represent the cost of the crop in the granary, loft, root house or silo, as the case may be.

COST OF PRODUCTION OF FIELD CROPS, OTTAWA.

Crop.	Number of years.	Average yield per acre.		Cost to Produce.		
				Per acre.	Per ton.	Per bushel.
		Tons. Lb.	Bush. Lb.	$ cts.	$ cts.	cts.
Oats	10	.....	45 33	14 14	.....	30.8
Hay (first year)	10	3 231	.....	12 65	4 06	
Hay (second year)	10	2 1779	711 03	11 90	4 12	
Turnips	6	20 1598	.....	38 85	1 86	5.4
Corn	4	14 1271	.....	25 19	1 72	

SHALLOW PLOUGHING AND SUBSOILING VERSUS DEEP PLOUGHING.

This experiment has now been under way for ten years. Two four-year rotations, differing only in the above-mentioned methods of preparation for hoed crop, were laid down in 1904.

ROTATION 'S' (SHALLOW PLOUGHING AND SUBSOILING.)

First year.—Corn or roots. Field manured at rate of 24 tons per acre. Ploughed out of sod previous August, 4 inches deep, subsoiled to a depth of 8 or 9 inches and ridged up in late autumn. The land is ploughed shallow or cultivated in preparation for the grain which follows.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice in the season, and the aftermath left on the field.

Fourth year.—Timothy hay. Broken in August and prepared for corn or roots, as indicated above.

ROTATION 'P' (DEEP PLOUGHING.)

This rotation differs from rotation 'S' only in the treatment of the timothy hay field in preparation for corn or roots. It is manured and ploughed in August, 7 inches deep, top-worked, and ploughed again in late fall, 7 inches deep.

The average returns for the ten years show a very slight advantage in favour of the deep ploughing. If there is taken into consideration the fact that where subsoiling is practised a single plough must be used, whereas a two furrow riding plough may be operated under the deep-ploughing method, the higher cost of operation in the former method would reduce the actual net profits still more. This experiment will be continued, as the results have not as yet shown any decided advantage in favour of either method.

COMMERCIAL FERTILIZERS.

In 1913 there were completed five years of experiments designed to supply information concerning the relative fertilizing merits, in regular farm rotation, of:—

1. No manure or fertilizer of any kind, but pastured one year in four (records kept in 1913 only).

2. Barnyard manure.
3. Complete commercial fertilizer.
4. Barnyard manure, together with commercial fertilizer.

To carry out this work, four areas of land were selected, 'N' in 1912, and 'X', 'Y' and 'Z' in 1909. Each area was divided into four equal-sized plots, and placed under the following rotation:—

First year.—Hoed crop.

Second year.—Oats. Seeded down with 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay on rotations 'X,' 'Y' and 'Z,' and pasture on rotation 'N.' Land ploughed shallow in early autumn, top worked and ribbed up in late autumn.

The fertilizing treatment given these areas is shown in the following table:—

FERTILIZER TREATMENT GIVEN ROTATIONS 'N' 'X' 'Y' AND 'Z.'

Crop.	Rotation N.	Rotation X.	Rotation Y.	Rotation Z.
Mangels.....	No fertilizer...	Manure 15 tons.	No manure.....	Manure, 7½ tons.
			Superphosphate, 300 lb.....	Superphosphate, 150 lb.
			Muriate of potash, 75 lb.....	Muriate of potash, 37½ lb.
			Nitrate of soda, 100 lb.....	Nitrate of soda, 50 lb.
Oats.....	No fertilizer...	No fertilizer....	Nitrate of soda, 100 lb.....	Nitrate of soda, 100 lb.
Clover hay...	No fertilizer...	No fertilizer....	Nitrate of soda, 100 lb.....	Nitrate of soda, 100 lb.
Timothy hay	Pastured.....	No fertilizer....	Nitrate of soda, 100 lb.....	Nitrate of soda, 100 lb.

The five years' results for this experiment supply rather interesting data.

Rotation 'X,' which was fertilized with barnyard manure alone, cost the least to operate and produced the largest returns. The average profit per acre for the period was $7.88.

Rotation 'Z,' which received a mixture of barnyard manure and commercial fertilizers produced equally as well as rotation 'X' but cost slightly more to operate with the result that the net profit was just $6.77 per acre.

Rotation 'Y' receiving commercial fertilizer alone was the lowest in producing power and cost as much to operate as 'X.' The profits therefrom have averaged only $5.55 per acre.

These results show a distinct advantage of barnyard manure alone over commercial fertilizer alone for this soil, but point to the possibility of combining the two to good advantage when barnyard manure is scarce or high in price.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

J. A. Clark, B.S.A., *Superintendent.*

CHARACTER OF SEASON.

The previous winter was severe, with snow on the ground for a very short period. The spring opened early in April with very warm weather. This was followed by a cool, dull May and June. July and August were seasonable. September was fine and the early harvest was well saved. October was extremely wet, with mo.t, warm weather throughout. Very little harvesting was done during the month, and it was not until the cold, dry winds of November that the late crops were brought in.

ROTATIONS.

Records were taken of all the work carried on with the six rotations started in 1912. The feature of these rotations was the splendid crops of clover obtained. In one case the aftermath was harvested for seed, in the others it was ploughed under. The crops on these rotations were harvested in good condition and, with the exception of wheat, which was injured by the joint-worm and rust, the yields were good.

ERADICATION OF COUCH (TWITCH OR QUACK) GRASS.

A hay field that was badly infested with couch grass was ploughed August, 1912, and was rolled and cutaway-disc-harrowed the following day. It was given a double cut with the disc harrow on August 14, 22, and 29, and on September 10, 12, and 27. It was worked deep and the couch cut in short pieces and buried. In the spring of 1913 the field was as green as ever with couch. It was then decided to resort to our old method of destroying this troublesome weed. The teeth of the spring-tooth harrow were set deep and the field was gone over twice on May 12, the smoothing harrow being used afterwards to shake out the roots. On May 14 the field was raked and several tons of couch roots per acre were removed. It was then ploughed six inches deep, spring-tooth harrowed twice, rolled and seeded. The smoothing harrow was used again to shake out the couch roots that the other harrow had brought to the surface, and though the harrow was lifted continually the couch gathered into bunches so that it had to be spread by hand. When the couch on the surface was thoroughly dried out, the field was given a light top-dressing of manure. The couch which had been hauled off and completely killed was placed on top of the spreader loads and put back on the field. The field gave an average yield of 80 bushels of oats per acre, and appeared to be completely free of couch.

APPLICATION OF BARNYARD MANURE.

One plot in rotation 'F,' with an area of .88 of an acre, had not received manure, so far as we could learn, for fifteen years. In the spring of 1913, 3 tons 1,800 pounds of barnyard manure were applied to the north half of the plot. The whole plot was then ploughed and worked similarly and seeded to Hannchen

barley. After the grain came up, the south half received a top dressing of 3 tons 1,300 pounds of barnyard manure. During the summer the top-dressed portion of the field was at least one week behind the other, and at harvest it yielded 3 bushels 13 pounds less barley and 43 pounds less straw than the ploughed under half. The difference in yield of barley per acre in favour of the manure being ploughed down was 7 bushels 21 pounds.

DRAINAGE.

Four carloads of tile were purchased and the area acquired from the Connolly estate was drained. Forty acres of land in all were acquired by the Station in 1913 and two-thirds of it will be drained as soon as the tile can be laid. The land drained previously gave excellent results in 1913.

IMPROVEMENTS.

All the land newly acquired was fenced with a strong woven wire fence and the posts were painted. Dikes and rows of trees were levelled and removed. The fields were surveyed and roads opened.

EXPERIMENTAL FARM, NAPPAN, N.S.

W. W. Baird, B.S.A., *Superintendent.*

SEASONAL CONDITIONS.

During the winter 1912-13 the snowfall was scanty and no severe frost was registered during the latter part of the season. No snow fell after March 15, but two inches of rainfall, on March 27, caused considerable damage by washing the fields. Seeding commenced on May 6, but was retarded and germination was checked by the cold weather which prevailed throughout the month. In fact, growth was slow until July, when vegetation made remarkable progress. Due to the frequent rain throughout the growing season, the ripening of the harvest was slow. The early-sown grain was harvested in late August or early September but late-sown grain was not ripe until October, when the heavy rain damaged the grain to such an extent as to make it useless for seed and barely fit for feed.

YIELDS OF FIELD CROPS.

The yields of crops grown in field lots and under regular field conditions averaged as follows in 1913:

Mangels,	19 tons	685 pounds per acre.
Turnips,	23 "	23 "
Corn,	12 "	1,380 "
Marshland hay,	1 ton	1,856 "
Upland hay,	2 tons	856 "
Wheat,	29 bushels	30 "
Upland oats,	59 "	24 "
Marshland oats,	20 "	00 "
arley,	33 "	44 "
Potatoes,	376 "	00 "

ROTATION OF CROPS.

There is, perhaps, no single practice in farm management of more importance than a systematic rotation of crops. So many different combinations of crops are possible, that a test of all that suggested themselves to us was quite impracticable. The following three, chosen because of the good results they have given in other sections of the country, are now in operation.

ROTATION 'B' (FIVE YEARS' DURATION.)

First year.—Roots. Manured at rate of 25 tons per acre.
Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.
Third year.—Clover hay. Ploughed in autumn.
Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.
Fifth year.—Clover hay.

ROTATION 'C' (FOUR YEARS' DURATION.)

First year.—Roots. Manured at rate of 20 tons per acre.
Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.
Third year.—Clover hay.
Fourth year.—Pasture.

ROTATION 'D' (THREE YEARS' DURATION.)

First year.—Roots. Manured at the rate of 15 tons per acre.
Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.
Third year.—Clover hay.

COST OF PRODUCTION OF FIELD CROPS.

In calculating net profits from the rotations, some interesting figures have been obtained regarding the cost of producing the various crops grown. In explanation of the rather high cost in some cases it may be explained that in 1913 some of the fields did not yield quite up to the average production for previous years. Corn and turnips were the chief sufferers.

COST OF PRODUCTION OF FIELD CROPS, NAPPAN, 1913.

Crop.	Yield per acre.				Cost to Produce.		
					Per acre.	Per ton.	Per bushel.
	Tons.	Lb.	Bush.	Lb.	$ cts	$ cts.	cts
Turnips	23	23	767	03	45 57	1 98	5 94
Mangels	19	685	644	45	49 51	2 56	7 68
Ensilage corn	12	1,380	.....	.....	39 33	3 10	.....
Potatoes	.....	.....	376	00	49 36	.....	13.13
Oats	.....	.....	59	24	17 25	.....	28 9
Wheat	.....	.....	29	30	14 42	.....	48 9
Barley	.....	.....	33	44	13 83	.....	40 8

COMMERCIAL FERTILIZERS FOR TURNIPS.

Seven different varieties of turnips were sown in lots of one acre each. One-half acre of each variety was fertilized with barnyard manure alone applied at the rate of 20 tons per acre. The other half acre of each variety received barnyard manure at the rate of 20 tons per acre, and, in addition 400 pounds per acre of a commercial fertilizer mixed in the following proportion: Superphosphate, 1½ pounds; bone meal, 1½ pounds; nitrate of soda, 1 pound; muriate of potash, 1 pound.

Of the seven tests made, two only gave profits to compensate for the cost of the fertilizer. As these results accord closely with those obtained in previous years, it seems evident that turnips on our soil are not benefited to any extent by the use of the above commercial fertilizer in addition to the regular application of barnyard manure.

EXPERIMENTAL STATION, KENTVILLE, N.S.

W. S. Blair, *Superintendent.*

The Field Husbandry work at this Station, in 1913, consisted largely of the clearing of new land and the growing of crops on same to secure feed for wintering stock.

CORN.

Ten acres of corn were planted. Part of it was seeded on May 26 on land fertilized with barnyard manure at the rate of 30 tons per acre. The manure was put into piles on the field during the winter and spread and ploughed under on May 13 to 15. A crop of buckwheat to be ploughed under had been grown the summer before, immediately following the removal of the stumps.

Three varieties of corn were sown in rows three and one-half feet apart. The following yields were obtained:—

Longfellow,	11 tons		150 pounds	per acre.
Compton's Early,	10	"	1,440	"
Canada Yellow,	8	"	1,440	"

Two acres of Longfellow, sown June 4, without stable manure, but fertilized with 400 pounds per acre of a complete fertilizer containing four per cent nitrogen, eight per cent phosphoric acid, and ten per cent potash, yielded only 4 tons 100 pounds per acre.

TURNIPS.

One and three-quarter acres of swede turnips were sown on May 19, the variety Lapland being used. The ground had been manured in the fall of 1912 with 20 tons of stable manure per acre. A crop of buckwheat had been ploughed in during the summer of 1912. This land was worked up and fertilized with 400 pounds per acre of a complete fertilizer. The turnips were sown in drills with a horse turnip seeder. The crop was harvested November 6 to 8, and yielded 628 bushels per acre.

Two acres of turnips were sown on land which had been stumped the previous summer and which had never before grown a crop. No stable manure was used, but a commercial fertilizer, containing four per cent nitrogen, eight per cent phosphoric acid, and ten per cent potash was applied at the rate of 800 pounds per acre. This was sown broadcast just before the ground was drilled for seeding. The variety Lapland was used. The yield was 565 bushels per acre.

OATS.

Ten acres of field oats, sown on newly-broken land, and fertilized with 200 pounds per acre of fertilizer containing four per cent nitrogen, eight per cent phosphoric acid, and ten per cent potash, yielded an average of 38.6 bushels per acre.

CLEARING LAND.

Seventeen acres of new land were cleared of stumps and ploughed during the season. Ten acres of the more easily cleared area cost as follows:—

Dynamite, 780 pounds (78 pounds per acre)	$	140 40
Fuse and caps		18 60
Pulling out stumps		932 00
Dynamiting		143 00
Cleaning roots, piling and burning		213 50
Clearing up roots (second time over) and burning		183 00
Moving stones		172 00
Harrowing		35 00
Ploughing		350 00
Total cost for ten acres	$	2,187 50
Cost per acre		218 75

The remaining seven acres were much more difficult and cost $282.40 per acre.

Thirteen acres were brushed ready for stumping during the summer, at a cost of $21.15 per acre.

FENCING.

Eleven thousand three hundred and twenty feet of wire fences were erected on the east, north and west boundaries of the Station. Part of this was built through woods, which made the work very difficult. Owing to the great number of roots, and to the presence of sandstone and slate rock near the surface, holes for the posts had to be blasted in many cases. Cedar posts were used, and were set at a distance of one rod apart.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

Joseph Bégin, *Superintendent.*

WEATHER CONDITIONS, 1913.

The spring of 1913 opened favourably, and seeding was commenced in good time. Weather did not continue warm, however, through May and June, and all crops made slow growth. Corn, especially, suffered from the changeable temperature. July was cool and windy, with more rainfall than in June. Clovers had been badly winter-killed, owing to the presence of ice on many of the fields, and hay yielded poorly. The early-sown grain was harvested in September in good condition, but the later sown was not ripe till October, and had to be gathered under very unfavourable weather conditions.

CROP YIELDS.

There were no facilities this year for weighing the total crops as they came from the fields, but careful estimates were made in all cases, which we publish in order better to convey to our readers the degree of success attending our efforts to increase crop production by improved rotations and cultural methods.

CROP YIELDS (APPROXIMATE), STE. ANNE DE LA POCATIÈRE, 1913.

Crop.	Area.	Yield per acre.			
	Acres.	Tons.	Lb.	Bush.	Lb.
Turnips, Magum Bonum variety	1.33	23	1175	786	15
Corn, Longfellow variety	8.00	4	....	.....	
Oats and peas, cut for hay	1.33	2	1000	.....	
Oats, for grain	20.3	.....		31	17

ROTATION OF CROPS.

Believing that much benefit would result if our farmers would adopt rotations that would eliminate the long continued growth of any one crop on the same land, it was decided to inaugurate a series of rotations, so that, by comparison the benefits of a well-arranged succession of crops could be shown. As yet three rotations only have been laid down, but more will be added as soon as land for the purpose is available. The three already under way are:—

ROTATION 'A' (FIVE YEARS' DURATION.)

First year.—Hoed crop of corn or roots. For corn, manure applied at rate of 25 tons per acre in spring and ploughed under. After crop is harvested land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

Fourth year.—Timothy hay or pasture. Ploughed shallow in August, top worked and re-ploughed or ridged up in late autumn.

Fifth year.—Grain. Seeded down with 10 pounds red clover which is allowed to grow to be turned under following spring, when the hoed crop is corn.

ROTATION 'C' (FOUR YEARS' DURATION.)

First year.—Hoed crop of corn or roots.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

Fourth year.—Timothy hay. Field ploughed shallow in August, top-worked and re-ploughed or ridged up in late autumn.

ROTATION 'D' (THREE YEARS' DURATION.)

First year.—Hoed crop of corn or roots. For corn, land is manured, 15 tons per acre, and ploughed in spring; for roots it is manured and ploughed in fall.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay.

DRAINAGE.

After the removal of the old fences, and the ploughing up of the old, unproductive sod land, underdrainage was the first improvement work that claimed our attention; 9,410 feet of tile were laid during the season on land intended to be planted to orchard, and a beginning was made in the draining of the land to be used for general crop production.

In order to demonstrate to just what extent underdrainage is profitable, two four-year rotations were laid down, one of which will be thoroughly underdrained, while the other will be left undrained. Records of the cost per acre to operate, and the value of the products from each rotation will be kept, so that at some future time we shall be able to publish reliable data as to the length of time required for the drains to pay for the cost of their installation.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

GUS. A. LANGELIER, *Superintendent.*

CHARACTER OF SEASON.

The mild winter of 1912–13 left bare many fields and pastures, which were affected by frost. On the undrained, low areas practically all the clover was killed and some of the grasses suffered. The spring, however, was very early and most suitable for the germination of the spring-sown clovers and grasses. Some grain was sown by the end of April, but the bulk of the seeding took place between May 7 and 15. The early-sown grain was damaged by frost, but the later sown made a splendid growth and yielded well. Grain seeded after the above dates, however, suffered extremely from the drought, which lasted throughout August. Corn was poor, due to the drought and frost of September 14, which terminated its growth. Roots suffered from the dry weather of late summer, but the cool nights of September and October, coupled with a fair precipitation, gave them a renewal of vigour, with the result that an average crop was harvested.

The following table summarizes the field crop areas and yields 1913:—

FIELD CROP AREAS AND YIELDS, CAP ROUGE, 1913.

Crop.	Area.	Total Yield.	Yield per acre.
Corn	9 92 acres	144,082 lb.	14,524 lb., or 7 tons 524 lb.
Swede turnips	7.67 "	301,354 "	39,290 lb., or 654 bush. 50 lb.
Carrots	1.52 "	40,583 "	[illegible] lb., or 414 bush. 59 lb.
Oats	10 89 "	28,955 "	2[illegible], or 78 bush. 7 lbs.
Hay	37.13 "	153,904 "	1[illegible], or 2 tons 145 lb.

ROTATION OF CROPS.

The following rotations are under test:—

ROTATION 'D' (THREE YEARS' DURATION.)

First year.—Corn, roots, potatoes, peas, and peas and oats mixed to cut for green feed or for hay.

Second year.—Oats. Seeded down with 10 pounds red clover, 6 pounds timothy and 3 pounds alsike per acre.

Third year.—Clover hay. Two crops cut if possible.

ROTATION 'C' (FOUR YEARS' DURATION.)

First year.—Corn, roots, potatoes, peas, and peas and oats mixed to cut for green feed or for hay.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Pasture.

ROTATION 'K' (SIX YEARS' DURATION.)

First year.—Corn, roots, potatoes, peas, and peas and oats mixed for green feed or for hay.

Second year.—Grain. Seeded down.

Third year.—Hay.

Fourth year.—Hay.

Fifth year.—Pasture.

Sixth year.—Pasture.

The work done with these rotations, to date, has not given the results which might have been expected, as the long rotation has given the most profit. The figures are, nevertheless, interesting. It must be understood that for the three- and four-year rotations, the season of 1911 was of a preparatory nature, and that 1912 was one of the worst years for spring work in the past quarter-century It was therefore to be expected that the six-year rotation, with its four years in hay, would forge ahead. Then again, the piece of land where is located rotation 'K' had been under a good four-year rotation for eight years, whereas the area where are the two others, was an old pasture in rather poor condition.

COSTS, RETURNS AND LOSSES OF ROTATIONS 'D' 'C' AND 'K', AVERAGE OF 3 YEARS.

Rotation	Cost to operate per acre.	Value of returns per acre.	Loss per acre.
	$ cts.	$ cts.	$ cts.
'D' (three years' duration)	23 96	18 19	5 77
'C' (four " ")	20 10	1 60	5 50
'K' (six " ")	17 88	16 42	1 46

The above figures, showing a loss throughout, do not at first appear encouraging. That all of them are rapidly improving and will soon show a handsome profit seems apparent, however, when the following table is examined:—

INCREASE IN VALUE OF PRODUCTS OF ROTATIONS 'D' 'C' AND 'K' IN 3 YEARS.

Items.	Rotation D	Rotation C	Rotation K
	$ cts.	$ cts.	$ cts.
Value of products per acre 1913	28 06	23 14	22 51
" " " 1911	16 80	12 67	15 58
Increase in value of products from 1911 to 1913	11 26	10 47	6 93
Per cent increase in value of products from 1911 to 1913	67	83	44

It will thus be seen that if the production per acre increases in the same ratio during the next three years as it has done in the last three, the present loss will be converted into a profit, as the fixed charges for rent of land, manure, and machinery will be the same, and the manual and horse labour will likely be augmented only to the extent of the added cost to load, cart and unload the larger crops.

COST OF PRODUCTION OF FIELD CROPS.

Using fixed rates of $4 per acre for manure, $3 for rent of land, 60 cents for machinery and actual cost of seed, twine, manual and horse labour, field lots of turnips, oats and hay cost to produce as follows:—

One bushel (60 pounds) of swede turnips cost 5.92 cents.
One bushel (34 ") of oats.....30.3 cents.
One ton of hay.....$5.95

RATES OF SEEDING.

RATES OF SEEDING CORN FOR SILAGE.

As in 1911 and 1912, Longfellow corn was sown at different spaces both in rows and in hills. The following table gives the average for the three years:—

In rows	42	inches apart,	plants	8	inches apart in row	9 tons	1,094	lb. per acre.
" "	48	"	"	"	"	8 tons	1,754	" "
In hills	36	"	"	every	direction	5 tons	1,398	" "
"	42	"	"	"	"	5 tons	1,364	" "

According to the above figures which, it must be understood, are the result of only three years' work, it would appear that more weight can be had by sowing corn in rows than by having it in hills. Where land is dirty it would perhaps be advisable to sow in hills because of the greater ease of cultivation.

RATES OF SEEDING OATS.

To determine the best quantity of seed oats to use they are being sown at thirteen different rates varying from one to four bushels per acre. The test has been conducted one year only, and as no regular gradation in yield was shown, the results, as yet, suggest little of value. In our field operations, two and one-half bushels per acre is the amount used.

EFFECT ON YIELD OF HAY OF QUANTITY OF GRAIN SOWN AS A NURSE CROP.

This experiment was carried out in duplicate, using a nurse crop of oats varying in quantity from one to three and one-half bushels per acre. One year's results do not supply sufficient data upon which to base a conclusion, but it may be pointed out that the group of consecutive seedings which gave the most oats produced the least hay afterwards, and *vice versa*. This is a very important question in a district where, after a crop of grain, the land is often in hay for five or six years, and then pastured for two or three more.

RATES OF SEEDING CLOVER AND TIMOTHY.

To determine whether the liberal use of clover and timothy seed has any effect on the yield of hay, twenty-two plots were sown to oats in the spring of 1912, on eleven of which 6 pounds timothy, 4 pounds red clover and 1 pound alsike were used per acre, whilst on the other eleven, twice this quantity was seeded. The full seeding yielded at the rate of 3,447 pounds per acre, whilst the half seeding gave only 2,989 pounds. The difference in favour of the heavy seeding was 458 pounds per acre, an increase of fifteen per cent.

DRAINAGE.

During 1913, 1020 six-inch, 1420 five-inch, 1,610 four-inch and 22,654 three-inch tiles were laid. A fifteen horse-power gasoline traction ditcher was used for most of the excavating. Though the grade in many cases was very slight, and the ground uneven, the work of the ditcher was very satisfactory.

A number of two-inch tile laid by a previous owner were examined and found to be clogged. Though they were, theoretically, large enough to carry away all the water, a very slight bulge or misplacement was sufficient to put them out of working order. Nothing smaller than three-inch tile is now being laid here, or recommended for the general use of farmers.

CLEARING LAND.

About twenty acres of land were cleared and ploughed during the season of 1913. The large stumps were dynamited. For the small ones, a double block and tackle were used, which is much superior to the chain attached from stump to whiffletree direct. Another time saver is what is called a double grub hook. With one good horse many roots which could not be taken hold of by a chain were easily handled by this method.

EXPERIMENTAL FARM, BRANDON, M N.

W. C. McKillican, B.S.A., *Superintendent.*

SEASONAL CONDITIONS.

The season of 1913 opened up very favourably for the accomplishment of farm work. The spring was not early, but when once arrived there was no occurrence of winter weather again. Seeding was pushed forward rapidly on most Manitoba farms. On the Experimental Farm, operations were badly upset by a local misfortune; the Assiniboine river overflowed its banks. The water remained on the land for from one to three weeks. Seeding on this portion of the Farm was either prevented entirely or was very much delayed, and the crops, where grown, were late and poor. On the unflooded land, seeding operations were finished early, and the crop was early in growing and ripening. The season was dry, the total rainfall up to July 31 being 5.33 inches. This shortage of moisture tended towards light yields of straw, but did not, however, prevent the harvesting of a good crop of grain of good quality. Hay and root crops were rather below the average.

ROTATION OF CROPS.

The year has been almost lost so far as experimental work on the rotation of crops has been concerned. The flood was the cause which so invalidated our results. The land on which several of the rotations are located was entirely inundated, other areas again were partially flooded, and some escaped entirely. This means that the conditions under which the crops in the various rotations were grown were not comparable. It is, therefore, impossible to know whether the differences observed are due to the character of the rotation or to the effect of the flood.

ROTATIONS 'D' AND 'E' (EACH OF FOUR YEARS' DURATION).

First year.—Wheat.
Second year.—Wheat.
Third year.—Oats.
Fourth year.—Summer-fallow.

The only difference between the two is, that whereas 'E' receives no manure, 'D' gets an application once in the four years. It is applied in the fall after the first crop of wheat, and is ploughed under in the fall.

Each of these rotations occupies four fields of three and one-half acres each. They are both located in the same range of land, the fields of the two rotations occurring alternately. This gives an excellent opportunity of observing any difference between the two.

The cultivation for the two rotations is identical. The wheat of the first year is sown on the summer-fallowed land of year four of the previous season. After this crop is harvested, the land is fall-ploughed. Wheat is sown again the next year. It is again fall-ploughed, if possible, and sown to oats the following year. After the oats are taken off, the land is summer-fallowed the fourth year.

The manure is charged against rotation 'D' at the rate of $1 per ton, including the work of the application. In 1912, rotation 'D' realized a greater profit than rotation 'E,' showing that the manure more than paid for itself. This season, however, the manure has failed to increase the crop sufficiently to compensate for the charge against it. The net profits on these rotations in 1913 were $4.45 per acre for rotation 'D,' and $5.11 per acre for rotation 'E.'

Rotation 'D' and 'E' were not seriously affected by the flood, one field only in 'E' being partially flooded.

ROTATION 'F' (FIVE YEARS' DURATION).

First year.—Wheat.
Second year.—Wheat.
Third year.—Corn or roots. Manured preceding fall.
Fourth year.—Oats or barley. Seeded with grass and clover.
Fifth year.—Clover hay.

Five fields of eight and one-half acres each are used for this rotation. After the first crop of wheat, the land is fall-ploughed for a second crop of wheat. After the second crop, it is manured and fall-ploughed for corn, which is kept well cultivated during the season. The barley and grass seed are sown the next spring without ploughing. As soon as the crop of hay is cut in the fifth year the land is ploughed up and given a partial summer-fallow for the balance of the season. It is then in first-class condition for the wheat of the first year.

Rotation 'F' is a mixed farming rotation suited to conditions where it is desired to grow both a considerable quantity of wheat and a large amount of fodder for stock. It pre-supposes a sufficient area of permanent pasture outside the rotation. It eliminates the summer-fallow.

This rotation is proving a decided success on the Experimental Farm. In a country where summer-fallowing is generally considered essential, it demonstrates the possibility of producing a profitable crop every year. The substitutes for the summer-fallow are, first, corn or roots, and, secondly, clover hay. While these crops do not show in themselves any very great profit, they more than pay for the operations they involve, and for the overhead charges counted against them, and they leave the land in such a condition that the following crops of grain are more profitable than any grown in the straight grain-growing rotation. The net profit per acre of rotation 'F' was $9.07. Two fields were partially injured by the flood.

ROTATION 'G' (SIX YEARS' DURATION).

First year.—Wheat.
Second year.—Wheat.
Third year.—Oats or barley. Seeded down with grass and clover.
Fourth year.—Clover hay.
Fifth year.—Pasture.
Sixth year.—Corn. Manured previous fall.

Six fields of six acres each are allotted to rotation 'G.' It is a mixed farming rotation, providing for wheat, coarse grains, hay, pasture, and fodder corn. It has been giving excellent results in past years, but unfortunately the land was entirely flooded this year, and as a result the figures obtained have no value.

ROTATION 'H' (SIX YEARS' DURATION).

First year.—Wheat.
Second year.—Wheat.
Third year.—Summer-fallow.
Fourth year.—Oats.
Fifth year.—Hay.
Sixth year.—Pasture.

Six fields of four and one-half acres each are used for rotation 'H.' This rotation is suitable for a farm where grain is still the principal crop, but where hay and pasture are desired for stock. It has no hoed crop and is therefore suited to the farmer who considers a hoed crop impracticable under present labour conditions. Rotation 'H' was entirely flooded this season and the results are of no value.

ROTATION 'I' (SIX YEARS' DURATION.)

First year.—Flax. Manured.
Second year.—Oats.
Third year.—Summer-fallow.
Fourth year.—Wheat.
Fifth year.—Hay.

It occupies a similar area to rotation 'H' and is situated in similar circumstances, the difference being a substitution of flax for one crop of wheat. This rotation was completely flooded this year.

ROTATION 'Q' (EIGHT YEARS' DURATION).

First year.—Roots and peas. Manured preceding fall.
Second year.—Wheat or oats.
Third year.—Hay.
Fourth year.—Hay.
Fifth year.—Pasture.
Sixth year.—Pasture.
Seventh year.—Pasture.
Eighth year.—Green feed and rape.

Five acres are allotted to each field of this rotation. It is especially adapted to a piece of poor, light land used as a sheep ranch. A profit of $2.03 per acre was the result of this season's operations on this land.

ROTATION 'W' (TEN YEARS' DURATION).

First year.—Wheat.
Second year.—Wheat.
Third year.—Corn or roots. Manured.
Fourth year.—Oats.
Fifth year.—Barley.
Sixth year.—Alfalfa. Sown alone.
Seventh year.—Alfalfa.
Eighth year.—Alfalfa.
Ninth year.—Alfalfa.
Tenth year.—Alfalfa. Ploughed up in midsummer.

Ten fields, varying in size from one and one-half to two and three-quarter acres, are to be used for this rotation. It is not in full operation yet.

This rotation is intended for a dairy or live stock farm, where the production of abundant fodder of high quality is the main consideration.

SOIL CULTURAL EXPERIMENTS.

A comprehensive system of soil cultivation experiments, inaugurated in 1911, has reached the stage where all the operations are being performed. Not much has yet been obtained in the way of definite results, hence, in this report, little attempt is made to draw conclusions. A brief summary only of the work being done is herewith given.

DEPTH OF PLOUGHING.

In this experiment there are tested:—

1. Ploughing wheat stubble three, four and five inches deep in preparation for oats.
2. Various depths of ploughing, and ploughing and subsoiling summer-fallow to be sown to wheat.
3. Ploughing sod three, four, five and six inches deep in preparation for wheat.

SUMMER-FALLOW TREATMENT.

In this experiment, seventeen different methods of summer-fallowing are being tried.

STUBBLE TREATMENT.

Ten different ways of handling wheat stubble land in preparation for another crop of wheat, and three ways of preparing it for a crop of oats are being tried.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS.

Land has been seeded down with a uniform mixture of grasses and clovers and is being broken up according to eight different methods.

APPLICATION OF BARNYARD MANURE.

Nine methods of applying manure are being tried on each of corn or roots, wheat, oats and barley.

GREEN MANURING.

A comparison is being made of ploughing under peas or tares and summer-fallowing with and without barnyard manure. A summer-fallow with barnyard manure has given best results so far.

SEED BED PREPARATION.

Three degrees of seed bed preparation, 'poor,' 'good,' and 'extra-ordinary,' are compared. The preceding summer-fallowing and ploughing are the same in all cases, the difference being entirely in the preparation of the seed bed at the time of seeding.

SOIL PACKERS.

Twenty-five different ways of using the different types of packers on summer-fallowed land, eleven on spring ploughing and fourteen on fall ploughing, are being tried. Results in this experiment show an advantage of all types of packing over no packer, but little distinction between kinds of packer or times of application.

DEPTH OF SEEDING.

Seeding one, two, three and four inches deep is being tried with both wheat and oats. Two and three inches deep gives the best results.

COMMERCIAL FERTILIZERS.

Eight kinds and combinations of commercial fertilizers are compared with no fertilizer, barnyard manure and clover.

UNDERDRAINING.

Two drained plots are compared with eight undrained plots.

SEEDING TO GRASSES AND CLOVERS.

The same mixture of grass and clover seed is used on all plots. Eleven different arrangements of preparatory crops and other conditions are under trial.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

T. J. HARRISON, B.S.A., *Superintendent.*

WEATHER CONDITIONS.

The spring opened up comparatively early and the soil was in a tillable condition by April 14. May was dry, which facilitated the early sowing of the crop. In June and July, 8·50 inches of rain fell giving the crop plenty of moisture at the growing period. This resulted in a rank growth of straw on the summer-fallowed land. August, with the exception of one bad storm which lodged the grain, was dry and bright. The grain ripened early and was all harvested before September 3. September was dry and warm, and the threshing was well advanced before wet weather came in October.

ROTATION OF CROPS.

This experiment consists of four rotations on which the cost of production and profit per acre are carefully calculated. The soil is analyzed from time to time to test their effect on soil fertility.

ROTATION 'C' (THREE YEARS' DURATION).

Kind of Crop.	Cost per acre.	Value per acre.	Profit per acre.
	$ cts.	$ cts.	$ cts.
Summer-fallow	4 96		
Wheat	10 49	31 01	20 52
Wheat	10 03	23 29	13 26

Profit per acre on all land in rotation.....$9 61.

ROTATION 'J' (SIX YEARS' DURATION).

Kind of Crop.	Cost per acre.	Value per acre.	Profit per acre.
	$ cts.	$ cts.	$ cts.
Summer-fallow	6 25		
Wheat	12 03	39 59	27 56
Wheat	11 20	34 15	22 95
Oats (seeded down with western rye grass and alfalfa)	12 12	30 91	18 79
Hay	5 66	13 11	7 45
Pasture	3 51	5 50	1 99

Profit per acre on all land in rotation, $12.08.

ROTATION 'P' (EIGHT YEARS' DURATION).

Kind of Crop.	Cost per acre.	Value per acre.	Profit per acre.
	$ cts.	$ cts.	$ cts.
Summer-fallow	8 66		
Wheat	13 11	36 30	23 19
Wheat	13 55	33 15	19 60
Summer-fallow	9 29		
Corn	14 07	33 30	19 23
Barley, (seeded down with western rye grass and alfalfa)	12 53	29 47	16 95
Hay	7 31	12 72	5 41
Pasture	5 38	5 50	12

Profit per acre on all land in rotation, $8.32.

ROTATION 'R' (NINE YEARS' DURATION).

Kind of Crop.	Cost per acre.	Value per acre.	Profit per acre
	$ cts.	$ cts.	$ cts.
Summer-fallow	6.09		
Roots	28.42	64.20	35.78
Wheat	12.18	33.72	21.54
Oats	10.80	19.04	8.24
Summer-fallow	6.98		
Wheat	11.87	35.00	23.13
Oats, (seeded down with western rye grass and alfalfa)			
Hay	7.14	13.31	6.17
Pasture	5.17	5.50	.33

Profit per acre on all land in rotation, $9.12.

While rotations 'P' and 'R' have given a smaller profit per acre than 'C' and 'J,' their worth should not be underestimated. Their cost to operate is higher, in that considerable manure is added and charged, the full beneficial effects of which will not be felt for some time.

RATES OF SEEDING WHEAT.

Marquis wheat was sown on summer-fallow at the rates of three-quarters, one, and one and one-half bushels per acre. The highest yield was obtained from a seeding of one and one-half bushels per acre.

SOIL CULTURAL EXPERIMENTS.

DEPTH OF PLOUGHING.

The results from a trial of ten different depths ranging from three inches to eight inches, and from five inches to eight inches with a four-inch subsoiling, would seem to indicate that six inches, and six inches with a four-inch subsoiling were best suited to the weather conditions of this season.

SUMMER-FALLOW TREATMENT.

This experiment consisted of seventeen methods of treatment. The indications are that one of the best methods is to plough six inches deep in June, harrow, subsurface pack at once and cultivate as necessary to kill the weeds and form a mulch. The only method that gave better results was where the land was cultivated the fall previous but received similar treatment the next season.

STUBBLE TREATMENT.

This consists of a trial of ten methods of preparing stubble land for wheat, and three methods for oats. The best results were obtained by sowing wheat on fall ploughed land that was subsurface packed immediately after ploughing. With oats, spring ploughing and subsurface packing gave the best results.

SEED BED PREPARATION.

This experiment consists of three methods of preparation which may be designated by the terms 'poor,' 'good,' and 'extraordinary.' The results show that the good and extraordinary methods give the most profitable returns.

SOIL PACKERS.

This experiment consists of twenty-five different kinds and times of packing. Subsurface packing the summer-fallow after ploughing and harrowing, then subsurface packing again in the spring after seeding, gave the largest yield. Subsurface packing and combination packing in the spring before seeding came next, with no difference in the yield between the two kinds of packers.

APPLICATION OF BARNYARD MANURE.

This experiment consists of the application of rotted and green manure at different times on land intended for corn, wheat, barley and oats. For corn, the best results were obtained by applying green manure, made from cut straw, in the winter on the stubble and ploughing it under in the spring. The wheat on this corn land also yielded highest.

GREEN MANURING.

This experiment consists of ploughing under peas and tares at different stages of maturity. The results would seem to indicate that peas turned under when in blossom would give the best results.

DEPTH OF SEEDING.

In this experiment, wheat and oats were sown at depths varying from one inch to four inches. Wheat gave the best results at from two to three inches, and oats at from three to four inches.

SEEDING TO GRASSES AND CLOVERS.

This work consists of a test of seeding down with and without a nurse crop on land prepared in different ways. The best results were obtained on fallow and corn land. Slightly larger yields were obtained when sown without a nurse crop, but it is doubtful if the increase would compensate for the loss of the grain crop.

EXPERIMENTAL STATION, ROSTHERN, SASK.

WM. A. MUNRO, B.A., B.S.A., *Superintendent.*

The work in Field Husbandry at this Station has suffered considerably because of the presence of an area of alkali which prevents authentic conclusions in experiments extending over it. The most affected area was cropped to sugar beets in 1913 to overcome this difficulty, but as some small spots in the area are more affected than others the difficulty is likely to continue for some time.

ROTATIONS.

Four rotations have been in operation for three years, and a careful record has been kept of the labour, amount of seed and resulting crop. The area of each division in each rotation is exactly two acres, which makes the conditions as nearly like ordinary field conditions as is possible on a small Experimental Farm.

ROTATION 'C' (THREE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.

The yield from this rotation in 1912 was 15½ bushels per acre on stubble and 22½ bushels per acre on summer-fallow, and in 1913 it was 20 bushels and 42 bushels respectively. No manure is applied, since none would be produced on a farm carried on under these conditions.

The profit per acre, valuing wheat at 65 cents per bushel, was $2.05 in 1912, and $5.45 in 1913. There was less work per acre required on this rotation, and a subsequent less cost per acre for operation; nevertheless, it produced a smaller profit per acre than any of the other rotations under experiment.

ROTATION 'J' (SIX YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Oats. Seeded down to rye grass, red clover and alfalfa.
Fifth year.—Hay.
Sixth year.—Hay or pasture.

This rotation has not been sufficiently long in operation to prove its merits' but with wheat at 65 cents per bushel, oats at 25 cents per bushel and hay at $10 per ton, the profit per acre in 1912 was $3.78, and in 1913, $7.99. This rotation affords oats and hay for stock as well as wheat for market.

ROTATION 'P' (EIGHT YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Summer-fallow. Manured at rate of 15 tons per acre.
Fifth year.—Roots.
Sixth year.—Barley. Seeded down.
Seventh year.—Hay.
Eighth year.—Hay or pasture.

After two seasons' work on this rotation, it appears that more satisfactory results would be derived by growing barley instead of wheat in the third year, and wheat instead of barley following roots. The barley on root ground following fallow, heavily manured, grows too rank, and not only is detrimental to itself, but tends to smother the seeding of grass.

Allowing a value of 65 cents per bushel for wheat, 30 cents per bushel for barley, $3 per ton for roots and $10 per ton for hay, the profit per acre in this rotation in 1912 was $5.67, and in 1913, $2.67. The yield of roots, in 1912, was 17 tons per acre, and in 1913, 18 tons per acre. The barley, in 1912, produced 45.75 bushels per acre, and in 1913, 53.75 bushels per acre.

The grass seed used in seeding down in 1912 proved of poor quality, and instead of getting a high yield of hay in 1913 the field had to be ploughed and re-seeded, which accounts for the comparatively small profit from this rotation in 1913.

ROTATION 'R' (NINE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Corn.
Third year.—Wheat.
Fourth year.—Oats.
Fifth year.—Summer-fallow.
Sixth year.—Wheat.
Seventh year.—Oats. Seeded down.
Eighth year.—Hay.
Ninth year.—Hay or pasture.

This rotation presents the difficulty on a small farm of too many divisions and consequently of too small fields, but in point of production and profit per acre it leads the others under experiment.

Our highest yield of wheat on field plots, since the establishment of the Station, was 104 bushels on two acres in this rotation in 1913 on ground on which there had been a yield of 30 tons of corn in 1912 and which had been summer-fallowed and manured in 1911. This wheat was also of the best quality of any on the Station. The yield from two acres of green corn was 30 tons 1,950 pounds in 1912, and 39 tons 1,240 pounds in 1913. The profit per acre from this rotation, with wheat at 65 cents per bushel, oats at 25 cents per bushel, green corn fodder at $3 per ton and hay at $10 per ton was $8.33 in 1912 and $10.23 in 1913.

The conclusions from two years' work on these rotations tend to show:—

1.—That land worked under a rotation including grains and hay gives a greater profit per acre than where wheat alone is grown, and this is emphasized in a season of early frosts.

2.—That a hoed crop in the rotation increases the cost of operation per acre, but very much more increases the profit per acre as well as the yield of the succeeding grain crops.

3.—That the diversity of crops affords more suitable food for live stock. When these crops are marketed through the medium of live stock, greater profit per acre would accrue than is here shown.

BARNYARD AND GREEN MANURES.

A visit to the Station during the growing season ought to afford anyone convincing proof of the importance of manure in crop production. Those rotations where manure is applied show a marked increase in yield over those where no manure is applied, and the effect is evident to the eye for at least three years following the application.

In an experiment to determine the relative value of summer-fallow manured, summer-fallow without manure, and green crops of peas and vetches ploughed under, the following yields were obtained with the succeeding crops:—

GREEN MANURING FOR WHEAT FOLLOWED BY OATS.

Plot.	Treatment.	Yield of wheat 1912 following treatment 1911.		Yield of wheat 1913 following treatment 1912.		Yield of oats 1913 following wheat 1912.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Summer-fallow, no manure	40	00	45	50	94	01
2	Peas ploughed under early July	38	40	44	40	108	08
3	Peas ploughed under in blossom.	33	30	40	40	114	04
4	Tares ploughed under in blossom.	46	40	43	40	130	20
5	Summer-fallow, manured	57	20	61	20	141	06

The ploughing under of a green crop evidently leaves the ground too dry for any great benefit to be derived by the crop of the succeeding year, but in the above instance shows an advantage over bare summer-fallow in the second succeeding crop.

SEEDING TO GRASSES AND CLOVERS.

An experiment has been under way for three years on methods of seeding to grasses and clovers. In each case the quantity of seed has been 10 pounds western rye grass, 3 pounds alfalfa and 3 pounds red clover per acre. This

mixture has been seeded with and without a nurse crop after eleven different arrangements of preparatory crops.

An experiment cannot be considered really valuable or, at least, in any way conclusive until it has been carried on successfully for a number of years, but we feel fairly safe in concluding that better results are obtained by seeding alone than by seeding with a nurse crop, though the difference is not sufficient to make up for the extra grain crop that would be otherwise lost by seeding alone. In these experiments the yield of hay seeded with oats has been rather light. This confirms our results from the seeding of larger areas. The difference does not seem to depend so much whether the cover crop be oats or barley or wheat, as whether it be not so heavy as to lodge and smother the young grass. For example, we have had very poor success in seeding to barley on summer-fallow. The barley grows so rank that it lodges and smothers the young grass. We have not tried it, but we believe that no crop would be better than barley to seed with if it were on stubble land.

Besides the regular experimental work in seeding to grasses and clovers, following are the results we have obtained on larger areas: One two-acre plot sown to wheat in 1911 and seeded down with oats in 1912 yielded at the rate of 1 ton 67 pounds per acre in 1913, and a plot sown alone in 1911 yielded 2 tons 768 pounds per acre in 1912, and 1 ton 1,950 pounds per acre in 1913.

Another two-acre plot sown to wheat in 1911 and seeded down with oats in 1912 yielded 1 ton 285 pounds per acre in 1913; another plot seeded alone in 1911 yielded 2 tons 1,984 pounds in 1913, and 1 ton 35 pounds per acre in 1913.

A two-acre plot seeded alone in 1912 yielded at the rate of 1 ton 792 pounds in 1913.

EXPERIMENTAL STATION, SCOTT, SASK.

R. E. Everest, B.S.A., *Superintendent.*

The short season and the scarcity of labour in 1912 rendered it impossible to do much fall work on stubble land for spring seeding in 1913. Spring ploughing for grain crops was therefore the rule. Here, the fields were ploughed to a depth of four inches, packed immediately, drag harrowed, seeded, then packed again. When the cereal crops were approaching five inches in height the drag harrow was again used with a view to destroying weeds and conserving moisture.

ROTATION.

Five rotations, varying in duration from one to nine years, are under test. They are as follows:—

ROTATION 'A' (WHEAT CONTINUOUSLY).

This rotation was begun in 1912 only. While the profits this year are greater than for any of the other rotations, it must not be construed to mean that this is the best method of cropping for this section of the country. It is not a method that is likely to long continue very profitable for it is both exhaustive of fertility and moisture and ineffective in the control of noxious weeds.

ROTATION 'C' (THREE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.

This is the rotation most commonly followed by our farmers. While it is likely to prove satisfactory for a longer or shorter time, depending on the natural fertility of the soil to begin with, it cannot be given an unqualified recommendation since, from other districts, there have been reported many instances of soil impoverishment from its long continued use.

ROTATION 'J' (SIX YEARS' DURATION.)

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat or coarse grain.
Fourth year.—Oats. Seeded down with western rye grass, red clover and alfalfa.
Fifth year.—Hay.
Sixth year.—Pasture.

The returns from this rotation have been moderate. It is more or less of a mixed farming rotation, supplying three grain crops in six years, two grass or hay crops and one summer-fallow. The seeding down with a nurse crop of oats has been fairly satisfactory so far.

ROTATION 'P' (EIGHT YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Hoed crop or legume. Manured 15 tons per acre.
Sixth year.—Barley. Seeded down with western rye grass, red clover and alfalfa.
Seventh year.—Hay.
Eighth year.—Pasture.

This is also somewhat of a mixed-farming rotation. Here, on the fifth year of the rotation, peas have been grown altogether, and good crops have been harvested. In 1913 a good catch of seeds was obtained with barley as a nurse crop.

ROTATION 'R' (NINE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Hoed crop or legume. Manured 15 tons per acre.
Third year.—Wheat.
Fourth year.—Oats.
Fifth year.—Summer-fallow.
Sixth year.—Wheat.
Seventh year.—Oats. Seeded down with western rye grass, red clover and alfalfa.
Eighth year.—Hay.
Ninth year.—Pasture.

As has been the case with 'P,' the area for hoed crops or legumes has been sown to peas from which good profits were made the past year. The catch of

seeds with oats as a nurse crop appeared good when winter set in. Because of the relatively small proportion of wheat it supplies, it may not find immediate favour among farmers, but results so far point to it as a valuable rotation where mixed farming is being adopted.

SOIL CULTURAL EXPERIMENTS.

The following experiments in methods of soil cultivation are being conducted, but as one year's results only are available, little more than a mere mention of the nature of the work is here given.

PRAIRIE BREAKING.

The experiments in this connection include among other methods the growing of peas and oats, and of flax the year of breaking. While fair yields of flax were obtained in 1913, the practice is not to be recommended in preference to spring breaking and leaving the land uncropped till the following year.

SEEDING TO GRASSES AND CLOVERS.

The nature of this experim[illegible] the results this year can perhaps best be shown by means of the table [illegible]ow. 10 pounds western rye grass and 10 pounds red clover per acre was [illegible]ding mixture used throughout.

Plot.	Treatment when seeding in 1912.	Yield of hay, 1913.	
		Tons.	Lb.
1	Seeded with wheat after summer-fallow	2	400
2	Seeded alone after summer-fallow	2	1200
3	Seeded with wheat after roots	2	800
4	Seeded alone after roots	2	680
5	Seeded with wheat after wheat	1	1240
6	Seeded alone after wheat	1	1160
7	Seeded with oats after wheat	0	1720
8	Seeded alone after wheat on manured land	1	80
9	Seeded with wheat after two successive crops of wheat	1	820
10	Seeded alone after oats preceded by wheat	1	400
11	Seeded with wheat after wheat preceded by hoed crop	1	1860

SOIL PACKERS.

In these experiments, the packed plots showed the beneficial effect of their treatment, but as yet no marked distinction in favour of any one kind of packer has been observed.

DEPTH OF SEEDING.

Wheat and oats are being sown one, two, three and four inches deep. In 1913, two inches was indicated as the best depth for wheat and from two to three inches for oats.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

W. H. Fairfield, M.S., *Superintendent.*

SEASONAL CONDITIONS.

The season of 1913 opened at about the usual time for the district. Winter grain, however, suffered, many areas in the winter wheat fields being badly injured owing to the high dry winds that prevailed. Spring seeding commenced early in April, germination was rapid and a good stand was obtained in all cases. The rainfall during the spring was scant, especially during late May and early June. Crops of all kinds suffered acutely, particularly early-sown grain. The rainfall, from late June on, was reasonably satisfactory. The late rain, however, stimulated a second growth which caused uneven ripening and thus materially reduced the yield and quality of both wheat and barley. The result with oats was better, the second growth being so strong and vigorous that it reached maturity before any serious loss was suffered from the shelling of the first growth.

CROP YIELDS.

On the dry land the yields of hay were very light. Brome grass produced only 1,580 pounds, and western rye grass 1,160 pounds per acre. Alfalfa sown broadcast yielded only 1,481 pounds per acre whereas alfalfa sown in rows yielded about double this amount. It would appear, therefore, that for hay as well as for seed purposes it will pay to sow this crop in rows far enough apart to permit of cultivation.

On the irrigated land the average yield of hay was between 4 and 5 tons per acre, this being slightly below the average for the past five or six years.

ROTATION OF CROPS.

Space will not here permit of a full explanation of the various rotations under test at this Station, but, as showing the advantage of certain successions of crops, the following results may be pointed out:—

1. Wheat following corn yielded as well as wheat after summer-fallow, and much better than wheat following turnips. The latter difference is no doubt due to the fact that the roots made considerable growth in the fall thereby using up moisture, whereas the corn ceased growth with the first frost.
2. A good profit was obtained from alfalfa seed when the crop was planted in rows and intertilled.
3. Heavy yields of oats and peas, grown for feed, were obtained when sown on summer-fallow.
4. With irrigation, the yield of spring wheat was over 52 bushels per acre, following potatoes.
5. With irrigation, potatoes planted on alfalfa sod gave a yield of 635 bushels 30 pounds per acre.

RATES OF SEEDING.

Tests to determine the correct quantity of wheat, oats and barley to sow have now been conducted for five and, in some cases, six years. Each of the above grains has been seeded at the rates of fifteen, thirty, forty-five, sixty, seventy-five, ninety, one hundred and five and one hundred and twenty pounds per acre. The preparation of the land in nearly all cases, each year, was summer-fallow.

The results in 1913 correspond closely to the average of past years. Without exception the smallest amounts of each gave the lowest yields. The crops obtained increased quite rapidly with the amounts of seed used up to a certain point, after which the increase was small and irregular. It is the point at which this change takes place that appears to be the most profitable quantity of seed to use. Our results to date indicate the following rates of seed to be the best:—

Winter wheat non-irrigated, 60 pounds per acre.
Spring wheat non-irrigated, 75 pounds per acre.
Oats non-irrigated, 60 to 75 pounds per acre.
Barley non-irrigated, 75 to 90 pounds per acre.
Spring wheat, irrigated, 90 to 105 pounds per acre.
Oats, irrigated, 75 to 90 pounds per acre.

The results with barley on the irrigated plots have not been uniform, and it is therefore difficult to draw definite conclusions. From the data to hand, however, 75 to 90 pounds per acre may be recommended.

DATES OF SEEDING.

Experiments in dates of seeding wheat, oats, barley and flax have been carried out again this season. In previous years the rule has been for the early-sown grain to yield most. In 1913 the yields were not according to precedent, but were irregular, due probably to the unusual manner of precipitation.

Owing to the fact that it has been the custom to sow flax late in May and early in June, and that many farmers are under the impression that it would not be safe to plant it in April, the following table is presented giving the results obtained for the season just past and the average results of two seasons' work in this connection:—

DATES OF SEEDING FLAX (NON-IRRIGATED).

Date sown.	Date ripe.	Yield per acre 1913		Average yield per acre 1912-13.		Remarks.
		Bush.	Lb.	Bush.	Lb.	
April 3.....	August 7.....	15	30	19	31	
April 15.....	August 7	19	46	23	41	
May 2.....	August 12.....	21	54	23	47	
May 16	August 28.....	20	50	25	17	Crop of 1912 frosted.
June 2.....	August 29.....	16	4	21	51	" "
June 16..	.....	.....	.....	.....	.....	Crop destroyed by frost both years.
July 2. ...	.....	.....	.....	.....	.....	" " " "

SOIL CULTURAL EXPERIMENTS.

The dry-land soil cultivation investigations incepted in 1911 were carried out successfully, but as yet few of the experiments have shown any marked results. Some interesting points, however, have been brought out, which may be briefly mentioned.

PRAIRIE BREAKING.

In this experiment, the results have brought out nothing that has not before been fairly well demonstrated, They strongly support our contention that sowing crops immediately after breaking is unprofitable, and point out that the most advisable and practical method of procedure on new land is to break the sod in the spring and allow it to lie till the following season before cropping.

DEPTH OF PLOUGHING.

The plots ploughed three and four inches deep appeared to suffer from drouth before those ploughed six and seven inches deep. Ploughing beyond the latter depth, however, seemed of no advantage.

TIME OF PLOUGHING.

One of the most striking results observed, because it happened almost without exception, was the fact that land ploughed in the fall gave poorer returns than that which was ploughed in the spring. Similar results have been obtained in previous years, but the difference has never been so marked as was the case this year. No doubt the dry winter with its scanty rainfall was, in a great measure, responsible for these results.

MEASUREMENT OF IRRIGATION WATER.

All the water used for irrigation was measured over a weir, and a record made by a Friez self-registering instrument. An effort has always been made to ascertain the amounts of water used on each individual crop but, because of the large number of small fields, this has not always been feasible. The quantity of water used for the season was sufficient to cover the land to a depth of 1.525 feet. The depth of water on the land on the Station devoted to mixed crops for the season of 1913 may therefore be said to be 1.525 acre feet. It should be stated in this connection that a continuous flow of a fixed amount was not used. Water was obtained from the main canal at such times, and in such quantities, as we desired.

The following table, giving details regarding dates and quantities of water used on an alfalfa field of fifteen and three-quarter acres, may be of interest:—

Area of field.	Dates of Irrigation.	Amount of water used, i.e., depth of water applied.
15.75 acres.....	May 22-29	664 feet.
	July 15-17	.754 "
	Sept. 25-27	495 "
Total depth of water applied		1 913 feet.
Average yield per acre of alfalfa.....		4 tons 230 pounds.

The rainfall during the growing season was:—

April.....	0.52	inches.
May.....	1.70	"
June.....	4.70	"
July.....	1.29	"
August.....	1.93	"
Total.....	10.14	"

The alfalfa was cut twice, and the yield of hay was 4 tons 230 pounds per acre. The irrigation in September was applied for the benefit of the 1914 crop. If the rainfall in the spring of 1914 proves to be normal, probably no irrigation will be required before the first cutting is made.

EXPERIMENTAL STATION, LACOMBE, ALTA.

G. H. Hutton, B.S.A., *Superintendent.*

WEATHER CONDITIONS, 1913.

The seeding season opened on April 10. The weather during April and for the first ten days of May was both cool and dry, keeping growth in check. Afterwards, however, conditions were so favourable that by June 15 all crops on well prepared land were as far advanced as has been the case in any season since the establishment of the Station. Favourable weather continued until harvesting and threshing were concluded. Fair yields of grain of better than average quality were the rule.

CROP YIELDS.

Banner and Abundance oats are the varieties grown in field operations. The yield, in 1913, was in favour of the Banner variety, which averaged 61 bushels per acre.

Marquis wheat has yielded at the rate of almost forty-five bushels per acre.

The yield of barley, from various causes, has been comparatively low, averaging only 37 bushels per acre.

Thirty-five acres seeded to peas and oats for fodder purposes produced 119 tons, the weights being taken when it was in fit condition for stacking. It is interesting to compare this yield with that secured from eighty-eight acres of timothy, from which there was produced slightly less than 111 tons.

Other crops grown for feed were turnips and corn. The yield of the latter was extremely small.

ROTATION OF CROPS.

While it is rather early to draw definite conclusions as to the particular rotation best adapted to local conditions, it has been shown that a rotation which includes an application of barnyard manure and at least two years of hay or pasture will ensure heavier yields of grain, during the years these crops are grown in the rotation, than is possible where no rotation is followed other than continuous grain growing. Of the several under test the following two rotations seem best adapted to local conditions:—

ROTATION 'K' (SIX YEARS' DURATION.)

First year.—Hoed crop.
Second year.—Wheat.
Third year.—Oats or barley. Seeded down.
Fourth year.—Hay. Manured in autumn at rate of 12 tons per acre.
Fifth year.—Pasture.
Sixth year.—Pasture. Ploughed July after haying in preparation for hoed crop.

ROTATION 'L' (SIX YEARS' DURATION.)

First year.—Hay.
Second year.—Pasture. Manured in autumn at rate of 12 tons per acre.
Third year.—Pasture. Break July for winter wheat.
Fourth year.—Winter wheat, or in case of failure to stand, spring wheat.
Fifth year.—Oats.
Sixth year.—Barley. Seeded down with 4 pounds timothy, 4 pounds alsike clover and 4 pounds red clover per acre.

F. FANNED VERSUS NOT FANNED WHEAT FOR SEED.

An interesting experiment has been conducted with fanned and not fanned Marquis wheat for seeding purposes. The results indicate the importance of a careful grading of all seed grain.

Wheat fanned three times, under strong wind yielded	35	bush.	11	lb.	per acre.
Wheat fanned once yielded	26	"	50	"	"
Wheat not fanned	24	"	00	"	"

SOIL CULTURAL EXPERIMENTS.

A series of soil cultivation experiments is being conducted and, as far as it has been possible to judge, the yields have not been influenced other than by the treatment given. Among the experiments conducted, the following are those considered conclusive enough to be reported upon:—

DEPTH OF PLOUGHING.

A. Ploughing on wheat stubble to be sown to oats.
B. Ploughing for summer-fallow.
C. Ploughing on sod.

The deep working of the land in the summer-fallow year did not appear to give any special results on the first succeeding crop (wheat) but influenced favourably the second crop (oats).

In the breaking out of sod, ploughing at a depth of five inches gave better results than at 3 or 4 inches. This practice also proved superior, this year, to breaking sod 3 inches and ploughing the wheat stubble 6 inches for the following oat crop.

SUMMER-FALLOW TREATMENT.

In the experiment with methods of summer-fallowing, the following points have been indicated:—

1. That it is of advantage to plough summer-fallow but once.
2. That deep ploughing gives better results than shallow ploughing.
3. That working or ploughing the stubble land in the fall previous to the summer-fallow does not always result in increased yields.

STUBBLE TREATMENT.

The fall or spring ploughing of stubble land proved better practice than the burning of the stubble in spring, and then seeding.

SEEDING GRASS AND CLOVER.

When the seeding of grass is made without a nurse crop, the yield of hay is increased, but the increase is not sufficient to compensate for the loss of crop sustained when seeding alone.

CLEARING AND BREAKING.

About fifteen acres of the more heavily timbered portion of the newly purchased farm have been cleared, and broken by means of a steam plough. The engine drew two twenty-four-inch brush breakers and cut a clean and well-turned furrow, considering that many of the roots encountered measured twelve inches or more across. Another six-acre area has been brushed, cleared and broken by horse-power.

FENCING.

About six and one-half miles of woven wire fence were erected during the season, the style being a nine-wire fifty-two-inch fence, ten stays to the rod, number nine gauge wire throughout.

EXPERIMENTAL FARM, AGASSIZ, B.C.

P. H. Moore, B.S.A., *Superintendent.*

ROTATION OF CROPS.

In the spring of 1911 practically the entire Farm was put down to a four-year rotation, namely:—

First year.—Hoed crop of corn, roots or potatoes.
Second year.—Grain. Seeded down.
Third year.—Clover hay.
Fourth year.—Pasture.

With the increase of barnyard manure, the results from each new section planted to hoed crops have shown an improvement.

The hoed crops this season were grown on a piece of land from which, since 1910, orchards have been removed from time to time. A part of the area is badly infested with couch grass, and another portion suffers somewhat from shading, due to its location between mountains on the north, and a section of Douglas fir trees on the south. Notwithstanding this, the yields have been fair. In all, there were harvested 284 tons 1,770 pounds of silage corn, 136 tons 110 pounds of mangels, 9 tons 1,980 pounds of carrots, 6 tons 100 pounds of sugar beets, 16 tons 1,560 pounds of potatoes, and 10 tons 800 pounds of turnips, making a total hoed crop yield of 464 tons 260 pounds.

Two varieties each of corn and mangels were grown as field crops, namely: Longfellow and Compton's Early corn and Giant Half Sugar White and Perfection Mammoth Long Red mangels. Regarding the corn, the sorts grown give the best results of any of the varieties grown to date. With regard to the mangels, we are not in a position to make this statement with such assurance as yet, because several of the varieties now being tested give promise of greater yields per acre.

The mangels were planted at the rate of nine pounds per acre in drills, thirty inches apart. These drills were set up with a double mould board plough, rolled and the seed sown with a hand drill. This rate of planting gave, at the time of the two-leaf stage, a perfect stand. Where fertilizer tests were not carried on, there were sown in the drills, at drilling time, 600 pounds per acre of a mixture of chemical fertilizers, consisting of 350 pounds superphosphate, 150 pounds muriate of potash and 100 pounds nitrate of soda. For the last two years the mangels, when treated this way, have grown faster than the average weeds. When once up and growing nicely they were hoed by hand with a small wheel hoe. They were thus easily and cheaply kept above the weeds, and the horse cultivator did the rest until thinning time. They were thinned about fourteen inches apart and hoed but once thereafter.

Because the field was badly overrun with couch grass, a great deal of preparation was required for the corn land. Many harrowings were given with the drag type of harrow, for too much cutting only defeated our aims. Barnyard manure was ploughed in at the rate of 16 tons per acre. The corn was planted by machine in checks three feet apart each way, for this distance has proven the most advantageous for this district in getting good silage results. The land was harrowed with a drag harrow twice before the corn came up, to keep down the corn spurrey. After the last cultivation with a two-horse two-rowed cultivator (except the finishing off, for which we used the single walking scuffler), it was hand hoed once. In harvesting, the corn was bound and hauled on low-wheeled wagons. The total cost in the silo was $2.73 per ton.

COMMERCIAL FERTILIZERS.

Several fertilizer experiments were conducted with field plots of mangels during the past season.

In estimating profits, barnyard manure was charged at the rate of $1 per ton, and all chemical fertilizers at the prices paid. Mangels were valued at $3 per ton.

NITRATE OF SODA VERSUS NITRATE OF LIME FOR MANGELS.

In a single field test, nitrate of lime did not give quite the amount of crop that the nitrate of soda made. An average of several years' results, where the difference is so little, will be required before any definite pronouncement may be made.

NITRATE OF SODA VERSUS NITRATE OF LIME.

Plot.	Fertilizers.		Yield of mangels per acre.		Cost of fertilizers.	Value of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.	Tons.	Lb.	$ cts.	$ cts.
1.	16 tons, applied from stack in spring....	Superphosphate 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb....	22	395	24 42	42.16
2.	16 tons, applied from stack in spring....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of lime, 100 lb.	21	1342	25.55	39.58

BARNYARD MA[illegible]E.

COMMERCIAL FERTILIZER ALONE VERSUS C[illegible]RCIAL FERTILIZER TOGETHER WITH BARNYARD MANURE F[illegible]ANGELS.

In order to ascertain the value of barny[illegible] manure for mangels, an experiment was begun using a mixture of commercial fertilizer only on one plot, and the same mixture, together with 16 tons per acre of barnyard manure on a second plot. While the second plot yielded over 3 tons per acre more mangels than the first, the manure could not be considered as having entirely paid for itself from the first crop after application. T[illegible] yields of succeeding crops, must of course, be considered before the full value of the manure will be known.

COMMERCIAL FERTILIZER ALONE VERSUS COMMERCIAL FERTILIZER TOGETHER WITH BARNYARD MANURE.

Plot.	Fertilizers.		Yield of mangels per acre.		Cost of fertilizers.	Value of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.	Tons.	Lb.	$ cts.	$ cts.
1.	16 tons, fresh applied in spring.	Superphosphate, 350 lb.; Muriate of potash, 150 lb.; nitrate of soda, 100 lb.	26	1820	24.42	56.30
2.		Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of sodn 100 lb.	23	1550	8.42	62 90

SPRING APPLICATION VERSUS WINTER APPLICATION OF FRESH MANURE.

In this very wet winter climate it is thought there may be undue loss through the leaching of barnyard manure applied in the fall or winter. An experiment to learn the probable extent of this loss has been conducted during the past season. The results, as tabulated below, favour spring applicati[illegible]n.

Further tests, verifying these results, must be made, before accepting them as conclusive.

SPRING APPLICATION VERSUS WINTER APPLICATION OF FRESH MANURE.

Plot.	Fertilizers.		Yield of mangels per acre.		Cost of fertilizers.	Value of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.	Tons	Lb.	$ cts.	$ cts.
1.	16 tons, fresh, applied in winter....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.	25	1000	24.42	53.07
2.	16 tons, fresh applied in spring....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.	26	1820	24.42	56.30

WINTER APPLICATION OF MANURE (FRESH) VERSUS SPRING APPLICATION (STACK).

In this experiment, sixteen tons per acre of manure were weighed and hauled on the plot in the winter and left in the stack, to be spread in the spring. The other plot received fresh manure direct from the yard in the spring. Spring application again produced a somewhat heavier yield of mangels, but results will be accepted as final only after further verification.

APPLICATION OF FRESH MANURE IN WINTER VERSUS APPLICATION FROM STACK IN SPRING.

Plot.	Fertilizers.		Yield of mangels per acre.		Cost of fertilizers.	Value of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.	Tons.	Lb.	$ cts.	$ cts.
1.	16 tons, fresh, applied in winter....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.	25	1000	24 42	52 07
2.	16 tons, from stack, applied in spring..	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.	25	1780	24.42	53.24