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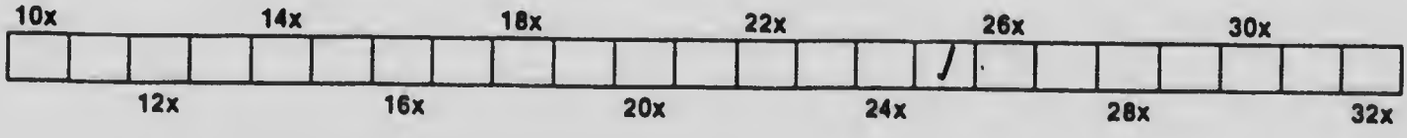

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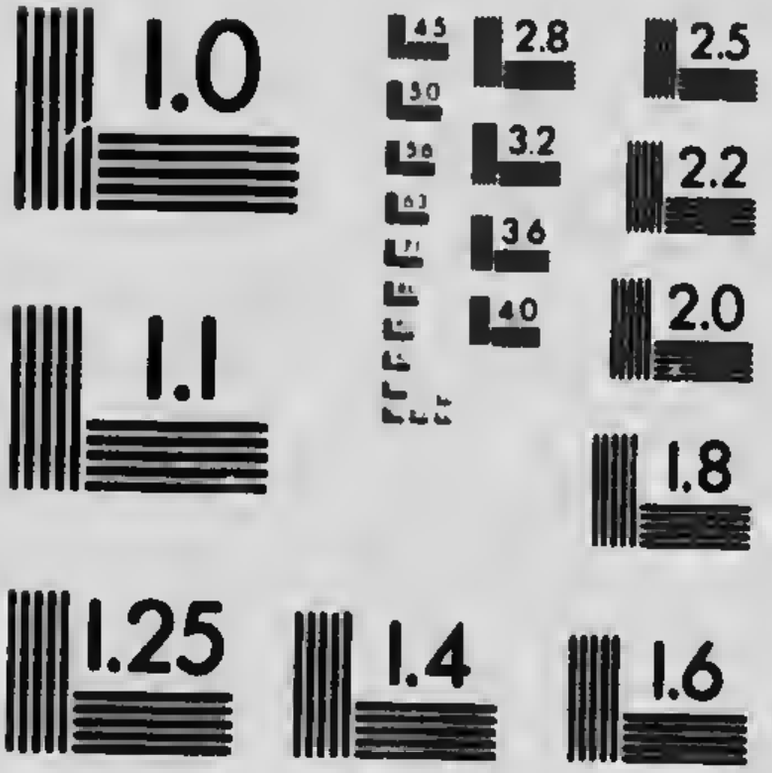

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS.

DIVISION OF FIELD HUSBANDRY

SUMMARY OF RESULTS

FIELD HUSBANDRY

1914

PREPARED BY
W. L. GRAHAM, B.S.A.
Assistant Field Husbandman
AND THE
SUPERINTENDENTS OF THE BRANCH EXPERIMENTAL FARMS
AND STATIONS.

Bulletin No. 83
JANUARY, 1915

Published by direction of Hon. MARTIN BURRELL, Minister of Agriculture, Ottawa, Ont.

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OTTAWA, February 5, 1915.

The Honourable,
The Minister of Agriculture,
Ottawa.

SIR,—I have the honour to submit herewith, for your approval, Bulletin No. 83 of the regular series, entitled "Division of Field Husbandry: Summary of Results, 1914."

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 issue a series of annual bulletins covering the above lines of work as dealt with by the Division of Cereals, Field Husbandry, Forage Plants, and Horticulture.

In these bulletins, of which this is the third, 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 officer having charge of this branch of the work, in this case the Assistant 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 1915.

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

J. H. GRISDALE,
Director, Dominion Experimental Farms.

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DIVISION OF FIELD HUSBANDRY

SUMMARY OF RESULTS, 1914

PREPARED BY

W. L. GRAHAM, B.S.A., ASSISTANT FIELD HUSBANDMAN,

AND THE

SUPERINTENDENTS OF THE BRANCH EXPERIMENTAL FARMS AND STATIONS.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

WEATHER CONDITIONS AND CROP NOTES.

Seeding operations were carried on under unfavourable conditions. April was cold, which retarded seeding, while the drought of the months of May and June resulted in the uneven germination of corn and mangels. Hay made slow growth and yielded below the average. Straw was short, but the oats filled fairly well and harvested a good yield of grain. Turnips made steady progress, while mangels and corn made remarkable autumn growth, and all yielded up to the average for the Farm. Potatoes produced a bumper crop of good quality.

The yields of crops grown under regular field conditions were approximately as follows:—

Hay, 2 tons per acre.
Corn, 14½ tons per acre.
Mangels, 17 tons per acre.
Turnips, 17 tons per acre.
Oats, 65 bushels per acre.
Potatoes, 373 bushels per acre.

ROTATION OF CROPS.

The line of farming engaged in will determine to a great extent the kind and relative amounts of crops that will be grown. For this reason it is impossible to outline definitely a rotation that would be most suitable and profitable for all. However, it may be stated that a good rotation includes hoed, cereal, and meadow or pasture crops, which for best results should rotate in the order named.

Experiments have been conducted for the past eleven years to determine the relative value of different rotations. The results are distinctly in favour of the systematic rotation of crops whereby the soil is left in the best possible condition to receive the crop following.

The reasons why farmers should place their farms under rotation rather than continue the practice of haphazard cropping are many. The following are a few of the benefits resulting from crop rotation:—

1. The general appearance of a farm is improved where each crop is confined to one large area.

2. Every field receives at regular intervals its fair share of manure and cultural treatment, therefore the whole farm is in a condition to ensure maximum yield.

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3. Cost is lowered by the saving of time due to all work of a kind being in one field.

4. Fewer fences are required, which reduces expenses.

5. Larger machinery can be utilized more economically where fields are larger and fewer.

6. More live stock can be kept, which makes more manure available.

7. Profits and yields are increased.

8. The farmer is not dependent upon a single crop.

9. It permits of the more even distribution of labour throughout the season.

The following rotations have been planned to meet the demands of the live stock farmer in eastern Ontario and Quebec. Any of these should prove satisfactory where all operations, including soil treatment, are well performed. It is only when all factors are considered and each given its due share of attention that success will be attained.

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 the 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 supplies a relative larger proportion of grain to roots and hay than the ordinary three- or four-year rotation; it would therefore be preferable where considerable grain is required. 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 has given good results here. Crop yields have been maintained and weeds have been kept in fair control.

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, seeds top-dressed in fall at rate of 15 tons per acre.

Third Year.—Hay. Ploughed late fall.

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

Fifth Year.—Clover hay.

This rotation has maintained crop yields, and has given profits equal to "A" in the tests so far conducted, but does not answer requirements where timothy hay is called for. It can, however, be easily extended to include timothy by allowing for two years of hay instead of one. This would extend the duration of the rotation from five to seven years, in which the crops would succeed each other as follows:—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 crop.

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.

The only objection to this rotation is that it supplies a smaller proportion of grain than is often desired. However, where live stock is kept, this point is of minor importance. It has given most satisfactory results here.

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 rotation is suitable where dairying or stock raising is carried on and where there is considerable rough land for pasture. It is suitable for heavy rather than light soils..

ROTATION "R" (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.

Three years' records only have been kept.—This rotation is designed to supply soiling crops.

The following is a summary of the characteristics common to all the rotations outlined above:—

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 form 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.

A rearrangement of the rotations was made in 1912, hence averages have been drawn for the preceding eight years only. The crops of 1914 were very light and the returns are therefore very low. In order to calculate the net profits as well as yields, careful records have been kept of all items chargeable against the rotation as (rent, manure, manual and horse labour, seed, twine, and use of machinery).

COSTS, RETURNS AND NET PROFITS OR LOSSES OF ROTATIONS, "A", "B", "C", "D", AND "R".

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profits or loss per acre 1914.	Profit average of 8 years 1904—1911.
	$ cts.	$ cts.	$ cts.	$ cts.
A (Five years' duration)..... ..	17 21	18 14	0 93	8 78
B (Five ").....	17 13	18 63	1 50	9 03
C (Four ").....	16 83	15 62	— 1 21	8 15
D (Three ")	18 83	18 17	— 0 66	10 08
R (Three ")..... .	18 76	19 49	0 73*	

*Records kept for two years only.

COST OF PRODUCTION OF FIELD CROPS.

The cost of production has been estimated from a four-year rotation, including the crops:—corn, oats, clover (first-year hay), and timothy (second-year hay). The cost for turnips was calculated from a similar rotation wherein the turnips take the place of the corn. Good farm practices have been followed, profitable crop production being the aim. The following is an outline of the rotation which has been in operation for the past eleven years:—

First Year.—Hoed crop, corn or roots.
Second Year.—Oats, seeded down to clover and timothy.
Third Year.—Clover hay (first-year hay).
Fourth Year.—Timothy hay (second-year hay).

Charges against the crops include manual and horse labour, rent, manure, seed, twine and the 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 of Produce.			Average yield per acre 1914.		Cost of Produce, 1914.		
				Per acre.	Per ton.	Per bush.			Per acre.	Per ton.	Per bush.
		Tons. Lb.	Bush. Lb.	$ cts.	$ cts	cts.	Tons Lb.	Bush. Lb.	$ cts.	$ cts.	cts
Corn	4	14 1,271	.....	25 19	1 72	.....	14 650	.....	27 33	1 91	
Oats	10	.....	45 33	14 14	.....	30·8	.....	55 10	15 90	.....	29
Hay (first year)	10	3 231	.....	12 65	4 06	.....	2 600	.....	13 25	5 76	
Hay (second year)	10	2 1,779	.....	11 90	4 12	.....	2 535	.....	12 95	5 70	
Turnips	6	20 1,598	.....	38 85	1 86	5·4	16 360	.....	28 98	.....	5·4

SHALLOW PLOUGHING AND SUBSOILING VERSUS DEEP PLOUGHING.

This experiment has been under way for the past eleven years, and the average returns for the period of ten years show a slight advantage in favour of the deep ploughing. The results of the experiment for the past season are also in favour of the deep ploughing. There must, however, be taken into consideration the fact that where subsoiling is practised, a single plough must be used, whereas a two-furrow plough may be operated under the deep-ploughing method. The cost of operation is higher in the former method, which reduces somewhat the net profits.

Two four-year rotations differing only in the treatment of the sod land in preparation for corn or roots were laid down in 1904.

ROTATION "S" (SHALLOW PLOUGHING AND SUBSOILING).

First Year.—Corn or roots. Field manured at the 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.

COSTS, RETURNS AND NET PROFITS OF ROTATIONS "S", AND "P".

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit per acre 1914.
	$ cts.	$ cts.	$ cts.
S. (shallow ploughing and subsoiling).....	17 96	20 33	2 37
P. (deep ploughing).....	17 36	21 12	3 76

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 and 1914 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 rototions "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. Superphosphate 300 lb. Muriate of potash, 75 lb. Nitrate of soda 100 lb.	Manure 7½ tons. Superphosphate 150 lb. Muriate of potash 37½ 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.

NET PROFITS OF ROTATION "N," "X," "Y," AND "Z."

Rotation.	Profit per acre 1914.	Profit average 5 year.
	$ cts.	$ cts.
N (No manure or commercial fertilizer)........	1 82	1 47*
X (Manure)................	5 37	7 88
Y (Commercial fertilizer).	4 49	5 55
Z (Manure and commercial fertilizer)	5 24	6 77

*Average two years only.

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.

The following fixed return and cost values have been used in calculating the foregoing tables and those of the Eastern branch Farms and Stations.

RETURN VALUES.

Oats..........	per bushel.	$ 0 34
Oat straw..........	per ton.	4 00
Hay..........	"	7 00
Corn ensilage..........	"	2 00
Turnips and mangels..........	"	2 00
Potatoes..........	per bushel.	0 50
Forage crops (green)..........	per ton.	2 00
Ox pasture.		
Each horse..........	per month.	1 00
Each cow..........	"	1 00
Each sheep..........	"	25

COST VALUES

Manual labour..........	per hour.	$ 0 17
Horse labour, including teamster —	"	
Single horse..........	"	0 27
2-horse team..........	"	0 34
3-horse team..........	"	0 41
4-horse team..........	"	0 48
Rent..........	per acre.	3 00
Barnyard manure (spread over rotation)..........	per ton.	1 00
Machinery (inclusive of threshing machinery)..........	per acre	0 60
Seed oats..........	"	1 00

Turnip, mangel, potato, and corn seed charged at actual cost.
Grass and clover seed charged at actual cost, distributed over the number of years in hay and pasture.
Twine charged at actual cost.
Threshing charged according to actual labour expended.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

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

SEASONAL NOTES.

The weather during January and February, 1914, was unusually severe, the thermometer registering as low as 21° F. There was, however, sufficient snow to protect even the more tender plants. March was very mild, but the late spring was cold and backward, several inches of snow falling on May 11. Seeding operations were delayed until May 18, and the cold showery weather of June retarded growth. July and August were very favourable for the growing crops. Grain ripened well and was harvested during September. Corn suffered from frost on October 7. All crops were saved in good condition, and more ploughing and general work was completed than during any recent season

YIELDS OF FIELD CROPS.

Crops grown on the regular rotations under field conditions gave the following average yields in 1914.

Wheat	20	bushels,	28	pounds per acre
Oats	62	"	32	"
Barley	53	"	32	"
Potatoes	230	"	21	"
Mangels	23	tons	680	"
Turnips	21	"	1,366	"
Hay	2	"	423	"

ROTATIONS.

Good crops were grown on the rotations in 1914. Several short rotations were started at this Station to destroy such noxious weeds as ox-eye daisy and perennial sow thistle. The effect of these rotations on the plants named has already been quite noticeable, and as soon as all the ox-eye daisy seed that is in the ground has germinated this troublesome weed will be eradicated.

Sand was hauled from the seashore during the winter of 1912 and spread to a depth of about 2 inches over the brick clay in the drained Pottery pond basin on rotation "G." The effect has been very satisfactory. Oats have grown each year much stronger on the treated area than upon adjacent good land. Clover also made stronger growth there than on any other land on the Station.

PREPARATIONS FOR CULTURAL EXPERIMENTS.

In order to obtain information regarding the uniformity of the soil of the areas set apart for cultural and commercial fertilizer experiments, the land was worked as evenly as possible and more than 300 plots were staked off. The 14 acres for cultural work were sown with Banner oats, and 4 acres for fertilizer experiments were planted in potatoes. Drainage operations delayed seeding until quite late. No manure or other fertilizer was applied to any of the plots in 1914. The records show that there is considerable variation in land that looked fairly uniform.

DRAINAGE.

The drilled drainage wells that provide outlets from the drains on certain small swamp areas continue to carry off all the surplus water. One has had to be cleaned occasionally, as brick clay oozed in. The work of draining the wet land of the Station was completed during the season, when a complete system of tile drains was installed throughout more than 20 acres. There has been a great increase in the returns from such land since it has been drained, and in many instances it has meant the difference between no crop and a heavy yield of first quality grain. The land has been worked from ten to fifteen days earlier than before it was drained, and requires less labour to get the same tilth.

CLEARING AND FENCING.

On the newer parts of the Station quite a little clearing and stumping was done. Fences were erected and roads opened. The favourable autumn enabled us to complete the work undertaken.

EXPERIMENTAL FARM, NAPPAN, N.S.

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

SEASONAL NOTES.

During the winter of 1913-14 a most satisfactory covering of snow remained on the ground from the 25th of December until the second week in March. During the latter part of March and the first part of April, however, there was alternative thawing and freezing which killed the clover and reduced the hay crop considerably. April was unsettled throughout. May gave promise of being a favourable month but a change took place toward the latter part, with the result that June came in very unseasonable with light flurries of snow and low temperatures. On the night of the 3rd the thermometer dropped to 26°, and the weather continued cold during the remainder of the month. July and August were undoubtedly the two best growing months. Very favourable conditions existed until the latter part of September, after which time dull, cold weather prevailed until the end of the season, with the exception of occasional fine days.

All grain was sown during the occasional fine days of the last week in May and the first of June. Germination was much more rapid this year than last, as the grain was sown only seven days before showing above the ground, whereas last season it was from eighteen to twenty days. However, it did not make very much growth until the latter part of July, when it came on very rapidly. This also holds true for corn.

This season was very unfavourable for roots, especially mangels which did not do well. Though there was no clover this season we had an excellent crop of timothy. It produced on the upland an average of 2 tons 241 pounds per acre, and was of excellent quality. The marshland did not yield as well, but the hay was of as good quality as the timothy.

YIELDS OF FIELD CROPS.

The yields of field crops grown in field lots and under regular field conditions averaged as follows in 1914:—

Mangels	8	tons	1,507	pounds.
Turnips	18	"	431	"
Corn	10	"	1,893	"
Marshland hay	1	ton	968	"
Upland hay	2	tons	241	"
Wheat	31	bush.	31	"
Oats	62	"	21	"
Barley	54	"	2	"
Mixed grain	40	"	16	"
Potatoes	229	"	30	"

ROTATION OF CROPS.

A systematic rotation of crops is a very important phase in the proper management of a farm. There are many combinations possible. Three only have been selected for this and surrounding districts and all are now in operation.

ROTATION "B" (FIVE YEARS' DURATION).

First Year.—Roots or corn. Manured at the 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. After which aftermath of clover is ploughed under in the autumn.

Fourth Year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, and 6 pounds timothy per acre.

Fifth Year.—Clover hay. Ploughed in the autumn, back again to roots, with manure at the rate of 25 tons per acre.

ROTATION "C" (FOUR YEARS' DURATION).

First Year.—Roots or corn. Manured at the rate of 20 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.

Fourth Year.—Pastured. Ploughed in the fall for roots.

ROTATION "D" (THREE YEARS' DURATION).

First Year.—Roots or corn. 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. Aftermath ploughed under in autumn for roots or corn again.

COST OF PRODUCTION.

The cost values used in estimating these results are enumerated on page 13 of this report.

Crop.	Yield per Acre.				Cost to Produce.		
					Per Acre.	Per Ton.	Per Bush.
	Tons.	Lb.	Bush.	Lb.	$ cts.	$ cts.	cts.
Turnips	18	431	607	11	45 56	2 50	7 5
Ensilage, corn	10	1,893	.....	.....	30 75	2 81	
Potatoes	.....	.....	229	30	49 25	.....	21
Oats	.....	.....	62	21	15 88	.....	25·3
Wheat	.....	.....	31	31	13 78	.....	43 7
Barley	.....	.....	54	2	12 78	.....	23 7

COMMERCIAL FERTILIZERS FOR TURNIPS.

Five different varieties of turnips were sown in lots of 1 acre each. One-half of each variety was fertilized with barnyard manure alone at the rate of 25 tons per acre. The other half received 25 tons of manure per acre, and an additional dressing of commercial fertilizer made up in the following proportion: Superphosphate, 1½ pounds; bone meal, 1½ pounds; nitrate of soda, 1 pound, and muriate of potash, 1 pound.

This was applied at the rate of 400 pounds per acre. The results for this year are in accordance with those for the previous year. This season only one variety gave a profit sufficient to compensate for the extra cost of the fertilizer.

It is evident from the results of three consecutive years that there is little benefit derived by the use of such a fertilizer in conjunction with barnyard manure for the growing of turnips.

BREAKING NEW LAND.

Some sixteen acres of new land were broken up during the summer months. The stumps were very plentiful in parts, but well rotted, making the stumping quite easy. The piling and grubbing out of the second growth spruce and fir was the most tedious job. The land is free from stone, but is very rough, which will necessitate two ploughings before it can be cropped to any extent. It is also very wet, and should be underdrained before cropping. The total cost to date for stumping, piling, burning, and breaking these 16 acres was three hundred and eighty seven dollars and thirty-one cents ($387.31), or a cost per acre of twenty-four dollars and twenty cents ($24.20). Another burning will be required to clear off all the stumps. Part of the ploughed area was harrowed once. The whole field contains about 25 acres, and when the balance has been cleared and ploughed a great deal will be added to our workable land, which will improve the appearance of the Farm.

EXPERIMENTAL STATION, KENTVILLE, N.S.

W. S. Blair, *Superintendent.*

CHARACTER OF SEASON.

On the whole the season has been favourable for field crops. Spring was late, and seeding was not possible until after the middle of May. During June, grain crops grew well, but owing to the cool weather corn made very slow growth. A late frost on June 4 damaged in some places the early-sown corn, but at this Station the corn which was just coming through was unharmed. July was a dry month with only 1·45 inches of rain, and growth was checked slightly. The precipitation during June being 4·2 inches, there was a good reserve of moisture for the crops and they did not suffer as much as would have been the case had June been dry. July weather was cool and no hot drying winds prevailed, so that the moisture supply was not unduly depleted. August and September were good months for crops in general, and for the most part grain crops were harvested in good condition. September was warm and corn made rapid growth, being fairly well matured when harvested.

FIELD CROPS.

The field husbandry work at this Station during the past season has been largely that of growing fodder corn and grain for stock, also the clearing of land for future crops.

No rotation work has been attempted and will not be possible until more land has been cleared. Fifteen acres have been cleared of green stumps ready for seeding next spring.

OATS.

Seventeen acres which had been cleared of green stumps and ploughed in 1913 was harrowed twice, after which all roots unearthed were gathered, piled and burned. The stones were also removed. The land is only fairly uniform and is not very level. On May 28 and 30 the field was sown to Banner oats at the rate of 3 bushels per acre, seeded down with 8 pounds red clover, 2 pounds alsike, and 8 pounds timothy.

Five acres of this area received an application of complete fertilizer. This was made up of nitrate of soda, acid phosphate, and muriate of potash which contained 4 per cent of nitrogen, 8 per cent of phosphorus and 5 per cent of potash. It was sown broadcast at the rate of 400 pounds per acre, and harrowed in before seeding. Growth was uneven but a fair stand of clovers and grass was secured. The grain was harvested on September 9 and 10, and the following yields resulted:—

	Yield per Acre.	Total Yield.
	Bushels.	Bushels.
5 acres Banner oats (with fertilizer)	53·2	266
12 acres Banner oats (no fertilizer)	40·6	487·2

A field of 4 acres was sown on June 4 to Improved Ligowo oats at the rate of 3 bushels per acre. This land was stumped in the autumn of 1912 and was in buckwheat in 1913, which crop was ploughed under. No fertilizer was used on this land. The oats were harvested September 16. The total yield was 151·2 bushels, or an average of 37·8 bushels per acre.

CORN.

The soil on which the corn was planted this year is light and of medium fertility. It was cleared of green stumps in 1911 and produced a crop of buckwheat in 1912, which was ploughed under. Potatoes were grown in 1913, the land receiving an application of complete fertilizer at the rate of 500 pounds per acre. This area consists of strips 30 feet wide between the orchard trees which are 40 feet apart. The corn was sown in rows 3½ feet apart.

In preparation for the corn the land was manured at the rate of 15 tons stable manure per acre and ploughed under. In addition, fertilizer at the rate of 300 pounds per acre was sown broadcast and harrowed in. The fertilizer was made up of nitrate of soda and sulphate of ammonia (equal proportions), acid phosphate and muriate of potash, containing 4 per cent nitrogen, 8 per cent phosphorus, and 5 per cent potash. The first corn was sown May 22, and another area on May 25. The balance of the corn, including 2 acres each of Compton's Early and Longfellow were planted June 3. The yields were as follows:—

Area.	Variety.	Yield per Acre.	
Acres.		Tons.	Lb.
2	Compton's Early	13	925
2	Longfellow	13	400
6	Longfellow	11	225

The total yield of corn was 120 tons or an average of 12 tons per acre.

The Compton's Early gave a little higher yield per acre than the Longfellow but was not as well matured at the time of harvest. The soil of the upper part of this field is a little better than the lower part which accounts for the heavier growth of the former. Besides the corn on the lower area was frozen on October 1 and dried out before harvesting, which lessened the yield somewhat. On the whole, the corn was fairly mature when harvested during the last week of September and the first week of October.

TURNIPS.

On June 3, 2 acres of turnips were sown on land that had been in turnips the previous season, as no other suitable land was available. In the orchard 2 acres adjoining the corn were prepared and sown to turnips on June 11. Both areas were manured at the rate of 15 tons stable manure and 400 pounds fertilizer per acre. The fertilizer was made up of nitrate of soda, sulphate of ammonia, acid phosphate, and muriate of potash containing 4 per cent nitrogen, 8 per cent phosphorus and 5 per cent potash.

One acre from which winter rye has been cut for green feed was sown to turnips. In preparation, 15 tons stable manure per acre were applied, after which the land was ploughed, harrowed and rolled. The seed was sown July 4, on the flat with a hand seed drill. The growth was good and, considering the late date of seeding, the yields obtained were satisfactory. The turnips were harvested November 9 to 12, the yields being as follows:—

Area.	Variety.	Date sown.	Yield per acre.	
Acres.			Bush.	Lb.
2	Lapland	June 3	634	35
1	"	" 11	685	25
1	Kangaroo	" 11	711	10
½	Lapland	July 4	496	40
½	Kangaroo	" 4	485	20

The total turnips harvested from the field areas was 3,013 bushels 10 pounds.

WINTER RYE.

One and one-half acres of land that has been in grain were sown on September 12, 1913, to winter rye at the rate of 1½ bushels per acre. The crop was ready to cut for green feed the first week in June and during the next two weeks furnished excellent feed. The rye was followed by turnips as stated before.

HAY.

The area in hay is limited and consists of 8 acres of marshland. The yield was 12 tons 635 pounds, but the quality of the hay produced was not very high. Some hay was gathered at other places on the Station, making a total crop of 16½ tons. The greater part of the marsh area was dyked last season, and it is proposed to drain it next year.

FENCING.

To procure pasturage for the stock, it was necessary to build a fence along the west side of the ravine, running from the main road to the back of the Station. This fence is not yet completed, but sufficient was erected to inclose the stock on the lower part of the ravine. For this purpose 5,400 feet of wire was used. The posts are of cedar placed a rod apart, to which are fastened six strands of plain wire. The work was difficult, as much of the fence was built on very rough ground.

ROADS.

To provide a road to the upper fields for the stock without having to fence the principal road through the Station, it was necessary to clear and stump an area 30 feet wide for a distance of about 2,850 feet along the west edge of the ravine. This road has been partially graded, but will require considerable additional work next spring.

DRAINAGE.

In order to render the land uniform, two underdrains, in all 1,500 feet long, were constructed through a low-lying area in the field used for permanent fertilizer plots. In addition to these, shorter drains amounting to 500 feet were necessary, making a total of 2,000 feet.

CLEARING LAND.

Twenty acres of land have been cleared of stumps during the past season. Eighteen acres of this will be ready for crop next season, the other 2 acres being cleared for the road and fence. The cost of clearing one 7-acre block of this land, which it is proposed to plant with corn next year was as follows:—

420 pounds dynamite at 18 cents	$ 75 60
Fuse, 1,250 feet	11 25
Caps, 1,000	12 50
Dynamiting	61 25
Cutting sprout growth	35 00
Stumping	591 50
Cleaning roots, piling, and burning	213 99
Ploughing	169 75
Removing stone	108 75
Harrowing, piling, and burning roots	97 35
Cross ploughing	68 50
Removing roots and stone	79 30
Harrowing and removing roots	62 80
Total cost for 7 acres	$ 1,587 54
Cost per acre	226 79

EXPERIMENTAL STATION, FREDERICTON, N.B.

W. W. Hubbard, *Superintendent.*

WEATHER CONDITIONS.

The winter was colder than the average, with spells of intense cold almost unprecedented. The average mean temperature for January, February, and March was 15·5 degrees, against an average for the last forty years for these months of 18 degrees. The snowfall was not above the average on the whole, but an even blanket of snow covered the ground from December 24 till April 19. The result was frost did not penetrate as deeply as in more open winters. April was a cold, backward month, with a below-zero record of —3·5 degrees on the 5th; cold high winds, and with a precipitation of 4·54 inches, nearly twice the average for the month. May continued cold and windy, with a minimum record on the 1st of 24 degrees, and frosts on the 2nd, 5th, 7th, 8th, 12th, 13th, and 29th. There were some warm days, the thermometer reaching 89 degrees on the 26th. There was only one-third of the normal precipitation that month, and conditions were most favourable for cultivation. Vegetation was very backward, and cold weather continued through June and until July 22, when 44 degrees was recorded. All crops consequently made slow growth till almost 1st August, and at that date such crops as corn and tomatoes were particularly unpromising. The precipitation though not quite up to the average was ample for the Station land and for most

soils in the province, and when continued warm weather came in August and September growth was most satisfactory and crops eventually were very good. The average mean temperature for August, September, and October was 3 degrees higher than the average temperature for the last forty years. Harvest weather was ideal. Hay and grain were housed in splendid condition, and fine weather continued into November, so that root crops as well as others were taken from the fields in the best possible condition.

The Field Husbandry work consisted of clearing land; draining; fencing; growing corn; turnips and oats for feeding purposes, and growing potatoes to test land for future fertilizing and variety tests.

CROP YIELDS.

OATS.

Thirty-five acres of newly cleared land were sown to oats. On account of the unevenness of the ground and the presence of small roots it was not possible to use the drill, and the seed was therefore sown broadcast at the rate of 3 bushels per acre.

The first oats were sown on May 23 on land cleared and ploughed the preceding year. Banner oats, the seed of which was grown on the Station land last year, were used. There were 4½ acres in this piece, and the yield was 220 bushels. No manure or fertilizer was used.

On May 27, 4¾ acres of land, newely cleared and ploughed, was sown to New Market oats, the yield being 200 bushels.

On the 28th, 29th, and 30th May, 25¾ acres of land, cleared and ploughed the preceding season, were sown to New Market, Home Grown Banner, P.E.I. Banner seed, and Early Blossom oats, and the yield was 583 bushels.

All the land having been ploughed only once was very uneven in quality and for lack of cultivation did not afford by any means an ideal seed-bed. On account of the very cold weather of June and July the early growth of this crop was most disappointing, and on August 1 appearance would not indicate a yield of more than 12 bushels per acre. From August on, portions of the field made splendid growth and the crop gave an average of 22¾ bushels per acre. A portion of the crop could not be gathered for threshing on account of the large quantity of roots in the stubble.

BUCKWHEAT.

Seven and one-half acres of buckwheat were sown on June 27 upon land newly cleared and ploughed, at the rate of 1 bushel per acre. Two hundred and twenty pounds of 2-5-8 fertilizer per acre was sown with the seed. The total yield was 136 bushels. At no time was the crop vigorous. The land was very rough and uneven, and conditions were not very favourable.

TURNIPS.

Eight acres of turnips were sown upon land that had been in corn the previous year, and was again used for a hoed crop, as it was so full of mustard as to be unfit for anything else. The land was manured at the rate of 35-bushel loads of horse-stable manure per acre for corn, and had in addition 468 pounds of fertilizer of a 3.6-10-5.5 mixture. After the corn was removed the land was ploughed in the spring it was worked early, and at intervals, with drag and disc harrows. Sixteen 35-bushel loads of horse-stable manure were applied and incorporated with the soil. Three hundred pounds of basic slag were applied broadcast and the land was then ridged up slightly with a potato planter. At the same time 265 pounds of fertilizer, analyzing 3 per cent nitrogen, 10 per cent phosphoric acid and 4 per cent potash were applied. The ridges were then rolled and the seed sown with a hand sower at the rate of 4 pounds to the acre, a quantity which was found to be insufficient in portions of the field. One and one-half acres were so badly destroyed by fly that it had to be reseeded.

To test the value of the fertilizer applied in addition to the horse manure and basic slag, one-half acre did not receive any chemicals. This area was checked with a half-acre along side that had received the full dressing of chemicals. The extra yield per acre obtained by the use of the commercial fertilizer was 43 bushels and 20 pounds which at 10 cents per bushel would be $4.34. The fertilizer cost $4.89. The total crop from 8 acres was 188 tons 353 pounds or 7,527·06 bushels. The average yield per acre was 940·8 bushels. The total cost of labour for raising and harvesting the 8 acres of turnips, was $360.66, $45.08 per acre, $1.91 per ton or 4·8 cents per bushel.

SUGAR BEETS.

Three varieties of sugar beets were grown. The land was in corn in 1914, manured at the rate of eighteen 35 bushel loads of horse-stable manure per acre and 468 pounds fertilizer of a 3.6-10-5.5 mixture. After the corn was removed the land was ploughed and in the spring it was worked early. Sixteen 35-bushel loads of horse-stable manure were applied and incorporated with the soil. The seed was sown in rows, 30 inches apart, on June 12. The inter-row cultivation was frequent and the beets were thinned to 8 inches apart. They were harvested on October 31, and the following are the varieties and yields:—

Variety.	Yield per acre.	
	Tons. Lb.	Bushels.
Vilmorin B	12 200	484
Vilmorin A	10 1,585	431·7
Tres Riche	10 500	410

CARROTS.

Five varieties of carrots were grown on land similarly treated, last season and this, as that on which the sugar beets were grown. Thinning was done to 4 inches apart, and the following are the varieties and yields per acre:—

Variety.	Yield per acre.	
	Tons. Lb.	Bushels.
Giant White Vosges	18 265	726·3
Improved Short White	12 50	481
Mamoth White Intermediate	11 1,580	471·6
White Belgian	10 905	418·1
Ontario Champion	10 575	411·5

INDIAN CORN.

Fourteen acres of corn were grown. The soil was sandy loam naturally well drained. Ten acres was land that was in potatoes and turnips last season and was planted in hoed crop again to help subdue the mustard with which the soil was very foul. Three acres were from fall-ploughed sod and 1 acre was in corn last year. The land this year was given a dressing of sixteen 35-bushel loads of horse-stable manure per acre and received 259 pounds per acre of fertilizer analyzing 4·37 per cent nitrogen, 9·37 per cent phosphoric acid, and 6·25 per cent potash.

The yield for the 13 acres of field crop was at the average rate of 9 tons per acre, and the stalks when cut on the 1st October were fairly well eared and the kernels were in the thin milky stage, the height of stalk being from 8 to 9 feet.

This corn was kept well cultivated and received one good hand hoeing to clean out mustard and couch, and that part which was planted on sod was hoed a second time to keep down the couch. The total cost for labour of raising and harvesting this corn crop, cutting it and putting in the silo was $470.88, $26.49 per acre, or $2.94 per ton.

A test as to the value of the application of the 250 pounds of fertilizer per acre used on this crop was made and it was found that where the fertilizer was used with Early Longfellow corn the yield was 7 tons 1,664 pounds per acre. Where no fertilizer other than barnyard manure was applied the yield was 7 tons 1,090 pounds, a difference of 674 pounds in favour of fertilizer. The cost of the 250 pounds fertilizer was $3.61 the value of the increased yield of corn at $3 per ton was $1.01.

POTATOES.

In all 10⅞ acres were planted in potatoes. Most of the soil was sandy loam. An area of 4½ acres, at the foot of a hill, was very wet until last season when it was tile-drained. It was planted in potatoes this season and staked out into fifty-three plots of one-twentiet' of an acre each. Roads 16 feet wide were run between the ranges of plots, and paths 4 feet wide between the plots. To test the relative fertility of each plot the whole area was planted to potatoes and a record kept of the product of each plot. This unfertilized area produced 209 bushels per acre and the sample was excellent. All portions of the crop were handled similarly, and excepting the "66 hill variety" area, everything was planted with a single row planter. A few Irish Cobbler were planted for table use on the 12th May. The rest of the crop was planted from the 12th to the 25th June. The potatoes were kept thoroughly cultivated before and after appearing above ground, and in some places where couch was bad hand-hoeing was resorted to. Mustard was hand pulled all through the season as it appeared in the rows. Spraying with poisoned Bordeaux was done four times, and the crop was harvested from 8th to 25 October.

TOTAL POTATO CROP.

—	Area.	Total Yield	Yield per acre.
	Acres.	Bushels.	Bushels.
Test for 53 fertilizer plots	2·65	555·42	209·6
Commercial field (no manure or fertilizer on this land for more than 30 years)	1·687	352·13	209·6
1913 fertilizer plots (repeated)	1·2	156·9	130·7
General fertilizer experiments	1·6	404·5	252·8
Special potash experiments	0·35	92·	262·8
Seed plots	1·4	400·	285·7
Land not included in fertilizer experiments	0·5	124·	248·
Varieties in 66-foot rows	0·666	208·	312·
Early potato patch	0·25	50·	200·
	10·30	2,342·95	227·9

Leaving out the experimental plots of 1913 which had no fertilizer this year and some of those which had none last (only one having complete fertilizers last season) and the early potatoes per acre for the crop was 241·3 bushels. It should also be considered that the fifty-three plots which were being tested for relative fertility and

the land between the plots aggregating 4¼ acres had no fertilizer whatever. The balance of the crop, namely, 4½ acres yielded at the rate of 272 bushels per acre.

CLEARING LAND.

Thirty acres of land ploughed last year was picked over for stone and roots before seeding. Fifty-six acres were stumped and left ready for cropping in 1915 at a total cost of $4,865.24. Some of this land was very rocky, both boulders and small stone abounding. The breaking up of these boulders and the removal of the stone added very materially to the cost of clearing the land. Part of the land was quite free from stone, and the size and number of stumps per acre varied.

The procedure followed was to break up the boulders and to shatter the stumps with stumping powder (a 40 per cent dynamite); then to haul away the stone so broken up and other stone on the surface, and to pull out what was left of the stumps with teams, using a direct hitch. These stumps were then piled and burned, after which the land was ploughed.

A power stump puller, capable of lifting 25 tons was tried and did its work well so far as the pulling of any sized green or dry stump, with one horse on the sweep, was concerned. It was found, however, that it cost more to handle the stump brought out in this way with its roots full of earth than to break it up with dynamite before extracting. Many stumps required a full half day's work of one man to get the earth pounded off the roots after three men and a horse had spent from fifteen minutes to half an hour in fastening the tackle and pulling it out. After the clearing process was completed there was always more or less cutting to be done with an axe before the stump could be piled for burning.

By using stumping powder, one man with a crowbar and tamping stick would plant the stumping powder, attaching cap and fuse, at the rate of a stump in three minutes, the powder would cost from 10 to 35 cents per stump, and with a man who understood the work the stump would be pretty well torn up and the earth all shaken away from the roots. Then two men and a pair of horses would pull out the pieces of the stump and roots about as fast as the chain could be fastened to them, released and taken back.

It was found that when the ground was wet the explosive was very much more effective than in dry soil. The average cost per acre of cutting bushes, burning them and other refuse, breaking up stones, stump removing and burning, ploughing and taking out all stones touched by the plough, harrowing, picking off roots, etc., and purchase of dynamite, leaving the ground ready for cropping, was $86.88 per acre. Different areas varied according to number and size of stumps and amount of stone from $35 to $180 per acre. This latter cost was on 4¾ acres of very rough and rocky land which it was desired to clean up thoroughly for orchard purposes.

FENCING.

Five hundred and sixty-six rods of fencing of No. 9 woven wire, 4 feet high, with turned cedar posts set 1 rod apart, were erected on both sides of the Wilsey road, along the main farm road and about the buildings.

Two hundred and ninety rods of division fences between fields, with ordinary cedar posts, were also built, as well as 160 rods of special 5-foot woven wire poultry fence put above close boarding 2 feet high.

Temporary woven wire fencing, stretched on stakes, to the extent of 230 rods, was erected to inclose pastures, as well as 89 rods of three strands of barbed wire. This fencing necessitated the setting of 575 turned cedar posts, 310 plain cedar posts, and 325 stakes, with which were used twenty stretching posts. The season's fencing aggregated 2⅝ miles of permanent fence and 1 mile of temporary fences.

DRAINAGE.

From five to twelve men were fairly steadily employed digging drains and laying tiles from May till November, and about 30 acres were underdrained. On much of the land the tiles were laid 30 feet apart. A good deal of the work the past season has been in laying mains preparatory to next season's work, and in draining wet spots that it is desired to crop. These drains have been so placed as to become part of the complete system.

All tile have been laid at least 3 feet below the surface, and the drains installed are doing excellent work. Some of the work was done by contract, but in no case was it possible to get the cost as low as has been reported for drainage work in some places. There was very little free digging. Nearly everywhere after the first foot of soil was removed it was pick work and considerable dynamite was necessary in the case of boulders.

The whole Station between the Canadian Pacific railway and the St. John river was surveyed for drainage purposes by Mr. W. R. White, and the work will be proceeded with systematically from year to year.

Herewith is a statement of the tiles laid and cost:—

Number.	Cost.	Rods.
	$ cts.	
Tiles, 17,220 three-inch	403 20	1,044
Tiles, 5,344 four-inch	160 20	324
Tiles, 1,096 six-inch	166 84	66
Labour	2,676 33	.....
Dynamite, tar paper, etc	25 48	.....
	3,432 05	1,434

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

JOSEPH BEGIN, *Superintendent.*

WEATHER CONDITIONS AND CROP NOTES.

The season of 1914 has been remarkable for the sudden and pronounced variations in temperature.

There was little snow during the winter, which was c[old] and dry, and the last fine days of March left the ground bare. April was so col[d] dry that frost was still found at a depth of 4 inches. May and June, being very [cold], were unfavourable for work on the land, which was not commenced until [May] 6. The first grain was sown on May 9. Rain fell during twenty-nine days from May 1 to June 25, and though the precipitation was but 4·21 inches, both soil preparation and seeding were retarded. The rainfall of July and August was 0·64 and 1·04 inches respectively. This drought, which was without precedent, caused the grain to ripen early which resulted in a noticeable decrease in the crop. The straw was very short but the grain filled well and was of good quality. The yields of hay, roots, and corn were poor. The results are as follows:—

Hay—1 ton 650 pounds per acre.
Corn—4 tons 200 pounds per acre.
Roots—12 tons 957 pounds per acre.
Oats—31·26 bushels per acre.

SOIL CULTIVATION.

It is interesting to note here that plots D^2 and C^2 first-year hay have given an average yield of 2 tons 1,120 pounds, or nearly double that of the adjoining fields sown in the same way and also producing their first crop of hay. This difference of yield can be attributed to a certain extent to the light dressing of manure applied to plots D and C in 1912, but above all it is due to thorough cultivation and the destruction of weeds. Moreover, the second cut on these same plots gave a yield of 1,400 pounds per acre compared to 465 pounds on an adjoining acre of the same nature.

From this is will be seen that proper tillage is not only a benefit to the next crop but also to subsequent ones, especially in the case of excessive dryness, as has been proved during the past summer. A well-tilled soil absorbs and retains a good reserve of moisture from the spring rains which produces better crops in dry seasons. On the other hand, proper cultivation aids in the evaporation of excessive moisture.

COMPARISON OF YIELDS AND COST OF OATS FOLLOWING ROOTS AND PASTURE.

We have recorded separately the cost of production of 20·33 acres of which 6·33 acres were in roots in 1913, namely, "A" 1, "C-D" 1, "C" 1, and "D" 1. These four plots had received in 1913 a dressing of manure valued at $3 per acre per year. The 14 acres in comparison were in pasture the previous year. The whole area was of exactly the same nature and of equal fertility (less the manure), and all was worked in the autumn. The quality and quantity of seed sown per acre was the same. The work of preparing and seeding were similar, and the grain was sown on 11th, 12th, and 13th of May. The comparative yields are as follows:—

COMPARISON of Yields and Costs of Oats Grown on Root and Pasture Land.

—	Area.	Yield per acre.		Cost to produce.	
				Per acre.	Per bush.
	Acres.	Lb.	Bush. Lb.	$ cts.	cts.
Oats (after roots)	6·33	15920	73 29	18 30	24·75
Oats (after pasture)	14	17164	36 2	15 30	42·50

COST OF PRODUCTION.

The cost of production for corn and turnips was estimated for the past season. The cost values used in determining the results are included on page 13 of this report.

Crop.	Yield per acre.		Cost of produce.		
			Per acre.	Per ton.	Per bushel.
	Tons Lb.	Bush. Lb.	$ cts.	$ cts.	cts.
Roots (M. Bonum)	12 957	415 57	36 30	2 94	8·73
Fodder corn	4 200	....	21 97	5 36	

DESTRUCTION OF COUCH GRASS.

An old meadow on clay soil infested with couch grass was ploughed in August, 1913, and then rolled and cutaway disc harrowed. It was again diseed twice in August and three times in September. Last spring couch grass appeared again, abundant and vigorous. The work of eradication recommenced during the first week in June, the soil was thoroughly tilled but the work had to be discontinued on account of wet weather until June 18. At this date the couch grass had again appeared but was once more covered by means of the disc and then rolled. The 20th of June the field was sown to buckwheat to kill the couch grass. Drought delayed the germination of the buckwheat, which in addition was not covered deep enough, having been sown broadcast and harrowed. The buckwheat grew uniformly but very slowly, and on August 1 the couch grass was not so thick as in the spring, but still thick enough to check the buckwheat which it surpassed in height in several places in the field. Of this field one-eighth of an acre was not sown but was worked with the cutaway disc on June 30 and July 7, 13, 20, and 29. By August 18 this piece of land was clear of couch grass which was eradicated by this thorough cultivation and the drought. At this date the whole field was worked, the couch grass not yet headed and the buckwheat very short but in bloom were ploughed in. This field was cross-rolled on September 10 and thoroughly harrowed with a spring harrow.

DRAINAGE.

Eighteen thousand four hundred and twenty feet of drains were laid during the past season. These drains were placed at an average depth of 3 feet 2 inches under ground and at a greater depth for the main drains according to the level of the outlets.

IMPROVEMENTS.

Good wire and painted cedar posts were used in the building of more than 900 rods of fence. A large quantity of stones from different fields were gathered and used in the paving of the barnyards, low places in the roads and the approaches to the barn. Six acres of timbered land were cleared and stumped and partly cleared of stones.

EXPERIMENTAL STATION, CAP ROUGE, QUEBEC.

G. A. Langelier, *Superintendent.*

THE SEASON.

The main feature about 1914 was the drought which lasted all through July and until August 11. This cut down the yield of hay and the stock-carrying capacity of pastures very much. Corn, which is grown only for ensilage in this district, did very well and was much better than for the last three years. Carrots, mangels, and sugar beets seemed to suffer from the lack of precipitation in the earlier part of the season, and germination was very poor. Swedes, as is customary around here, forged ahead during the warm days and cool nights of September and October, and the crop was a little better than usual, though bad weather increased very much the cost of lifting and storing them. The grain, with over half an inch of rain during the latter part of May, started very well, and what was sown early escaped the bad effects of the dry weather of the middle of the summer. As the acreage of corn for silage and of roots is small in central Quebec, and as the crop of hay was very light, roughage will be very scarce and high in price.

The last frost, 29·2° occurred on May 17, though the thermometer fell to 32·2° on June 2. The first one, in the autumn, was on September 29, when 27.2° was registered. The highest temperature was on August 11, 92° and the lowest, exactly six months before, on February 11, -30.7°.

CROP YIELDS.

All crops yielded above the average, with the exception of hay, which gave about 40 per cent less than usual, on account of the drought of the middle of summer.

FIELD CROP AREAS AND YIELDS, CAP ROUGE, 1914.

Crop.	Variety.	Acreage.	Total Yield.	Yield per Acre.
Corn	Longfellow	17·35	349,652 Lb.	10 tons 158 lb.
Turnips	Good Luck	10·89	309,643 "	14 " 671 "
Oats	Banner	14·68	31,560 "	63 bus. 8 "
Wheat	Huron	1·78	3,530 "	33 " 3 "
Barley	Manchurian	1·96	1,975 "	21 "
Peas	Arthur Selected	2·69	4,075 "	23 " 15 "
Hay	Clover	19 37	55,019 "	1 ton 840 "
"	Timothy	12 03	31,717 "	1 " 894 "

The varieties named above are the ones which, to the present, seem best adapted to this region.

COST OF PRODUCTION OF FIELD CROPS.

Accurate records were kept of the cost of production of three of the main crops of this district, turnips, oats, and hay on 13 acres of land.

COST OF PRODUCTION OF FIELD CROPS, CAP ROUGE, 1914.

Crop.	Variety.	Acreage.	Yield per Acre.	Cost to produce.	
				Per ton.	Per bushel.
				$ cts.	$ cts
Turnips	Good Luck	3	17 tons 1,973 lb.	2 18	
Oats	Banner	3	69 bus. 29 "		0 33
Hay	Clover and timothy	7	2 tons 326 "	5 86	

In calculating the above, the cost values as outlined on page 13 have been used.

ROTATION OF CROPS.

A good rotation must not only give an immediate profit, but should be a weed destroyer and a maintainer or improver of fertility; in choosing it, a person will also take the one best adapted to the production of roughage and concentrates according to the particular needs.

The following rotations started in 1911, have been continued this year:—

ROTATION "D" (THREE YEARS' DURATION).

First Year.—Swedes. Twelve tons barnyard manure per acre.

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

Third Year.—Hay. Cut early and again cut late if possible.

ROTATION "C" (FOUR YEARS' DURATION).

First Year.—Swedes. Sixteen tons barnyard manure per acre.
Second Year.—Oats. Seeded down with 12 pounds timothy, 8 pounds red clover, and 2 pounds alsike per acre.
Third Year.—Hay.
Fourth Year.—Hay.

ROTATION "K" (SIX YEARS' DURATION).

First Year.—Swedes. Twenty-four tons barnyard manure per acre.
Second Year.—Oats. Seeded down with 12 pounds timothy, 8 pounds red clover, and 2 pounds alsike per acre.
Third Year.—Hay.
Fourth Year.—Hay.
Fifth Year.—Hay.
Sixth Year.—Hay.

The details of costs, returns, profits or losses are given in the following tables:—
The cost and return values used are the same as those enumerated on page 13 of this report.

ROTATIONS—COSTS, RETURNS, PROFITS OR LOSSES, CAP ROUGE, 1914.

Rotation.	Cost per acre.	Return per acre.	Profit or Loss per acre.
	$ cts.	$ cts.	$ cts.
"D" (three years' duration).....	25 32	23 89	- 1 43
"C" (four " ").....	20 51	23 17	2 66
"K" (six " ").....	17 42	20 32	2 90

It is too early yet to see which of the above rotations, with the fixed cost and return values set for them, will give the most profit, but the following table shows that a systematic rotation of crops will pay:—

RETURNS FROM ROTATIONS "D," "C," "K," CAP ROUGE, 1911-14.

—	"D,"-3 years.	"C,"-4 years.	"K," 6 years.
	$ cts.	$ cts.	$ cts.
Returns per acre, 1914	23 89	23 17	20 32
" " " 1911..	16 80	12 67	15 58
Increase in four years..	7 09	10 50	4 74
Percentage of increase	0 42	0 83	0 30

Total cost per acre, for all three rotations 1914 . . . . . $21 08
Total cost per acre for all three rotations, 1911.. . . . . 21 00

It is interesting to note that the returns increased from 30 to 83 per cent, whilst the cost did not increase by 1 per cent.

PLANTING FODDER CORN IN DRILLS AND HILLS.

Since 1911, inclusively, all the corn (Longfellow) grown for silage on 39.46 acres was weighed. The following table gives details:—

CORN FOR ENSILAGE PLANTED IN DRILLS AND HILLS, CAP ROUGE, 1914.

Method of Planting.	Yield 1914.	Average Yield 4 years.
	Tons.	Tons.
In drills 48 inches apart, 8 inches between plants	17·62	11·58
" 42 " " 8 " " "	11·95	10·76
In hills 42 " "	5·67	5·52
" 36 " "	4·67	5·
Total	10 08	8·32

RATES OF SEEDING.

RATES OF SEEDING OATS.

Twenty-six plots of one-sixtieth acre were used in 1913, and in 1914, the experiment was duplicated for each quantity sown, which was from 1 to 4 bushels per acre, going up by quarters of a bushel.

It is interesting to note that on sandy loam soil, in this district, a rather heavy seeding is required, as the average yield from all quantities of seed below 2½ bushels per acre is 1,681 pounds, whilst it is 2,040 pounds when the quantity of seed was over this amount.

RATES OF SEEDING CLOVER AND TIMOTHY.

In 1912 and 1913, forty-four plots of one-sixtieth acre each were used. Half of them were seeded with 12 pounds of timothy, 8 pounds of red clover, and 2 pounds of alsike per acre, and the others with half of this quantity. Oats were used as a nurse crop. The full seeding gave an average of 2,191 pounds of hay per acre, and the half seeding 2,040 pounds.

YIELD OF HAY WHEN NURSE CROP IS SOWN AT DIFFERENT RATES.

In 1912 and 1913, forty-eight plots of one-sixtieth acre each were used, oats being sown at from 1 to 4 bushels per acre, going up by quarters of a bushel, and seeded down with 12 pounds timothy, 8 pounds red clover, and 2 pounds alsike per acre. The most noteworthy thing about the results is that there was 24 per cent more hay, on an average, from the plots where less than 2½ bushels of oats were used as a nurse crop than on the plots where more than this quantity was sown.

YIELD OF HAY WITH DIFFERENT NURSE CROPS.

It was seen above that the heavy seeding of oats produced more grain, but less hay the following year. An experiment was started in 1912 and continued in 1913, when all the trial plots of cereals were seeded down with a mixture containing 12

pounds timothy, 8 pounds red clover, and 2 pounds alsike per acre. The following table shows that oats is not as good a nurse crop as peas, barley or wheat:—

Kind of grain.	Number tried In 1912.	Yield of hay per acre In 1913.	Number tried In 1913.	Yield of hay per acre In 1914.	Average yield per acre for 1913 and 1914.
		Lb.		Lb.	Lb.
Peas	10	4,920	6	2,650	3,785
Barley	13	4,740	7	2,057	3,398
Wheat	14	4,320	15	1,968	3,144
Oats	12	2,660	10	1,488	2,074

EXPERIMENTAL FARM, BRANDON, MAN.

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

SEASONAL CONDITIONS.

The season of 1914 has been rather a hard one in Manitoba. The spring was favourable, though somewhat cool, and until July 1, crops were doing well. July and August were extremely hot and windy, and with a shortage of moisture these conditions caused too rapid ripening of grain crops and a light crop of corn and roots. The early rains ensured a good first cutting of hay but there was no second growth except of alfalfa and it was light. New seeding of grasses and clovers did very poorly until after harvest, when favourable weather brought an improvement.

ROTATION OF CROPS.

The eight crop rotations under test at this Farm have all been under full operation this year, and interesting results have been obtained.

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

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

These rotations represent typical Manitoba grain growing. The only difference between the two is, that whereas "E" receives no manure, "D" gets an application once in 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 3¼ 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 of 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 application.

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 8½ 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 presupposes 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 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.

ROTATION "G" (SIX YEARS' DURATION).

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

This is a mixed-farming rotation which provides for one-third of the farm in wheat and, in addition, gives a good area to different kinds of feed for live stock, including pasture. The latter necessitates the building of divisional fences between the fields.

The wheat of the first year is sown among the stubble of the corn of the sixth year, without ploughing. The stalk from the corn is raked off and burned and the land harrowed. After the crop of wheat is harvested the land is fall-ploughed for a second crop. After the second crop, it is again fall-ploughed. The third crop is oats or barley, and with it is sown a mixture of 5 pounds of timothy and 8 pounds of red clover per acre. The fourth year, there is a crop of hay, mostly clover. As soon as it is removed, the aftermath is used for pasture. The fifth year is pasture, up till about the middle of July or first of August, when the aftermath of the hay field is ready to carry the stock. The pasture is then manured and ploughed under. There having been only two years of grass, the sod is not very hard to plough and does not need to be backset. The sixth year is corn or roots. These are thoroughly cultivated, so that the land is left as clean as a summer-fallow, and is ready for wheat again without ploughing. The land used for rotation "G" is heavy clay loam. This rotation was the first started on the Farm, and has been in full operation several years and is giving good results.

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 4½ 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 "I" (SIX YEARS' DURATION.)

First Year.—Flax. Manured.
Second Year.—Oats.
Third Year.—Summer-fallow.
Fourth Year.—Wheat.
Fifth Year.—Hay.
Sixth Year.—Pasture.

Rotation "I" is similarly located to rotation "H," and is much like it in character. The chief difference is the use of flax on sod instead of wheat.

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 of poor gravelly upland are allotted to each field of this rotation. It is intended to make use of this poor land for a sheep ranch. In this dry unfavourable year the results have been poor.

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 mid-summer.

This is distinctly an alfalfa rotation. For the use of this crop it is necessary to have a long rotation, as the alfalfa is expensive to seed, and takes some time to reach its highest production. This rotation would be best suited to a dairy or stock farm, as half the land is under alfalfa.

The soil on which rotation "W" is used is heavy clay. The first year wheat is sown on land that grew alfalfa for four years and was ploughed in midsummer after the first cutting of the last year of alfalfa was taken off. After fall ploughing, another crop of wheat is taken off. The land is then heavily manured, and sown to corn or roots. Following the hoed crop, oats is sown, without ploughing. Following the oats, a crop of early maturing barley is grown, and the land is given a partial summer-fallow either before the barley is sown or after it comes off. The next year, alfalfa is sown without a nurse crop. Three full years of alfalfa hay and a first cutting of the fourth year are harvested. The land is then ploughed in midsummer and made ready for wheat again.

This rotation is in full swing this year for the first time and has shown itself extremely profitable.

For each of these rotations complete records have been kept of all items of cost and revenue. The cost includes interest on investment and depreciation of equipment. The following is a brief summary of the results for 1914:—

COSTS, RETURNS, AND NET PROFITS OF ROTATIONS "D," "E," "F," "G," "H," "I," "Q," "W."

Rotation.	Cost to operate per acre.	Revenue per acre.	Profit or loss per acre.
	$ cts.	$ cts.	$ cts.
"D" (Four years dura	9 50	12 61	3 11
"E" (Four "	8 01	12 11	4 10
"F" (Five "	12 94	21 07	8 13
"G" Six "	11 68	21 00	9 32
"H" Six "	8 16	13 40	5 24
"I" Six "	7 94	12 40	4 46
"Q" Eight "	7 71	6 53	—1 18
"W" Ten "	13 66	33 86	20 20

The following fixed values are being used in this and similar work here and at the other prairie branch Farms and Stations:—

RETURN VALUES.

Wheat (from the machine)	per lb.	1¼c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	1c.
Flax " "	"	1¼c.
Timothy hay	"	3c.
Red Clover hay	per ton.	$10 00
Alfalfa hay	"	10 00
Brome Grass hay	"	12 00
Western Rye Grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	10 00
Barley straw	"	2 00
Wheat straw	"	2 00
Pea straw	"	1 00
Flax straw	"	2 00
Dry corn stalks	"	2 00
Corn ensilage	"	5 00
Mangels and turnips	"	3 00
Sugar beets	"	3 00
Pasture, each horse	per month.	4 00
" " cow	"	1 00
" " sheep	"	25

COST VALUES.

Rent	per acre.	2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00
(All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.)		
Machinery	per acre.	60
Manual labour	per hour.	19
Horse labour (including te[illegible]ster)—		
Single horse	per hour.	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	each hour.	7
(Work done by traction engine is to be converted into the amount of horse labour required to do the work, and charged accordingly.)		
Threshing (covering work from stook to granary)—		
Wheat	per bush.	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

CULTURAL EXPERIMENTS.

The extensive system of cultural experiments inaugurated on this Farm in 1911 is being continued from year to year. Very little in the way of conclusive results has been obtained as yet. The following comments will give some idea of the scope of this work.

DEPTH OF PLOUGHING.

Various depths from 3 to 8 inches and subsoiling 4 inches are compared in summer-fallow ploughing in this experiment. No decisive results are apparent as yet, except that the effect of the subsoiling has been injurious rather than otherwise.

A test of ploughing sod 3, 4, and 5 inches deep has shown that the greater depths have been more effective in subduing the grass.

SUMMER-FALLOW TREATMENT.

Seventeen different methods are being tried, but nothing conclusive appears as yet in the results.

STUBBLE TREATMENT.

Ten methods of treating wheat stubble, to be sown to wheat again, are being tried. So far, fall ploughing has somewhat of an advantage over spring ploughing, but the difference is not at all decisive. Three different treatments of stubble for oats have not brought out anything conclusive.

SEEDING TO GRASSES AND CLOVERS.

Six preparatory treatments of land for grass and clover sown with nurse crop and five for sowing without nurse crop are being tried. Better results are being obtained without nurse crops than with them, but not enough better to compensate for the loss of the grain crop. Grass and clover sown on well cultivated corn land gives best results, summer-fallow does next best, and grain land not quite so well, though satisfactory catches are obtained even with the third crop of grain.

BREAKING SOD OF CULTIVATED GRASSES AND CLOVERS.

Land has been seeded down with a mixture of timothy, western rye grass, red clover, and alfalfa, and is being broken up in eight different ways.

APPLICATION OF BARNYARD MANURE.

Nine methods of applying barnyard manure are being tried on each of the following: Corn or roots, wheat, barley, and oats.

GREEN MANURING.

A comparison is being made of ploughing under peas and 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 "extraordinary" 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. Good preparation has shown a decided advantage over poor, but extraordinary preparation made little or no additional improvement.

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. The only time that seems to stand out as specially advantageous is immediately after ploughing summer-fallow in June.

DEPTH OF SEEDING.

Seeding 1, 2, 3, and 4 inches deep is being tried with both wheat and oats. Two and 3 inches deep gives the best results.

COMMERCIAL FERTILIZERS.

Eight kinds and combinations of commercial fertilizers are compared with no fertilizer, barnyard manure and clover. Indications are that money spent on commercial fertilizers for Manitoba soil would be wasted largely.

UNDERDRAINING.

Two drained plots are compared with eight undrained plots. The draining has not shown any advantage.

DATES OF SEEDING—ALFALFA.

Six pairs of plots of alfalfa were sown on different dates: two on May 1, two on May 15, two on June 1, two on June 15, two on July 1, and two on July 15. Those sown on May got an excellent start; those on June 1, good; on June 15, rather poor; on July 1, very poor; and on July 15, almost complete failure. In a season such as this one, with great heat and drought in midsummer, early-sown alfalfa has a great advantage.

DATES OF SEEDING—FLAX.

Two plots of flax were sown on each of the following dates: May 1, May 15, June 1, and June 15. The plots sown in May gave very much better results than those sown in June. Flax sown as late as June 15 is likely to freeze before ripening.

QUANTITIES OF SEED—ALFALFA.

Different rates of sowing alfalfa both for hay production and for seed production were tried this year. All lots germinated well and made a good growth this year. Some information should be available on this question next year.

QUANTITIES OF SEED—FLAX.

Quantities of seed varying from 18 pounds to 38 pounds of flax per acre were tried. From this and other seasons' results the conclusion is reached that 28 pounds per acre is about the proper quantity to use.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

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

WEATHER CONDITIONS.

The season of 1914 was one of the driest on record, and therefore demonstrated very clearly the benefit of good methods of cultivation. Land that was well cultivated gave a profitable return, while poorly cultivated soil gave either a complete or partial failure. On the Experimental Farm the season opened up comparatively early and wheat seeding started on April 15. During the month of April and until the 9th of May, 2.34 inches of rain fell. After that date the dry weather started and the crops had to depend on the moisture stored in the soil from the early spring and the previous fall. The result was that early-sown wheat on summer-fallow germinated quickly and made a good even stand, while later-sown grain on fall and spring ploughing germinated very unevenly with the result that in many places there was a considerable second growth. July and August were very dry, with the result that the grain was short in the [illegible]. The frost on August 9 lowered both the quality and quantity of the grain [illegible] a result of the dry weather and frost the cereals ripened very quickly and h[illegible] was completed one month earlier than the previous season. The dry weath[illegible] also caused a very light yield of hay, and roots and the frost greatly reduced the feeding value of the corn. So, taken as a whole the season was one of the most unfavourable that has been experienced for some time.

CROP ROTATIONS.

This season four different rotations are being tried out. The fields on which these rotations are tested are large enough to allow of calculating the cost of labour, etc., and to estimate the revenue and profit per acre.

ROTATION "C" (THREE YEARS' IN RATION).

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

This is a grain grower's rotation, as it does not provide any feed for live stock. At present this arrangement gives us a good average yield per acre. This season the profit per acre on the whole rotation was $3.61, and the average for three years was $5.69.

The objection to this rotation is that it does not return vegetable matter or plant food to the soil and, as might be expected, the land becomes badly infested with weeds.

ROTATION "J" (SIX YEARS' DURATION).

First Year.—Summer-fallow.
Second Year.—Wheat.
Third Year.—Wheat.
Fourth Year.—Oats. Seeded down with western rye grass and alfalfa.
Fifth Year.—Hay.
Sixth Year.—Pasture.

This rotation is suitable to a man who wishes to start mixed farming. It allows of considerable wheat to be sold for cash and also provides a quantity of feed in the form of hay and oats for the live stock. This year the profit per acre was $6.39, and the average for two years was $9.23.

The objection to this rotation is the seeding down with oats as a nurse crop on the second year stubble. Up to the present, however, no failure of a stand has been obtained, but the yield of hay, especially in dry seasons, is very low.

ROTATION "P" (EIGHT YEARS' DURATION).

First Year.—Summer-fallow.
Second Year.—Corn.
Third Year.—Barley. Seeded down with western rye grass and alfalfa.
Fourth Year.—Hay.
Fifth Year.—Pasture.
Sixth Year.—Summer-fallow.
Seventh Year.—Wheat.
Eighth Year.—Wheat.

This rotation is well adapted for cleaning up a dirty farm, as in the eight years there are six in which crops or methods of cultivation are employed which would help to eradicate weeds. As would naturally be expected, therefore, the profit per acre from the arrrangement is lower than any of the others. This year $4.48 was obtained per acre, and the average for two years was $6.83.

ROTATION "R" (NINE YEARS' DURATION).

First Year.—Summer-fallow.
Second Year.—Wheat.
Third Year.—Oats. Seeded down with western rye grass and alfalfa.
Fourth Year.—Hay.
Fifth Year.—Pasture.
Sixth Year.—Summer-fallow.
Seventh Year.—Corn.
Eighth Year.—Wheat.
Ninth Year.—Oats.

The arrangement of crops in this rotation is well adapted to a man who is going into stock raising almost exclusively, for out of nine years only two are in wheat, the other seven being devoted largely to the production of crops that would be suitable as forage for live stock. The profit per acre is slightly more than on the preceding one but is not equal to the two former. While these last two rotations do not show at present as large a profit per acre as the two former, they should not be discriminated against because of this, for after the work has been running ten or more years it is possible that rotations "P" and "R" will be giving the largest profit per acre because manure is being applied and crops are grown which will not exhaust the soil fertility.

SOIL CULTURAL EXPERIMENTS.

This work was only inaugurated in 1911, so that the data are for three years only. Consequently it cannot be taken as conclusive. As the work goes on it is possible, therefore, that some of the conclusions drawn at present may be changed in future bulletins.

DEPTH OF PLOUGHING.

The affect that the depth of ploughing summer-fallow has on the succeeding crop of wheat seems to depend largely on the amount and distribution of rainfall throughout the season. The average yield for three years was highest on soil ploughed from 6 to 8 inches deep. This season, presumably on account of the heavy precipitation in the autumn of 1913, land that was ploughed 8 inches deep and subsoiled 4 inches deeper, or, in other words, cultivated 12 inches deep, gave the highest yield. The affect of the deep ploughing is always more noticeable on the second crop than on the first. For this reason the oats always yield highest on the plot which was summer-fallowed deepest, although the land was only ploughed shallow preceding the oat crop.

SUMMER-FALLOW TREATMENT.

Depth of Ploughing.—In the summer-fallow treatment the depth of ploughing is again given a test, and the results corroborate the findings in the "depth of ploughing" experiment, namely, that land ploughed 6 to 8 inches deep gave considerably larger yields than land ploughed only 4 inches deep.

Number of Times Ploughed.—While the yield is sometimes highest on the land that is ploughed twice in the season it is doubtful if it is sufficiently high to offset the cost of extra ploughing. Also, where the land is infested with annual weeds, a much cleaner fallow will be obtained if it is only ploughed once and then surface cultivated throughout the season.

Date of Ploughing.—The summer-fallow that is ploughed early invariably yields higher than that which is ploughed late. While the yield on the plot that was ploughed on May 15 is higher, the difference between this and the yield on the plot ploughed on June 15 is not very great. A great difference, however, is noted between that ploughed on June 15 and July 15.

CULTIVATION AFTER HARVEST PREVIOUS TO SUMMER-FALLOWING.

Land that is disced in the fall after the crop is taken off gives better results than where the land is left untouched or skim ploughed in the fall 4 inches deep.

Cultivation after Ploughing.—Indications are that subsurface packing after the plough and then cultivating as necessary to keep down the weeds gives best results. This season, however, land which was sown with rape and pastured off gave the highest yields. The reason for this may be due to the fact that a large amount of rain fell in the fall of 1913.

Summary.—From the foregoing it would seem that the following outline will give the best results: Double disc immediately after harvest, plough 6 to 8 inches deep in the latter part of May or early June, subsurface pack and harrow immediately after the plough, then cultivate as necessary to keep down the weeds and form a mulch.

STUBBLE TREATMENT.

Stubble land that is ploughed in the fall and subsurface packed at once has given the highest yield, while land that is ploughed in the fall and left untouched has given the lowest. Spring ploughing, discing, and stubble burning range in between these extremes, spring ploughing and spring burning giving nearly as good results as fall ploughing and packing.

SEEDING TO GRASSES AND CLOVERS.

This experiment consists in seeding down a mixture of grass and clover with and without a nurse crop on land prepared in different ways. The result would seem to indicate that a better stand and higher yield would be obtained when sown without a nurse crop. It would seem doubtful, however, if this increase in yield would pay for the loss of a crop of grain. This is especially true on well-prepared soil such as summer-fallow or corn land.

APPLYING BARNYARD MANURE.

This experiment has not been running long enough to give any definite data. Apparently best results were obtained when the manure was applied on land intended for corn. In applying manure for corn it would seem better to apply it on soil after it has been ploughed and then disc it in. Oats and barley also respond to the application much better than wheat. Practically no difference is noted between rotted and green manure when applied as above. The green manure in this case is made from cut straw and applied in winter.

GREEN MANURE.

The ploughing under of green crops does not seem to be quite so effective as barnyard manure. It does give a slightly higher yield than no manure at all, but it causes the grain to be late in maturing, especially the second crop.

SEED-BED PREPARATION.

This experiment simply consists in the number of times the disc, harrow, and packer are used at seeding time. As might be expected, there is little difference in the yields on summer-fallow which has been well cultivated the year previous. The yields, however, would indicate that even here the harrow should not be neglected. On spring ploughing by far the largest yields are obtained on land that has been given from two to four strokes of the harrow at seeding time.

SOIL PACKERS.

The result of this experiment would seem to indicate that the soil packer would, under average conditions, be a profitable implement to use on the farms in southern Saskatchewan. The kind of packer will depend on when it is to be used. If right after the plough or before seeding the subsurface gives best results. For packing after the seeder the surface packer will not bury the grain so deeply and therefore gives a more even stand.

DEPTH OF SEEDING.

In seeding wheat on well worked summer-fallow the largest yields were obtained when the seed was sown from 2 to 3 inches deep.

Oats sown on fall or spring-ploughed land require deeper seeding, 3 or 4 inches giving best results.

EXPERIMENTAL STATION, ROSTHERN, SASK.

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

The season of 1914 opened rather slowly, alternate cold and warm spells of several days occurring from the middle of March. Seeding began on April 23, and work continued under favourable auspices. Occasional showers kept the crops growing and in thriving condition until early in July, but from then on those on sandy or ill-prepared land suffered.

The rainfall for July of this year was the lowest, for the same month, since the records of this Station began.

Following is the precipitation record for the past four growing seasons, from April 1 to August 15:—

Month.	1911.	1912	1913.	1914.
	Inches.	Inches.	Inches.	Inches
April	0.86	0.67	0.26	0.63
May	2.38	2.15	1.26	1.96
June	3.55	2.81	1.87	2.00
July	2.89	5.25	3.80	1.40
August 15th	0.43	0.23	2.24	0.13
Totals	10.11	11.11	9.43	6.12

CROP YIELDS.

The yield of all grain was below the average this year, but considering the relative conditions, the yield of wheat on corn ground is higher than that on fallow, and the yield of oats on wheat ground following corn is higher than that on wheat ground following fallow.

ROTATIONS.

Four rotations have been in operation for four years and a careful record kept of all costs and returns. In figuring the cost of operation, rent, manure, seed, twine, use of machinery, manual and horse-labour, have all been recorded at a fair price.

The area of each lot in each rotation is two acres, which makes the conditions as nearly like ordinary field conditions as is possible with the present acreage of this Station.

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; in 1913 it was 20 and 42 bushels, respectively, and in 1914 it was 20¾ and 41½ bushels. No manure is applied, as none would be produced on a farm carried on under these conditions.

The profit per acre, including the summer-fallow, and valuing the wheat at 80 cents per bushel, was $3.89 in 1912, $9.81 in 1913, $7.06 in 1914, an average of $6.92 profit per acre for three years.

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 operated long enough to prove its merits, but allowing 80 cents per bushel for wheat, 34 cents for oats, and $10 per ton for hay, the profit per acre for the last three years is as follows: In 1912, $5.56; in 1913, $10.26; in 1914, $3.12; an average profit for three years of $6.41 per acre.

This rotation not only affords wheat for market, but plenty of feed for stock.

ROTATION "P" (EIGHT YEARS' DURATION).

First Year.—Summer-fallow.
Second Year.—Wheat.
Third Year.—Wheat.
Fourth Year.—Summer-fallow manured at the rate of 15 tons per acre.
Fifth Year.—Roots.
Sixth Year.—Barley. Seeded down.
Seventh Year.—Hay.
Eighth Year.—Hay.

The results from this rotation are not altogether satisfactory as the barley grown on root ground following summer-fallow, heavily manured, grows too rank, and smothers the grass to a considerable extent. It would appear after three seasons' work on this rotation that more satisfactory results could be obtained by having the barley follow the wheat instead of the roots, and the second year's wheat follow the roots.

The profits per acre, including the summer-fallows, valuing wheat at 80 cents per bushel, roots at $3 per ton, barley at 48 cents per bushel and hay at $10 per ton for the last three years, are as follows: $7.65 in 1912; $5.77 in 1913; and $2.72 in 1914; an average profit for three years of $5.35 per acre.

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 leads them all in point of production and profit, but has the disadvantage of cutting a farm into too small fields for convenience.

Our highest yield of wheat on field plots since the establishment of this Station was 104 bushels on 2 acres in this rotation in 1913, on ground on which acre has 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 at the Station.

The profit per acre, including summer-fallows, allowing 80 cents per bushel for wheat, $3 per ton for green fodder corn, 34 cents for oats, $10 per ton for hay; was: $11.26 in 1912; $15.14 in 1913; $3.80 in 1914; an average of $10.08 for three years.

The character of the season was such this year as to cause almost a total failure of the hay crop. The returns from 2 acres of first-year hay and 2 acres of second-year hay at $10 per ton, did not equal the cost of seeding down 2 acres of new meadow. This shows the profits from those rotations involving a hay crop to be much lower than in previous years.

The root crop in rotation P amounted to 11 tons, 1,114 pounds per acre in 1914, as against 17 tons, 1,706 pounds in 1913, which further accounts for the low profits in this rotation this year. On a farm so infested with weeds as this Farm is, a root crop is expensive because of the large amount of manual labour required. A root crop is much more expensive than either a crop of potatoes or a crop of corn.

In rotation R, the corn crop in 1914 was 8 tons, 1,920 pounds per acre, as against 39 tons, 1,240 pounds in 1913 and 30 tons, 1,950 pounds in 1912.

CONCLUSIONS.

The conclusions from three 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. This is emphasized in a season of early frost.

(2) That a hoed crop in a 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, in an average year.

(3) That the cost of growing a root crop considerably exceeds the cost of growing a potato or corn crop, but that the cost of any of them is considerably reduced after the full effect of the rotation is felt, that is to say, after a period of eight years in a rotation like rotation "P," and nine years in a rotation like rotation "R."

(4) That a diversity of crops affords more suitable food for live stock. When crops such as those grown on rotations "P" and "R" are marketed through the medium of live stock, a greater profit per acre accrues than is here shown.

COMPARISON OF RESULTS OF BARNYARD MANURE, PLOUGHED-UNDER GREEN CROP, AND BARE SUMMER-FALLOW.

An experiment has been under way for three years to determine the comparative effects of bare summer-fallow, summer-fallow manured, and a crop of green peas or green vetches ploughed under. The average result for three years, as indicated by the following table, shows the great value of barnyard manure, not only on the crop of wheat immediately following the application, but on the succeeding crop of oats:—

Plot.	Treatment.	Yield of wheat average three years.		Yield of oats following wheat average three years.	
		Bush.	Lb.	Bush.	Lb.
1	Bare summer-fallow	42	25	84	49
2	Green peas ploughed under	37	38	88	15
3	Green vetches ploughed under	38	47	95	23
4	Barnyard manure on summer-fallow	52	20	100	07

EXPERIMENTAL STATION, SCOTT, SASK.

M. J. Tinline, B.S.A., *Acting Superintendent.*

WEATHER CONDITIONS

Very little snow fell during the winter of 1913-14. The winter broke up in March, but a series of cold spells prevented work on the fields until April 13.

The rainfall for 1913 was very light and this, with the small amount of moisture from the winter snow, left the soil in very unfavourable condition to withstand the drought to which it was subjected during the past summer. As a result, the lightest crop in the history of this district has been harvested this year. A considerable portion of the wheat crop was sown on summer-fallow and breaking and did not suffer to the same degree as did the oats and barley, which in many cases were sown on stubble land with very little preparation.

At this Station the yields are very low for all kinds of grain. Oats and barley suffered the most severely, as they were not sown as early as the wheat and were not so far advanced when the dry, warm weather checked their growth. Cultivated hay crops were very light, as were fodder crops of all kinds.

ROTATION OF CROPS.

The experimental work with crop rotations was again continued this season. Records were kept of the necessary expenditure for labour, use of machinery, seed, twine, etc., as well as the returns of hay, grain, straw, etc., from each of the fields. The values fixed for these items are included on page of this report.

This work has not been under way a sufficient time to warrant any definite conclusions being drawn.

The following table will show the profits from two fields of wheat and two fields of peas grown under comparable conditions on the rotation fields:—

Crop.	Previous treatment.	Value of crop per acre.	Profit on crop per acre.	Average profit per acre.
		$ cts.	$ cts.	$ cts.
Wheat	Summer-fallow	11 85	5 10	
Wheat	Sod land summer-fallowed	16 52	9 65	
				7 37
Peas	Summer-fallow	26 50	14 95	
Peas	Sod land summer-fallowed	20 99	9 65	
				12 30

Peas have proven to be one of the most profitable crops to grow, providing an early variety is grown and sufficient help is available for harvesting.

SOIL CULTURAL EXPERIMENTS.

The scope of the cultural investigation work has been increased by the addition of 311 more plots, making a total of 484 plots, including eleven distinct experiments. The additional experiments include depth of ploughing, methods of ploughing summer-fallow, treatment of stubble land, methods of breaking up cultivated grasses and clovers, ploughing down green manures, application of barnyard manure, and treatment of seed-bed.

PRAIRIE BREAKING.

An experiment to determine the best method of breaking up the prairie sod has been under way for two years.

The plots were broken last season as outlined in the following table. Plots 1 and 2 were fall ploughed 5 inches deep and all were sown on May 5 with Marquis wheat at the rate of 1¾ bushels per acre:—

Plot.	Treatment Season 1913.	Yield per acre, 1914.	
		Bus.	Lb.
1	Broken 3½ inches deep in May, sown to peas and oats and cut green	13	00
2	Broken 3½ inches deep in May, sown to flax	13	10
3	Broken 4½ inches deep in June, and cultivated	22	22
4	Broken 2½ inches deep in June, and backset in September	13	20

DEPTH OF SEEDING.

Four plots were sown with Marquis wheat on May 2 at the rate of 1¾ bushels per acre. These plots were summer-fallowed in 1913.

The yields for the year 1913, when a similar experiment was conducted, are herewith included:—

Plot.	Depth of Seeding.	Yield per acre, 1913.		Yield per acre, 1914.	
	Inches.	Bus.	Lb.	Bus.	Lb.
1	1	31	00	20	00
2	2	32	40	21	20
3	3	33	00	27	20
4	4	29	40	31	20

SOIL PACKING ON SPRING PLOUGHING.

The land was ploughed on May 4 and treatment given May 5, on which date wheat was sown at the rate of 1¾ bushels per acre:—

Plot.	Treatment given after ploughing.	Yield per acre, 1914.	
		Bus	Lb.
1	Harrowed, subsurface packed, harrowed sown	14	20
2	" surface packed " "	18	20
3	" combination packed " "	15	40
4	" subsurface packed " " subsurface packed	21	00
5	" surface packed " " surface packed	21	40
6	" combination packed " " combination packed	22	20
7	" sown "	14	40
8	" " surface packed	18	00
9	" " subsurface packed	15	20
10	" " combination packed	16	00

It will be noted that an average of 1½ bushels per acre increase was secured by packing once, and 7 bushels per acre by packing both before and after seeding, over plot 7, which received no packing.

RATES OF SEEDING.

Wheat was sown on the uniform plots on April 17 and harvested August 11. Oats were sown on May 8. All plots were summer-fallowed in 1913.

RATES of Seeding Wheat.

Variety.	Rate of Seeding per acre	Number of Days maturing.	Yield of Grain per acre.	
	Bush.		Bush.	Lb.
Marquis	1½	116	18	40
"	1¾	115	18	40
"	2¼	115	18	00
"	2¾	116	14	40
Prelude	1¼	108	10	50
"	1½	105	11	20
"	2¼	104	13	50
"	2¾	104	10	30

RATES of Seeding Oats.

Variety.	Rate of Seeding per acre.	Number of Days Maturing.	Yield of Grain per acre.	
	Bush.		Bush.	Lb.
Banner	1	99	48	28
"	1½	99	52	32
"	2	99	41	26
"	2½	97	57	22
"	3	92	61	06
"	3½	94	61	06

DATES OF SEEDING.

Experiments in dates of seeding oats and flax have been carried on.

DATES of Seeding Oats.

Variety.	Date of Seeding.	Number of Days Maturing.	Yield of Grain per acre.	
			Bush.	Lb.
Banner	April 17	111	67	02
"	" 24	108	62	12
"	May 1	102	67	02
"	" 8	97	60	00
"	" 15	90	55	10

It will be noted that the heavier seeding and the early seeding gave the best yields this season.

DATES of Seeding Flax.

Plot.	Date of Seeding.	Yield per acre.
		Lb.
1	May 1	340
2	" 15	360
3	" 29	360
4*	June 8	200

* Frosted.

The yields were very light, owing to the dry weather.

YIELDS OF SEED GRAIN FROM FIELD PLOTS.

The land upon which the seed grain was sown was broken 4 inches deep in 1913 and kept cultivated throughout the summer.

As a result of the drought, the yields are all very low. The samples of grain, with the exception of the oats, are fairly plump and all are free from weeds:—

[1] Marquis wheat from 2 acres, 1,700 pounds.
Pioneer wheat from 4 acres, 3,450 pounds.
Prelude wheat from 4 acres, 2,790 pounds.
Victory oats from 1 acre, 1,345 pounds.
O.A.C. No. 21 barley from 1 acre, 834 pounds.
Arthur peas from 1 acre, 1,180 pounds.

ADDITION TO THE STATION.

Three hundred and twenty acres of wild land adjacent to the Station were purchased this season. This now gives a total acreage of 518½ acres.

A substantial fence has been built around the entire Station.

An additional 100 acres was broken and prepared for crop, this past summer.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

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

SEASONAL NOTES.

On account of the excessive drought the season of 1914 has been, with the possible exception of 1910, when the area affected was more restricted, the most trying that has been experienced in southern Alberta since settlement has taken place. In regard to the amount of moisture carried in the soil from 1913 it might be said that the precipitation during the last four months of that year was light, amounting in all to only 2½ inches. During this period, heavy drying winds were prevalent, with little or no snow on the ground, so that the soil moisture was severely drawn upon. To counteract this in a measure, however, 3·63 inches of precipitation was received during the first three months of this year, so that the soil was reasonably moist and in excellent condition when work on the land was started.

The first discing, harrowing, or seeding on the Station occurred March 17. The ground froze up toward the latter part of March but opened again shortly and seeding was begun April 4. Unfortunately the rainfall during April, May, and until the latter part of June was very much less than usual. For this entire period no soaking rain was experienced; what did come was in the form of light showers that were not sufficient to wet through the dry layer of 2 or 3 inches at the surface and connect with the moisture lower down. The fact that the total precipitation for April was only 0·54 of an inch and for May 0·29 of an inch fully illustrates how serious conditions were and how difficult it was to obtain a stand from seeds when sown. A wet spell during the last ten days of June revived things generally, but the dry, hot July was too severe a strain on plant life, and the result was that there was a failure of all crops except those sown on summer-fallow. Corn, late-sown roots, and potatoes which were able to profit by the August rains were a possible exception, although they, of course, did much better on summer-fallow. The last frost in the spring occurred on May 12, when a temperature of 29·8° was recorded. The first frost in the fall was on September 15, when the temperature dropped to 31°.

[1] The Marquis wheat was injured considerably by Gophers from the adjacent wild land.

CROP YIELDS.

Non-irrigated.—All crops except those sown on summer-fallow and corn land were a practical failure. Field lots of spring wheat sown on summer-fallow averaged a little over 15 bushels per acre; winter wheat, 14 bushels. The yield of oats and barley were in proportion. Peas and oats sown as a mixture on summer-fallow for green feed gave a return of 1 ton 500 pounds per acre of field-cured hay. The yield of wheat after corn was rather remarkable; it is referred to later. Hay, including alfalfa, clover, and grasses failed to make sufficient growth to be worth cutting, except alfalfa in rows which gave light returns.

Irirgated.—The yields of grain were fully up to the normal. All kinds of hay gave returns slightly in excess of those obtained in 1913.

EXPERIMENTS IN ROTATION OF CROPS.

Non-irrigated.—The necessity of having a summer-fallow introduced every second or third year in the crop rotations was fully emphasized.

CORN A SUBSTITUTE FOR SUMMER-FALLOW.

A hoed crop is generally considered to be a very good substitute for summer-fallowing, but one of the most striking lessons learned from this season's work at this Station has been the fact that there appears to be a marked difference in the kind of hoed crop used. In one of the rotations wheat follows corn, in another wheat follows turnips, and several places where wheat follows summer-fallow. The results, which are somewhat surprising and perhaps difficult to explain, are as follows:—

	1913.		1914.	
	Bush.	Lb.	Bush.	Lb.
Yield of wheat after turnips	15	55	1	3
Yield of wheat after corn	33	20	22	12
Yield of wheat after summer-fallow	26	55	15	14

Both the corn and turnips are planted on summer-fallow, and no spring cultivation is given, except a harrowing when necessary just previous to seeding. The yield from the summer-fallow in 1914 is the average yield of five different fields, the highest yield being 16 bushels 22 pounds, and the lowest being 14 bushels 4 pounds. The corn was cut for ensilage, and was weighed green. It yielded at the rate of 11 tons 718 pounds in 1913, and 12 tons 652 pounds in 1914. The reason for the wheat yielding so much better on corn stubble than on turnip land is doubtless due to the fact that corn not only requires less soil moisture, but that growth stops with the first killing frost, which is in early September, while in the case of turnips, perhaps the heaviest drain on the moisture in the soil begins about this time.

It is difficult to offer a satisfactory explanation for the increased yield of wheat sown on the corn stubble over that sown on summer-fallow, unless it might possibly be the fact that manure at the rate of 12 tons per acre was applied to the land just before it was summer-fallowed for the corn. The same quantity of manure was applied, however, to the rotation in which the turnips are, but not just previous to the turnips. That a dry-land farmer can obtain a goodly supply of rough fodder for his stock by putting in a few acres of summer-fallowed land with Compton's Early or some similar variety of corn, and still have his land in excellent condition for a grain crop the

following year is important, but there is another method opened to him. If he could use some extra early variety of corn that would mature the grain he would be still farther ahead, for he could thus add materially to his supply of hog as well as cattle feed in the fall. None of the ordinary sorts can be relied on to do this. We have found, however, that the variety known as Squaw will. It has matured every year here since the Station has been established. It does not grow more than about 3 feet high and the ears grow close to the ground, and although very small are numerous. To make the growing of Squaw corn practicable it would probably be necessary to allow the stock to pasture off the corn in the field during the fall and winter rather than attempt to harvest it.

An experiment was conducted this year to ascertain the feasibility of growing this corn on spring-ploughed stubble. Land on which oats were grown in 1913 was ploughed 6 inches deep and immediately harrowed, marked, and planted, the hills being placed 3 feet apart each way. By having it checked rowed in this manner it was possible to cultivate both ways and thus keep the weeds down with practically no hand work. Although the seed germinated very slowly and some of it was late in coming up it all matured, and yielded 16 bushels 20 pounds of shelled corn to the acre. When the season in which no wheat or oats were obtained except on summer-fallow is considered, the yield of 16 bushels of corn planted on stubble land is certainly encouraging.

A farmer on a half section of land in this district should prepare at least 100 acres of summer-fallow each year. He should be able to get 40 to 60 acres of this ploughed in time to put it in with corn. With the proper machinery he should be able to plant this cheaply and quickly. The necessary work to keep it clean, provided it was planted in check rows, should not be much greater than that required to keep his summer-fallow clean. If then he could obtain 16 bushels or better of corn he would be salvaging a pretty valuable crop from his summer-fallow which otherwise would be yielding him nothing.

In these parts, which until recently have been used for range purposes, where the snowfall is light and does not remain long at a time on account of winds, it would certainly be feasible to pasture off a crop of this kind in the fall or winter by hogs, cattle, or sheep. If our mild dry winters were an asset in the ranching days why not still make them so?

Irrigated.—The value of using alfalfa in a rotation on irrigated land is well illustrated by the yields obtained in rotation "U," which is a ten-year rotation consisting of six years alfalfa, one year each of hoed crop, wheat, oats, and barley. The average yield of cured hay from the six fields of alfalfa, including the field freshly seeded this year from which no crop was obtained, was 4 tons 168 pounds per acre. The total yield of potatoes was 598 bushels, of these 583 bushels and 25 pounds were marketable; wheat, 63 bushels 30 pounds; oats, 107 bushels; and barley, 46 bushels. The field in which the barley was grown this year has not been in alfalfa on account of the rotation not having been established long enough, otherwise the yield would doubtless have been larger.

SOIL CULTURAL EXPERIMENTS.

The cultural investigation work started in 1911, consists of thirteen lines of experiments. Some observations concerning the work and the results obtained are herewith given:—

PRAIRIE BREAKING.

The six methods of breaking from prairie point in favour of early breaking in June, backsetting in September.

DEPTH OF PLOUGHING.

Of a trial of ten different depths of ploughing summer-fallow to be sown to wheat, ranging from 3 inches to 8 inches and from 5 inches to 8 inches with 4-inch subsoiling, results indicate that 8 inches was best suited to the drought conditions of this season.

SUMMER-FALLOW TREATMENT.

The results of three years incline towards ploughing 8 inches deep in June, harrow, and cultivate as necessary. Growing a crop of rape sown in rows for pasture on the fallow resulted in no succeeding crop of wheat this dry season, and the average of the two preceding years decreased the yield of wheat, as compared to summer-fallow, 10 bushels 30 pounds per acre.

A fallow ploughed June 15 produced an increase of 6 bushels 30 pounds per acre of wheat over a fallow ploughed July 15, but otherwise similar treatment.

Once ploughing of the fallow is preferable to twice ploughing. Ploughing 6 inches in June showed an increase of 3 bushels 50 pounds per acre of wheat over ploughing 6 inches in June and 6 inches in September. Similarly ploughing 6 inches in June showed an increase of 5 bushels 20 pounds per acre of wheat over ploughing 8 inches in June and 8 inches in September, otherwise same cultivation.

STUBBLE TREATMENT.

The experiment with ten methods of preparing stubble land for wheat and three for oats, give highest yields when sown on spring-ploughed land. The unusually dry season appeared to particularly emphasize this fact.

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 summer-fallow. Larger yields resulted when sown without a nurse crop.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS.

Land has been seeded with a uniform mixture of grasses and clovers and broken up in eight different ways. When breaking from grasses and clovers, a season needs to be lost in order to allow the sod to become rotted and to allow the soil and subsoil to collect the moisture for the crop of grain to follow. In the past two seasons, one point has been clearly noticeable, and it is that when the sod is broken and seeded at once to wheat, no crop has resulted.

APPLICATION OF BARNYARD MANURE.

Green manure applied in winter on summer-fallow and disced in before seeding gave 2 tons 1,986 pounds of turnips over summer-fallow treated the same without manure.

When roots were grown on wheat stubble, the best results were obtained by applying green manure in winter on the stubble and ploughed under in the spring.

When applying manure for wheat, barley, and oats, green manure applied in winter on summer-fallow and disced in gave about similar yields as top dressing with rotted manure with spreader after grain sown on summer-fallow.

No important comparisons can be drawn from the application of manure on wheat, barley, and oats seeded on stubble, as this year's crop was a failure.

GREEN MANURING.

This experiment consists of ploughing under peas and tares at different stages of maturity as compared with summer-fallow with and without barnyard manure. Peas ploughed under early in July gave better results than peas ploughed under when in blossom, or tares in late July. Compared with summer-fallow with manure (12 tons per acre) the three-year average succeeding crop of wheat gave an increased yield of 1 bushel 20 pounds per acre over peas ploughed under early in July. The yield of wheat following tares ploughed under in late July fell below summer-fallow without manure.

SEED-BED PREPARATION.

The experiment consists of three methods of seed-bed preparation for wheat on summer-fallow land treated alike. The terms "good," "poor," and "extraordinary" are used to designate the method employed.

The three years' average shows that harrowing the summer-fallow in the spring before seeding gives 8 bushels 20 pounds per acre of wheat more than seeding without any preparation. It is questionable whether the higher yield of wheat by extra work on the summer-fallow in the spring before or after seeding compensates for the work involved.

SOIL PACKERS.

The surface, subsurface and combination packers are used in this experiment.

In ploughing for summer-fallow the three years' average increase of one-half bushel of wheat per acre has been noted in favour of the subsurface packer.

Subsurface packing when the grain is 6 inches high gives about the same results as subsurface packing immediately after seeding.

There is very little difference in yield between the surface and combination packers.

DEPTH OF SEEDING.

Wheat and oats are sown from 1 inch to 4 inches. Both wheat and oats gave the highest yields when seeded 2 inches. In this connection the important point is to be sure that the seed is placed deep enough to be in moist soil.

EXPERIMENTAL STATION, LACOMBE, ALTA.

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

CHARACTER OF SEASON.

Seeding operations were in progress about the middle of April, and the season throughout was ideal for cultural work. The growth was not checked by late spring frosts, and crops ripened in splendid condition with the exception of crops on summer-fallowed land. These were slightly later in maturing and suffered from the early autumn frost of September 1.

GENERAL CROPS.

Banner oats was the only variety grown in field operations, the yield being 77 bushels per acre. Marquis wheat yielded 38 bushels per acre. Ten acres of Prelude wheat were sown on land which had previously grown a crop of roots. It ripened fully ten days earlier than Marquis, and yielded about 28 bushels per acre.

The average yield of barley was approximately 38 bushels per acre.

Approximately 2 acres of corn were planted on May 25. The varieties sown were Longfellow and North West Dent. The season was unusually warm and consequently corn grew well until checked by the first early fall frost, after which it was cut and put into the silo. The yield was exceptionally good for this locality, being at the rate of 15 tons per acre.

Peas and oats, sown at the rate of 1 bushel of peas and 2 bushels of oats and cut in the milk stage, makes a splendid forage crop for fall and winter feeding. The greatest value of this crop as a feed lies in the fact that it is proving a splendid substitute for corn for silage purposes.

It may be interesting at this point to mention that an experimental silo, 12 by 30 feet, was built this season to ascertain the value of green feed for silage. Thirty tons of green corn was cut into the silo; the remaining space was filled with green feed. The silage is relished by all classes of live stock.

Several acres of roots were sown. However, the mangel seed did not germinate and the turnips came only in part, thus reducing the area by 2 acres. The yield was 47 tons.

Field peas were ripened for the first time at this Station. The "Arthur" variety was sown on new land and yielded 30 bushels per acre.

CROP ROTATION.

What is meant by rotation? It means the adoption of a fixed system of farm crops to be grown successively on the same soil at regular intervals.

Rotation is specially adapted to mixed-farming areas, such as are found in central Alberta. To be successful in mixed farming it is essential that some systematic rotation be practised. Concluding from the experiments conducted at this Station, the most suitable rotation for local conditions would be one which includes an application of barnyard manure and at least two or three years of hay or pasture. The pasture land of the second or third year should be ploughed early in August and well worked down during the remainder of the season. Such treatment acts as a partial summer-fallow, and at the same time leaves the soil in good tilth and forms a mulch to conserve the moisture for the succeeding grain crop. By this method heavier yields of grain are obtained than where continuous grain growing is followed. Summer-fallowing is not necessary for local conditions, as there is an abundance of moisture during the growing season to ensure maximum production. Summer-fallow land is conducive to rank growth, which usually results in the crop lodging.

Practical reasons why a rotation should be followed:—

1. Because it encourages the keeping of more live stock on the farm.
2. Because it distributes labour throughout the entire year.
3. Because it enriches the soil.
4. Because it improves the mechanical condition of the soil and increases bacterial action.
5. Because it demands the application of manures to maintain the fertility of the soil.
6. Because it destroys injurious weeds and insects.
7. Continuous grain growing depletes the soil of its plant food.

Furthermore, from a chemical point of view, a systematic rotation should be practised, because a deep-rooted crop alternates with a shallow rooted crop, thus uniformly distributing the plant food. Different crops require different mineral constituents in varying amounts. Of the several rotations under test the following two prove 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 the rate of 12 tons per acre.
Fifth Year.—Pasture.
Sixth Year.—Pasture. Ploughed in July in preparation for hoed crop.

ROTATION "L" (SIX YEARS' DURATION).

First Year.—Hay.
Second Year.—Pasture. Manured in autumn at the 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 or coarse grain.
Fifth Year.—Oats.
Sixth Year.—Barley. Seeded down with 4 pounds timothy 4 pounds alsike clover, and 4 pounds red clover per acre

SOIL CULTURAL EXPERIMENTS.

A comprehensive system of cultural work is being carried on in order to ascertain the best methods of soil cultivation. However, as these experiments have been running only a short time no definite data can be given. A brief summary of conclusions drawn is herewith given.

DEPTH OF PLOUGHING.

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

OBSERVATIONS.

1. That deep ploughing of the land in summer-fallow year does not appear to influence results on the first-year crop (wheat), but influences somewhat favourably the second crop (oats).
2. That land subsoiled in summer-fallow year does not influence the yield or the date of maturity in the first crop (wheat), but influences to a marked degree the date of maturing in the second crop. Subsoiling may prolong maturity two to four days.
3. Ploughing on sod; no conclusive data can be deducted from work done to date.

SUMMER-FALLOW TREATMENT.

In the methods of summer-fallowing, the following points have been observed:—
1. That it is not advantageous to plough summer-fallow twice.
2. That cultivation or ploughing the stubble land in the fall previous to summer-fallowing does not always result in increased yields.

STUBBLE TREATMENT.

That fall or spring ploughing of stubble land proves better practice than the burning of the stubble in spring and then seeding.

SEEDING TO GRASS AND CLOVER.

Where the seeding of grass and clover is made without a nurse crop, the yield of hay is materially increased. The increase, however, is not sufficient to compensate for the loss of crop sustained when seeding alone.

BARNYARD AND GREEN MANURES.

The application of barnyard manure gives a marked increase in yield and, when compared with green manure (peas and tares), gives uniformly better results. The effect of barnyard manure is evident, on the following crops, for at least two years. Furthermore, the application of barnyard manure has the tendency to hasten ripening and maturity.

EXPERIMENTAL STATION, INVERMERE, B.C.

G. E. Parham, *Superintendent.*

CHARACTER OF SEASON.

The rainfall during the spring and early summer was greater than usual for this district, so that irrigation work was light, but August was dry and this necessitated much late irrigation. The frost was out of the ground by the end of March, and it was possible to lay out the plots early in April, but as this was the first year of laying out these plots, and much levelling had to be done to facilitate irrigation, some of the crops were sown rather late.

The cold winds and frosty nights of April and May retarded germination, and it was not until July that there was any promise of a good crop. The results on the irrigated land were good, those on the dry-farming plots poor.

ROTATION OF CROPS.

ROTATION "A" (FOUR YEARS' DURATION).

First Year.—Roots.
Second Year.—Oats.
Third Year.—Peas.
Fourth Year.—Wheat.

Plots of half an acre each are used for this rotation. The plots will be irrigated when required. A box flume has been arranged in order that an exact record may be kept of the amount of water used on each plot per annum. Farm manure will be applied on the wheat stubble in preparation for the root crop, at the rate of 12 tons per acre.

The pea crop will be ploughed under in order to supply the much-needed humus to the soil.

ROTATION "B" (FIVE YEARS' DURATION).

First Year.—Wheat.
Second Year.—Roots.
Third Year.—Oats, seeded down.
Fourth Year.—Clover.
Fifth Year.—Clover.

Plots of half an acre each are used for this rotation. The crops will be irrigated, but no exact record will be kept of the amount of water used.

This rotation will supply hay, roots, and grain, and should prove a suitable one for mixed-farming conditions in this district.

ROTATION "C" (TWO YEARS' DURATION).

First Year.—Oats.
Second Year.—Summer-fallow.

Plots of one-quarter acre each are used for this experiment.

This system of farming has been practised considerably in this district, and although it may reduce the cost of irrigation, this method has no doubt impoverished the land, encouraged many weeds difficult to eradicate, and depleted the soil of humus. This rotation alongside other rotations may demonstrate the evils of the system.

ROTATION "D" (TEN YEARS' DURATION).

First Year.—Summer-fallow.
Second Year.—Alfalfa.
Third Year.—Alfalfa.
Fourth Year.—Alfalfa.
Fifth Year.—Alfalfa.
Sixth Year.—Summer-fallow.
Seventh Year.—Hoed corn.
Eighth Year.—Grain.
Ninth Year.—Summer-fallow.
Tenth Year.—Grain.

Plots of one-quarter of an acre each are used for this experiment. The crops will have no irrigation. The alfalfa is sown in drills 28 inches apart, using 4 pounds of seed per acre. An application of farm manure will be applied in the eighth year on the stubble before ploughing. The alfalfa was sown the last day of June and produced a good plant. The returns in roots and grain in this the first season were poor, but one has to take into account that no special preparation for dry farming had been made.

EXPERIMENTAL STATION, SYDNEY, B.C.

SAMUEL SPENCER, *Foreman Manager.*

WEATHER CONDITIONS AND CROP NOTES.

The spring season commenced early in April, with fine weather and light showers of rain. Fall wheat and rye sown in November, 1913, made 12 inches growth during the month. Timothy, rye grass, and clover were also showing good growth. Owing to the cold nights in June and the very dry weather of May, June and July, the yields were small but good in quality and free from disease. This will give seed for next season.

CROP YIELDS.

Crop.	Variety.	Area.	Yield per acre.	Pounds per bushel.	Total yield per acre.
		Acres.	Bushels.		Lb.
Wheat	Marquis	7·7	27	59	1,593
Oats	Victory	14·5	38	43	1,634
Oats	Banner	1	66	42½	2,704

ROTATION OF CROPS.

Next season rotation "C" (four years' duration) will be commenced on about 35½ acres. Draining will also be started on this area and continued until the 35½ acres are drained.