CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS SERVICE

DOMINION RECLAMATION STATION
MELITA
MANITOBA

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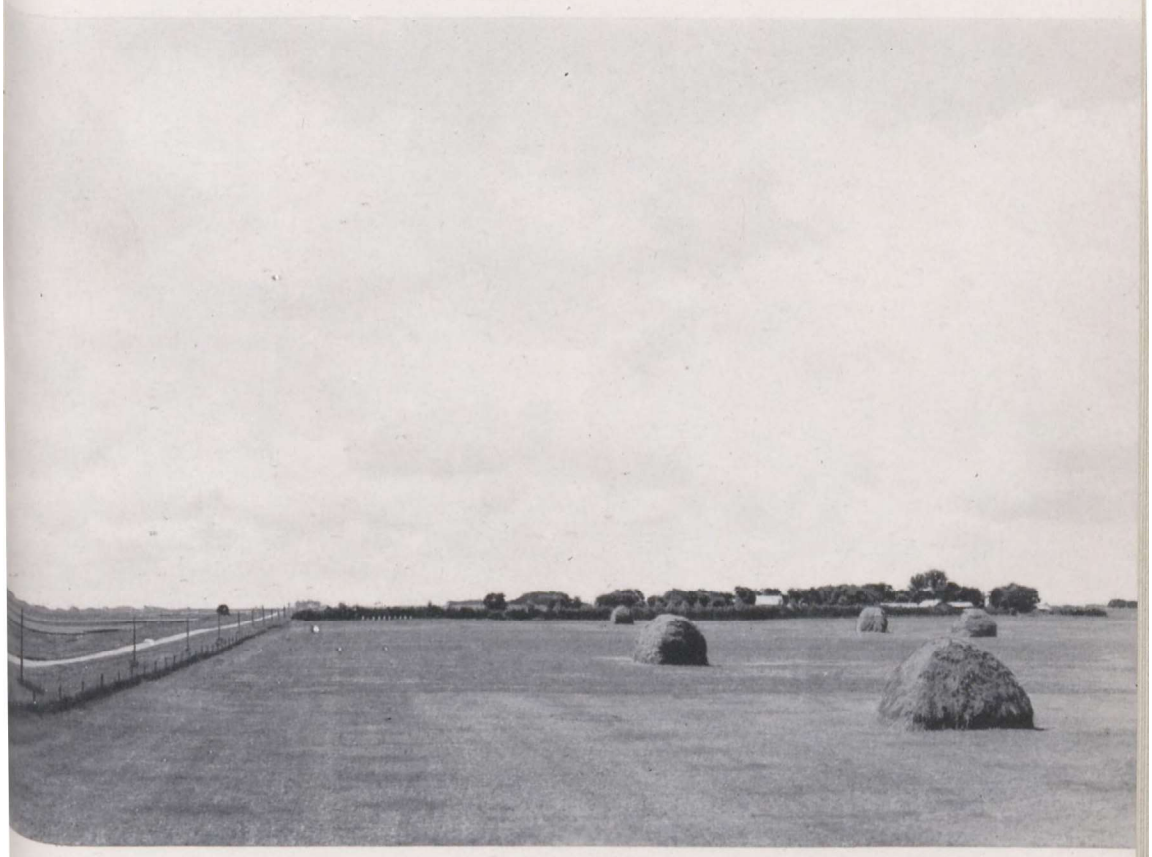
PROGRESS REPORT
1936-1947



HAYFIELD AT RECLAMATION STATION SHOWING HEADQUARTERS IN BACKGROUND. IN 1935, WHEN THE STATION WAS ESTABLISHED, THIS FARM, LIKE MANY OTHERS IN THE REGION, HAD BEEN ABANDONED ON ACCOUNT OF DROUGHT AND SOIL DRIFTING.

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Introduction

The Dominion Reclamation Station at Melita, Manitoba, was established in 1935 primarily to study problems of drought and soil drifting on the light soils of southwestern Manitoba. Since its inception, the Melita Station has been supervised from the Dominion Experimental Farm at Brandon.

M. J. Tinline, B.S.A., Superintendent of the Brandon farm, selected the site and initiated the experimental work at Melita. He retired in 1946. The following officers have also been responsible at different times for conducting the experimental projects:

H. A. Craig, B.S.A.
A. J. Strachan, B.S.A.
W. H. Nelson, B.S.A.

J. V. Parker has been responsible at the reclamation station in a supervisory capacity since it was started.

This is the first progress report issued from the Dominion Reclamation Station, Melita.

Progress Report

DOMINION RECLAMATION STATION

Melita, Manitoba

1935-1947

Under the provisions of the Prairie Farm Rehabilitation Act, passed early in 1935, an abandoned farm of 1,280 acres, located near the town of Melita in southwestern Manitoba, was rented and placed under the supervision of the Superintendent of the Experimental Farm, Brandon, as a Reclamation Station. This farm land represented an extensive area that had been badly eroded by wind. Experimental projects were at the time started for the purpose of determining methods by which badly eroded and abandoned land could be reclaimed for crop production. The initial work undertaken included levelling and the stabilizing of drift soil by seeding to grass, fall rye and other crops. The program was then extended to include studies relating to crop rotations, the use of fertilizers and barnyard manure, the restoration of soil structure and organic content, and tillage methods designed to prevent wind erosion. Additional projects dealt with the production of hay and pasture, the testing of suitable crops for drouth conditions, the adaptability of farm machines, the use of tree shelterbelts and field hedges, weed and insect control and the building up of feed reserves.

As these projects developed, the necessity of fitting livestock into the program was obvious and in 1941 a portion of the Shorthorn herd at the Brandon Farm was transferred to Melita. By 1947 the herd on the reclamation station numbered 78 animals. It is serving to demonstrate how mixed farming can contribute toward a soil-saving husbandry on the light soils of the Souris Basin in southwestern Manitoba.

The soil on the Station is classed as Souris Light Fine Sandy Loam. The surface soil to a depth of four to six inches is dark coloured fine sandy loam while the subsurface soil to a depth of several feet is yellow coloured sandy clay. Underlying this layer is a subsoil composed of more or less impermeable clay. The water-table averages about ten feet from the surface, a condition that is typical of the light soiled area within the Souris Basin.

Prior to taking over this land for reclamation purposes drifting had removed the top soil sometimes to a depth of one foot in wide strips half a mile in length. Fence rows were banked high with drift soil and gouged areas were transformed into sloughs when heavy rains fell. Weeds of many varieties had encroached over abandoned fields and several hundred acres were saved from further erosion by a dense growth of couch grass.

During the eleven years that have elapsed since the reclamation projects began all the land that was leased in 1935 has been brought into satisfactory production. It should be observed, however, from Tables 1, 2 and 3 that reclamation projects have benefited from more favourable weather conditions during the period.

A series of dry years has yet to be experienced before the projects at Melita, designed to combat the conditions that accompany drought, can be fully appraised.

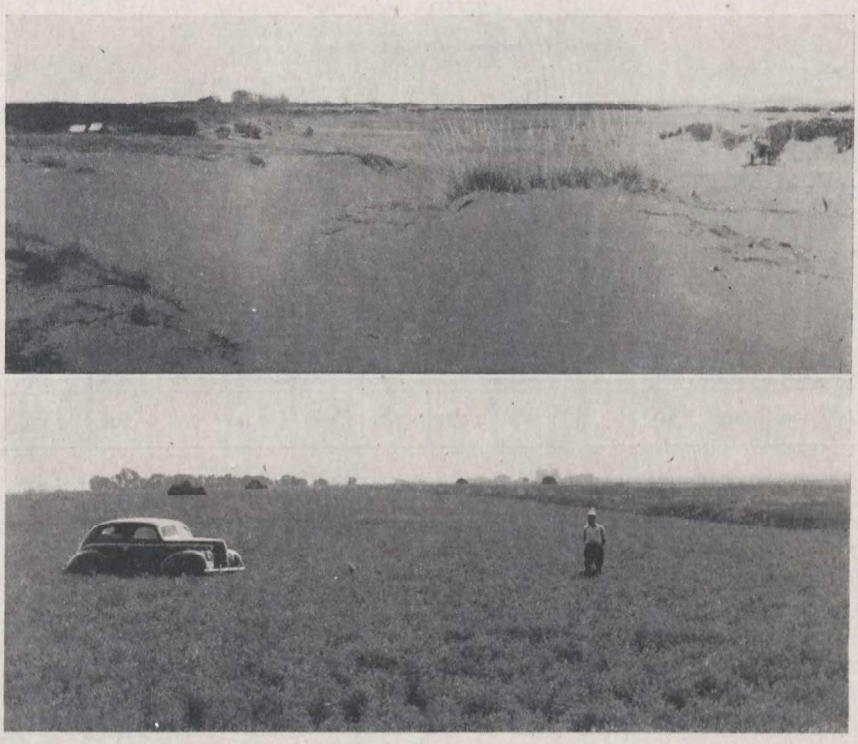

Fig. 2.—The upper picture shows soil drifting conditions on the Reclamation Station in 1935, the lower one alfalfa growing in the same location a few years later.

Meteorological Data

Meteorological data including temperature, precipitation, and wind velocity, have been recorded at the Station since the beginning of 1937. Tables 1 and 2 show an eleven-year summary of these data for the period 1937 to 1947, inclusive.

TABLE 1.—METEOROLOGICAL RECORDS

Dominion Reclamation Station, Melita, Manitoba.
1937-1947 (11 years)

	Temperature °F.			Precipitation (11 yr. Average)			Wind Velocity 11 yr. Av.
	Highest in 11 yrs.	Lowest in 11 yrs.	Mean 11 yr. Av.	Rain	Snow	Total Precip.	
January	50	−49	4·36	–	6·93	0·69	8,399[1]
February	49	−42	6·42	–	9·32	0·93	7,642[1]
March	75	−40	19·55	0·29	9·63	1·25	9,057[1]
April	87	−11	39·42	0·82	3·91	1·21	9,069[2]
May	92	12	51·50	2·14	1·18	2·26	9,341[2]
June	94	26	59·40	4·42	–	4·42	8,286[2]
July	103	37	67·31	2·75	–	2·75	7,060[1]
August	100	34	64·62	3·44	–	3·44	7,427[1]
September	96	10	54·23	1·28	–	1·28	7,656[1]
October	85	− 1	44·14	0·69	2·45	0·93	8,627[1]
November	64	−23	22·42	0·20	7·00	0·90	8,137
December	64	−42	12·65	0·06	6·07	0·67	8,701[1]
Annual			37·17	16·09	46·48	20·73	99,402

[1] 10 year Average. [2] 9 year Average.

TABLE 2.—ANNUAL PRECIPITATION

Dominion Reclamation Station, Melita, Manitoba,
1937–1947 (11 years)

(Inches)

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1937....	0·55	0·75	–	2·41	2·35	4·18	4·07	1·36	1·62	2·32	0·30	–	19·91
1938....	0·30	1·15	1·20	0·56	1·67	0·99	1·89	2·38	0·02	1·03	1·82	1·07	14·08
1939....	0·98	0·80	0·60	0·67	2·03	2·35	3·75	2·05	1·28	0·22	0·05	0·26	15·04
1940....	0·30	1·67	0·50	1·47	3·07	2·69	3·92	5·45	1·16	0·98	1·10	0·60	22·85
1941....	1·02	0·75	1·25	2·20	4·15	5·76	1·50	4·41	3·67	0·79	2·11	0·21	27·82
1942....	0·35	0·47	3·07	1·65	1·96	4·13	4·30	4·33	0·79	0·10	0·57	1·72	23·44
1943....	1·57	0·95	1·65	0·69	3·19	4·48	2·07	2·44	0·38	0·38	0·37	0·07	18·24
1944....	0·05	0·20	2·07	0·89	1·42	9·69	1·67	5·92	1·54	–	0·45	0·23	24·13
1945....	0·42	0·40	2·46	1·36	1·22	3·82	1·53	2·85	1·24	1·34	1·27	0·47	18·38
1946....	0·65	1·27	0·64	0·31	2·06	1·90	4·53	3·15	1·42	2·65	0·95	0·63	20·16
1947....	1·42	1·85	0·37	1·05	1·75	8·63	1·06	3·51	0·94	0·45	0·94	2·07	24·04
Aver. 11 yrs.	0·69	0·93	1·24	1·21	2·26	4·42	2·75	3·44	1·28	0·93	0·90	0·67	20·73

TABLE 3.—A COMPARISON OF PRECIPITATION RECORDS

Period Covered	Precipitation
12 Months	*Average*
1883–1937[1] (55 years)	17·63 inches
1937–1947 (11 years)	20·73 inches
1929–1934 (6 years)	14·58 inches (includes drought period)
Four growing months April, May, June, July	
1883–1937[1] (55 years)	8·37 inches
1937–1947 (11 years)	10·64 inches
1929–1934[1] (6 years)	6·44 inches (includes drought period)

These data are mean values for all stations in the area, including Waskada, Deloraine, Pipestone, Pierson, Hartney, Souris and Melita. The figures are taken in large part from the Soil Survey Report, Southwestern Manitoba, by J. H. Ellis, Soils Department, University of Manitoba and W. H. Shafer, Dominion Department of Agriculture.

It will be noted from Table 3 that during the 11 years, 1937 to 1947, inclusive, the mean annual precipitation has exceeded by more than 3 inches the mean annual precipitation during the long-term period of 55 years, 1883 to 1937, inclusive. On the other hand, in the six-year period, 1929 to 1934, inclusive, there were over 3 inches less mean annual precipitation than occurred during the 55-year period. Thus, during most of the time covered by this progress report actually there were more than 6 inches greater mean annual precipitation than during the drought years, 1929 to 1934, inclusive.

When the four growing months only are considered, the same general trend is shown. It will be appreciated, therefore, that the period covered by this report has been one of unusually heavy mean annual precipitation.

TABLE 4.—THE OCCURRENCE OF FROST AND FROST FREE PERIODS

Dominion Reclamation Station, Melita, Manitoba,
1937–1947 (11 years)

Year	(Freezing Temperature 32°F., or lower)		
	Date of last frost in Spring	Date of first frost in Fall	Days frost free
1937	June 8	Sept. 15	99
1938	June 11	Sept. 15	96
1939	June 11	Sept. 10	91
1940	June 19	Sept. 10	83
1941	June 8	Sept. 9	93
1942	June 13	Sept. 18	97
1943	June 6	Sept. 10	96
1944	May 8	Sept. 19	125
1945	May 29	Sept. 13	107
1946	June 18	Sept. 1	74
1947	June 1	Sept. 15	106
Average	June 7	Sept. 12	97

Date of the latest spring frost on record —1940 June 19–32°.
Date of the earliest fall frost on record —1946 Sept. 1–29°.
Shortest frost free period on record —1946–74 days.
Longest frost free period on record —1944–125 days.

Wind

Wind mileage records kept at the Station since 1936 show that the most frequent and damaging winds occur during March, April and May with May giving the highest wind mileage record. Other months in which high wind mileage and velocity have been recorded are October and December. This indicates the necessity of protecting land against drifting in the fall before snow provides a cover, and in the spring after the snow has disappeared. In the spring the land is usually most vulnerable to high winds before work commences, and, after seeding, until the crop makes a protective cover.

Field Husbandry

CULTURAL EXPERIMENTS

Experiments on the Control of Soil Erosion

Shortly after the establishment of the station in 1935, plantings of tree shelterbelts and intersectional hedges were made on one quarter section. The value of these windbreaks in reducing wind velocity at the ground and thereby reducing soil drifting, is recognized. The remainder of the station is not protected by trees, and experiments are conducted on the control of soil erosion by other means.

Strip farming and the use of trash cover have proved valuable in controlling wind erosion. By comparison with surrounding farms where such practices are not followed their value has been clearly demonstrated.

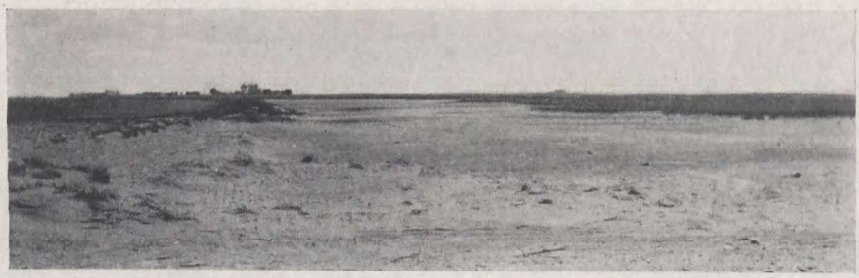

Fig. 3.—Wind erosion damage at Reclamation Station 1935. Over a foot of topsoil has been removed in this area.

STRIP FARMING

Width of Strips: In an experiment conducted from 1937 to 1943, inclusive, on width of strips, using 4- 8- and 16-rod widths, it was evident that soil drifting could be equally controlled with the wider strips as with the 4-rod strips. Practically all of the fields on the Station are now 10 rods wide.

Direction of Strips: To be most effective in preventing wind erosion, strips should be so arranged that prevailing high winds will blow across the strips rather than down their length. Observations from 1938 to 1947 indicate that wind of sufficient velocity to cause soil drifting came more frequently from the northwest than from any other direction. From these results it would appear advisable to run strips from northeast to southwest, but since this plan would not be practical on most farms, strips running north and south or east and west, with a preference for the former, would be recommended.

TRASH COVER

The most effective cultural method of controlling soil erosion on grain land in Manitoba is through the maintenance of a trash cover on the summerfallow. The protection afforded by a trash cover depends on the amount of trash available and the success with which it is anchored on the surface to protect the soil. A trash cover is generally composed of stubble from the previous year's crop as well as any weed growth that may be present. The preservation of a trash cover depends largely on the proper use of machinery. In the investigations at Melita, the broad shared cultivator has proved more effective than the one-way disk in destroying weed growth and at the same time leaving the crop residue on the surface. More than once over with the one-way disk even at a slow speed usually buries too much of the trash for satisfactory soil protection.

Fig. 4.—Trash cover.

AUTUMN SPREADING OF STRAW TO OBTAIN A TRASH COVER

An experiment was conducted from 1937 to 1943 to find out the advantages of spreading straw on fallow strips in the autumn and also to determine the need for anchoring the straw in the soil. Results showed that on areas where there was not adequate plant residue to prevent drifting, adding straw was beneficial in giving protection. However where straw spreading was not necessary to prevent drifting there were no benefits to this practice and it tended to increase weeds. Also a slightly lower yield of the succeeding crop resulted. Pressing the straw in with the press drill did not appear advantageous.

BINDER STUBBLE VS. COMBINE STUBBLE

In 1941 an experiment was designed to compare the effect of combine stubble with that of binder stubble in soil drifting control. The crop sequence is a three year rotation, summerfallow, wheat, oats. The heavy combine stubble from the wheat crop when worked into the soil apparently had a depressing effect on the yield of oats the following year. Binder stubble yielded 48 bushels of oats per acre, over a six year average, while after combine stubble the average yield was only 33·7 bushels per acre. During the years of the experiment, soil drifting was not a problem and from the standpoint of erosion no difference has been apparent.

SURFACE TILLAGE VS. PLOUGHING

This experiment is designed to compare the value of surface tillage with ploughing in the preparation of land for grain crops. A duck-foot cultivator is used for the first operation on the surface tillage part of the experiment and a mould board plough for the initial work on the ploughed area. Subsequent work on both areas is done with the cultivator.

Yield and cost averages for eleven years show only a very slight margin in favour of exclusive surface tillage. Surface tillage has, however, afforded trash cover protection to the soil.

The crops in this experiment have been harvested with the binder and thresher. The effect of a heavier trash such as is left by the combine harvester has not entered into the results.

Fig. 5.—Soil drifting conditions on bare fallow in the fall of 1942. This field now produces excellent yields of alfalfa hay.

BASIN LISTING

In the autumn of 1938 an experiment was started to determine the value of the basin lister as a tillage implement on light land with special reference to its usefulness in conserving water and in preventing soil drifting. In 1942 the soil drifted badly on the fallow treated with the lister and it was decided that on sandy soils where drifting is a constant hazard, work done by the lister predisposed the soil to wind erosion. Listing did not increase the moisture content of the soil. Its operation on the comparatively level fields of the station did not therefore appear to serve any useful purpose.

SUMMERFALLOW SUBSTITUTES

From 1937 to 1943 tests were conducted to evaluate corn as a summerfallow substitute. Eroded soil did not appear well suited to growing corn as yields of fodder were very light and weed infestation extensive. Corn in wide spaced rows (16 feet) on summerfallow strips afforded some protection to the soil in fall and winter months, but the weed infestation following corn reduced yields of the succeeding crops. This cultural practice has not therefore shown sufficient advantage to warrant its general adoption.

Methods of Preparing Stubble Land for Crop

An experiment was designed to determine the most practical tillage method of preparing stubble land for crop and the best time of the year for tillage operations on light soils. The following methods of preparing wheat stubble for barley have been tested—one-way disk in the autumn; one-way disk in the spring; cultivate in the autumn.

Weeds have been best controlled on land one-wayed in the fall but higher yields gave evidence that more moisture is conserved by leaving tillage until the spring. The soil drifting hazard has also been less with spring tillage.

CROP ROTATION STUDIES

Crop rotation studies occupy an important place in the investigational work conducted at the Reclamation Station. In 1936 eleven rotations were laid down. Further rotations were started in later years replacing some of those started earlier.

TABLE 5.—CROP ROTATIONS TESTED AT MELITA, 1936-1947

Rotation Designation	Length	Crop Sequence
	Years	
10A	2	Fallow, wheat.
10B	2	Fallow, fall rye.
10C	2	Clover hay, wheat.
10D	2	Fall rye hay, wheat.
10E	3	Clover hay, wheat, wheat.
10F	3	Clover hay, corn, wheat.
10G	3	Fallow, wheat, wheat.
10H	3	Fallow, wheat, fall rye.
10I	4	Fallow, wheat, clover hay, oats.
10J	4	Corn, wheat, clover hay, oats.
10K	6	Fallow, wheat, hay, hay, corn, oats.
10L	5	Fallow, wheat, fall rye, fall rye hay, wheat.
10M	4	Fallow, wheat, clover hay, wheat, (hay-4-years).
10N	8	Fallow, wheat, oats, hay, hay, hay and break, wheat, oats.

Rotations 10A to 10K inclusive were conducted on severely eroded soil and with six years results from 1937 to 1942 only rotations 10E and 10F showed satisfactory profits. The two year rotation 10C showed a small profit.

In 1943 an eight-year rotation 10N replaced rotations 10B, 10C, 10D, 10E, 10G, 10H and 10J. Rotations 10I, 10K and 10L were conducted until 1945. Tables 6, 7 and 8 give a summary of the results of the rotations up to the time they were discontinued.

TABLE 6.—SUMMARY OF FOUR-YEAR ROTATION 10I. 1937-1944 INCLUSIVE.

Crop	Yield per Acre 8 year Average	Profit or Loss per Acre 8 year Average
	bu. or tons	$
1. Fallow	-	−3.49
2. Wheat (seed clover)	10·3	1.80
3. Sweet clover hay and fallow	·89	−0.52
4. Oats	39·1	5.73
Total for Rotation	-	3.52
Average per Acre	-	0.88

This rotation has shown a profit per acre almost double that of the two-year rotation of alternate wheat and fallow for the same eight-year period. It has also the advantage of providing a high protein hay but is not as useful in the rebuilding of eroded soils as a cropping system that includes grass as well as a legume.

TABLE 7.—SUMMARY OF FIVE-YEAR ROTATION 10L. 1938-1943 INCLUSIVE

Crop	Yield per Acre 6 year average	Profit or Loss per Acre 6 year average
	bu. or tons	$
1. Fallow	-	−3.74
2. Wheat	20·5	6.71
3. Fall Rye	14·8	−0.24
4. Fall Rye (hay)	0·93*	−0.75
5. Wheat	19·9	6.22
Total for Rotation	-	8.20
Average per Acre	-	1.64

* 4 year average.

This rotation was designed to determine the practicability of substituting fall rye hay for summerfallow. Crops used make little provision for the return of fibre and none for the return of nitrogen to the soil. Reasonably good results have been secured during recent wet seasons, but it is doubtful if sufficient moisture could be conserved in dry years to support four consecutive grain crops.

TABLE 8.—SUMMARY OF SIX-YEAR ROTATION 10K. 1940-1944 INCLUSIVE

Crop	Yield per Acre 5 year average	Profit or Loss per Acre 5 year average
	bu. or tons	$
1. Fallow	-	−3.10
2. Wheat (seed Brome and sweet clover)	14·3	6.35
3. Hay	1·20	−0.13
4. Hay and break	1·22*	−0.83
5. Corn	3·89	2.02
6. Oats	33·16	6.50
Total for Rotation	-	10.81
Average per Acre	-	1.80

* 4 year average

This rotation is adapted to mixed farming areas where considerable hay and fodder is required. It makes provision for increasing soil fibre and only one field in the six is fallowed each year. An objectionable feature is that of having corn following late ploughing of brome grass. A complete kill of brome is frequently not obtained and the grass continues to grow in the corn crop making it difficult to cultivate and causing low yields of fodder.

Rotations That Continue Under Test

TWO-YEAR ROTATION—10A

Results from this rotation for the years 1937 to 1947 show an average yield per acre of 16·8 bushels of wheat, produced at a cost of 74 cents per bushel and yielding an average profit at market price of $2.35 per acre.

THREE-YEAR ROTATION—10G.

The crop sequence was changed from fallow, wheat, wheat in 1945 to fallow, wheat, barley.

This rotation is commonly used by farmers throughout Manitoba. In the three years for which results are available a reasonably high profit per acre has been obtained. Neither the two- nor three-year rotation provides, however, for the restoration or maintenance of fertility and the physical structure of the soil.

A COMBINATION ROTATION—10M

1. Fallow or breaking.
2. Wheat and seed sweet clover.
3. Sweet clover hay and break.
4. Wheat.
5. Hay (down for four years).

} Four year rotation.

This has been one of the most promising rotations under test at the Reclamation Station. It occupies five fields, one of which remains seeded down to brome and alfalfa hay for four years while the other fields go through a four-year rotation of fallow, wheat, sweet clover hay and break, wheat. Every fourth year the field of wheat after the year of sweet clover breaking is seeded to brome and alfalfa and left down for four years, the old hay field is then broken up and brought into the four-year rotation.

Results of this rotation for the years 1938 to 1947 inclusive are shown in the following table:

TABLE 9.—RESULTS OF COMBINATION ROTATION 10M. 1938-1947 INCLUSIVE

Year in Rotation	Crop	Average per Acre 10 years		Profit or Loss
		Yield	Cost	
		bu./ton	$	$
1	Fallow or breaking	–	4.70	−3.14
2	Wheat	19·3	6.73	9.49
3	Sweet clover hay and break	1·05[1]	7.12	−1.09
4	Wheat	19·1	7.06	9.79
5	Hay	0·96[2]	5.21	−0.80
	Average for Rotation per acre	–	6.16	2.85

[1] Av. 7 years. [2] Av. 9 years.

Rotation 10M is proving satisfactory for this area. Yields have been reasonably high and returns from the rotation over the past ten years have been encouraging. It is suited to mixed farming practices where a sizeable herd is maintained and for the restoration or maintenance of soil fibre and organic matter.

EIGHT-YEAR ROTATION—10N

1. Fallow.
2. Wheat.
3. Oats and seed brome and alfalfa.
4. Hay.
5. Hay.
6. Hay and break.
7. Wheat.
8. Oats.

This rotation, now gaining in popularity throughout Manitoba, is proving satisfactory on the Station. It is a well balanced rotation and satisfies reasonably well the requirements of a mixed farm and a soil that needs rebuilding. Half of the land is in cash crops each year and stubble fallow is reduced to one-eighth. The hay crops are seeded down long enough to improve the physical structure of the soil and with the use of alfalfa and brome grass as the hay crop, fibre and nitrogen are added to the soil.

Fig. 6.—A good mixture of brome and alfalfa growing on sandy soil at the Station. This field is part of the eight-year rotation.

The main disadvantage of this rotation in areas of low rainfall is that seeding down is done with the second grain crop after fallow, and the risk of not securing a catch is involved.

SOIL FERTILITY

Soil fertility is contained mostly in the surface layer of the soil. When this layer has been almost completely removed by wind the fertility is reduced to a point where it will scarcely support plant growth. The problem of returning these soils to productiveness has been one of major importance in the investigational work conducted at the Melita Station. Methods of reclaiming the eroded land have included—the use of barnyard manure and commercial fertilizers, the seeding of grasses and legumes for hay and pasture, and the growing of sweet clover as a green manure.

Manure and Commercial Fertilizers for Wheat

The object of this experiment has been to determine the effectiveness of various commercial fertilizers and rotted barnyard manure for increasing the productiveness of eroded soils.

The following treatments have been compared in a three-year rotation of fallow, wheat, wheat.

(1) Triple superphosphate applied at 45 pounds per acre (T.S.P.).
(2) Ammonium phosphate (11-48-0) at 40 pounds per acre (A.P.).
(3) Rotted barnyard manure at 10 tons per acre.
(4) Ammonium phosphate (16-20-0) at 100 pounds per acre.
(5) Check—no treatment.

The commercial fertilizers are applied with both the first and second crop wheat while the manure is applied only during the fallow year. The following table shows average results of this test for the eleven-year period 1937 to 1947 inclusive.

TABLE 10.—MANURE AND COMMERCIAL FERTILIZERS FOR WHEAT 1937–1947

—	T.S.P. 45 lb/ac.	A.P. 11-48 40 lb/ac.	Manure 10T/ac.	Check	A.P. 16-20 100 lb/ac.
	bu/ac.	bu/ac.	bu/ac.	bu/ac.	bu/ac.
Average yields 11 years	21·2	22·1	23·5	18·3	20·0
Increase over check	2·9	3·8	5·2	–	1·7
WHEAT AFTER WHEAT					
Average yields 11 years	14·1	15·4	17·4	13·3	16·8
Increase over check	0·8	2·1	4·1	–	3·5

All treatments have shown an increase over the check but barnyard manure appears to be superior to commercial fertilizer for increasing yields of wheat on eroded soil. One application of 10 tons per acre of manure in the fallow year has resulted in an average increase of over 9 bushels of wheat per acre, from the two successive crops compared with plots where no manure or fertilizer was applied. Barnyard manure appears to build up a reserve of soil fertility as indicated by increased yields during the second crop year.

An increase of weeds on land where manure is applied is definitely noticeable even though the manure is rotted for a year or more before being applied. This and the cost of application constitute the chief disadvantages of manure as a fertilizer.

Ammonium phosphate (11-48-0) has given good results, especially with wheat after summerfallow. Ammonium phosphate (16-20-0) has been less effective. Triple superphosphate has given no increase in yields of wheat after wheat.

TABLE 11.—VALUE OF CROP PER ACRE AFTER DEDUCTING COST OF FERTILIZER 1937–47 INCLUSIVE

—	T.S.P.	AP 11-48	Manure*	Check	AP 16-20
	$	$	$	$	$
Wheat after fallow. Average value 11 years	16.85	17.40	16.97	15.42	14.39
Wheat after wheat. Average value 11 years	10.67	11.67	13.39	11.33	11.54

* A charge of fifty cents per ton is made for applying manure.

The use of commercial fertilizers and manure on light soils has been profitable in this test only during years of relatively high grain prices and when moisture conditions are such that good yields are obtained.

Manure and Commercial Fertilizers for Wheat on Eroded Soil

A test similar to the above on slightly eroded and severely eroded soil has given similar results with increases being obtained from each treatment. Manure proved more effective than the commercial fertilizers for increasing yields of wheat on such soils. This was also borne out in the results of a greenhouse test conducted from 1940 to 1944 inclusive. Indications are, however, that the restoration of sufficient fertility to grow good crops on areas where the top soil has been completely removed would take many years of such treatments.

Manure and Commercial Fertilizer in Combination for Oats and Barley

An experiment was designed in 1945 to test the effect of various rates of applying rotted barnyard manure with and without commercial fertilizer—ammonium phosphate (11-48-0) to oats and barley. Definite increases were obtained with the manure and the commercial fertilizer but lodging followed heavy applications of barnyard manure and yield differences between the various rates were not clearly defined.

Renovation of Old Stands of Brome Grass and Alfalfa by Manure and Commercial Fertilizers

The effect of barnyard manure and commercial fertilizers on grasses and legumes has been tested to determine the best method of renovating old stands of alfalfa, brome grass and mixtures of brome and alfalfa. The original stands were seeded in 1940 and the first applications of manure and fertilizer were made in 1945. The soil on this field had been eroded by wind and in one area practically all of the top soil had been removed. The following treatments were made (1) manure at 6 tons per acre, (2) ammonium phosphate (16-20-0) at 100 pounds per acre, (3) no fertilizer but disked with a single-disk grain drill, (4) check (no treatment).

In 1945 and 1946 marked increases were obtained by the use of manure and commercial fertilizers. The results indicated that barnyard manure was more effective in increasing yields of brome grass than the commercial fertilizer, while the commercial fertilizer, ammonium phosphate (16-20-0), gave greater increases with alfalfa than the manure. Where the land was disked with the grain drill there was very little beneficial effect.

The Effect of Various Grasses and Legumes on Yields of Subsequent Grain Crops

Various grasses and legumes were used in this experiment to determine what effect they had on yields of succeeding crops after ploughing them up. The plots remained down for three years and were then fallowed for one year. Two successive crops of wheat were then grown. The test was replicated six times.

The following table gives average comparative yields of wheat following each kind of grass and legume.

TABLE 12.—YIELDS OF WHEAT AFTER GRASSES AND LEGUMES

Grass or Legume Crop	Yield in bushels per acre of wheat	
	First Crop Wheat 3-year average	Second Crop Wheat 2-year average
Alfalfa	23·5	15·8
Sweet Clover	22·9	14·3
Slender wheat	22·0	13·5
Crested wheat	17·2	15·2
Brome	15·8	12·4

Both the first and second crop wheat after alfalfa gave the highest yields, while yields of wheat after brome grass have been the lowest in both cases.

Sweet Clover as a Green Manure

Nine years' results on an experiment to determine the effects of ploughing down sweet clover as a green manure showed that little or no benefit was derived from this procedure on light soils. When moisture is deficient a loss generally occurs with the wheat after sweet clover due to the moisture used by the sweet clover. When moisture has been abundant the increase obtained has not been sufficient to pay for the added cost of the clover seed.

Manure and Commercial Fertilizer for Corn

A complex experiment was conducted from 1940 to 1945 inclusive to determine the effect of various rates and methods of application of commercial fertilizers and rotted barnyard manure on the yield of corn, both for grain and for ensilage. Ammonium phosphate (11-48-0) was applied at 25, 50, 100 and 200 pounds per acre with the seed, and at 50 pounds per acre below the seed; ammonium phosphate (16-20-0) at 50 pounds; triple superphosphate at 50 pounds; C.I.L. (2-16-6) at 50 and 150 pounds; ammonium sulphate at 50 and 100 pounds, all with the seed and rotted barnyard manure at 12 tons per acre as a top dressing. The test was in triplicate. Falconer was the corn variety used.

Yield data for the past six years indicate that ammonium phosphate (11-48-0) has been the best fertilizer treatment used for corn at Melita. Light applications appear to be nearly as beneficial as heavy applications. The use of commercial fertilizer on corn has resulted in: (1) Accelerated growth, (2) Hastened maturity, (3) Increased yields of dry matter, (4) Increased tillering, and (5) Increased height of plants.

Corn has not responded to applications of barnyard manure as favourably as to ammonium phosphate (11-48-0).

The following illustration shows the response of corn during the growing season to an application of AP 11-48-0 at 50 pounds per acre.

Fig. 7.—Corn fertilizer test. Corn to left of centre has been fertilized with ammonium phosphate 11-48-0 at 50 lb. per acre. Check plot is to right. Photo taken June 10.

The Effect of Grasses and Legumes on the Physical and Chemical Composition of the Soil

An experiment was designed to determine the change in nitrogen and organic-matter content of soils where the land has been left seeded down to grasses and legumes. Unfortunately no record was made of the original level of these constituents in the soil when the seeding down was done but the change from 1941 to 1946 was recorded. Although the results were somewhat irregular, indications are that the process of restoring the nitrogen and organic-matter content of eroded soils by grass and legume seedings is a slow one and would take many years of careful management. The possibility of restoring the original level of these constituents to the soil by short-term plans of regrassing is doubtful.

MACHINERY INVESTIGATIONS

Machinery investigations have been undertaken at the Reclamation Station with a view toward securing information as to the efficiency and effectiveness of different machines with special reference to their use on light soils.

Press Drill versus Wheel Drill versus One-Way Seeder

The object of this experiment was to test the relative merits of the press drill, wheel drill and one-way seeder with respect to their influence on soil drifting control and crop returns on fallow and stubble land. From 1938 to 1944 the press drill and wheel drill only were compared. Since 1944 comparison has included also the one-way seeder. The results show the different methods of seeding to have had relatively little effect upon crop yields. Observations indicate that emergence of the grain in the spring was rather slow and uneven when seeded with the one-way seeder. On the average of the past three years, grain seeded with the one-way seeder has been about four days longer emerging than when seeded with the press drill, while the grain seeded with the wheel or disk drill was one or two days longer emerging than that seeded with the press drill.

There was found to be no advantage in seeding summerfallow with the one-way seeder. It is slow and costly and tends toward pulverization of the soil. The slower emergence of the grain seeded by this method leaves the land more vulnerable to soil drifting. In seeding stubble land the one-way seeder has an advantage in that only one operation is necessary. The press drill appears advantageous for soil drifting control as it corrugates the surface and tends to anchor the trash and stubble and thereby lessens the danger from drifting. Under average conditions it would appear that the added cost of a seeder attachment for a one-way disk is not generally warranted by the advantages of this method of seeding.

Methods of Harvesting: Combine versus Thresher

A comparison has been made between the costs of harvesting with the binder and thresher and with the swather and combine on adjacent strips of uniform soil during the four-year period 1943-46 inclusive. A rotation of summerfallow, wheat, oats, is used for each method of harvesting. The land is worked entirely by the one-way disk and cultivator. Combine straw and stubble are retained and worked into the soil.

TABLE 13.—COMPARISON OF COSTS FOR METHODS OF HARVESTING 1943-1946 INC.

Method	Average yield per ac.	Cutting or swathing	Stooking	Twine	Threshing	Total Harvest Operations	
						Per Ac.	Per Bu.
	bu.	$	$	$	$	$	$
Wheat on Fallow:—							
Binder and thresher.....	29·4	.77	.44	.33	2.54	4.08	·143
Swather and combine.....	26·3	.42	–	–	1.83	2.25	·090
Oats after Wheat:—							
Binder and thresher.....	52·3	.72	.52	.33	2.43	4.00	·080
Swather and combine.....	33·9	.37	–	–	1.85	2.22	·075

Costs per acre have been considerably less with the swather and combine than with the binder and thresher. The lower yield of oats on the combined field is considered to be the result of drilling the crop into a poor seed-bed prepared by one-waying heavy combine stubble and straw. It has resulted in the cost per bushel being high for this field. Weed infestation has been slightly worse in the part of the experiment which is combined, due to the difficulty experienced in working couch grass covered by a heavy trash, and from the fact that more weed seeds are scattered on the land by this method of harvesting.

WEED CONTROL

Chief among the experiments with weeds at the Melita Station has been the chemical eradication of leafy spurge. Other experiments have included—the usefulness of crested wheat grass in controlling leafy spurge, tillage at harvest time for control of annual weeds and methods of eradicating couch grass.

Herbicides for the Control of Leafy Spurge

Early experiments at Melita for the control of leafy spurge involved the use of sodium chlorate. This work was conducted at the Station in 1939 and 1940. As a result of information derived from these investigations and from work done at the Dominion Experimental Farm, Brandon, the Provincial Department of Agriculture, in co-operation with municipalities, inaugurated a plan to control leafy spurge on a province-wide basis.

From 1945 to 1947 experiments were conducted to obtain information on the value of 2,4-D preparations for the control of leafy spurge. Different formulations and rates of application were used. Sodium chlorate was included as a control. The treatments of 2,4-D were applied at various stages of growth including full emergence, early bud, full bloom, late bloom and pre-frost.

It was found that one spraying of 2,4-D was not sufficient to bring about control of leafy spurge. The top growth was killed effectively with all treatments but growth was soon resumed from the roots.

Pre-frost sprayings appeared to be more effective than summer sprayings. The reduction of stand in 1946 from treatment at pre-frost stage in 1945 was from 25 per cent to 75 per cent, the heavier applications giving the greatest kills. The late bloom sprayings of 2,4-D caused little reduction of stand by the following year and the full bloom and earlier sprayings were even less effective.

In 1946 in addition to sprayings made at the above dates an experiment was conducted in triplicate where the plots were sprayed three times during the season—on June 25, July 26, and September 28. For this part of the experiment 2,4-D in an amine base was used exclusively at a concentration of 2000 parts per million in water and a rate of 1½ gallons per square rod.

Even the three sprayings did not cause complete eradication of the weed. After the first spraying on June 25, 90 per cent of the top growth was killed in all plots. The remaining 10 per cent was killed with the second spraying July 26. Shortly thereafter growth was resumed from the roots of some of the plants, and at the time of the third spraying was in a rosette form about 2 inches high. The third spraying killed only 25 per cent of the small plants.

A test similar to the above was conducted in 1947 with the plots being sprayed five times during the season. All of the top growth was killed, but whether or not a complete kill of leafy spurge was effected will have to await the growing season of 1948.

Seeding Crested Wheat Grass Into Leafy Spurge

In 1942 an experiment was undertaken whereby crested wheat grass was seeded into land infested with leafy spurge to investigate the possibility of the grass competing with the weed. Seedings were made in May 1942, 1944 and 1945. The 1944 seeding was resown in September 1944.

A good catch of grass was obtained from the 1942 seeding and this was still an excellent stand in 1947. At this time there were only a few leafy spurge plants remaining, which were dwarfed and had practically no seed on them. There was a very poor catch of grass from the 1944 seedings and this has been reflected by a thriving growth of the leafy spurge in this plot. The 1945 seeding was not a complete failure in that the crested wheat grass grew in spots. However, as yet it has offered little competition to the leafy spurge.

The following table shows average square foot counts of leafy spurge on successive years from the three seedings of crested wheat grass.

AVERAGE COUNTS OF LEAFY SPURGE PER SQUARE FOOT

Year of Seeding Crested Wheat Grass	Year of Count		
	1944	1945	1946
1942	34	33	21
1944	104	62	43
1945	-	-	28

The crested wheat grass is apparently gradually crowding out the leafy spurge. If 1942 conditions could be duplicated this procedure of seeding crested wheat grass into leafy spurge would be highly successful in controlling the weed. Complete eradication of leafy spurge by this method would seem doubtful.

After Harvest Tillage for Control of Weeds

This experiment was designed to determine the value of harvest cultivation in controlling annual weeds, with special emphasis on the control of Russian thistle .The experiment was started in 1938. For the first two years the test was conducted with wheat, but since 1941 oats has been used. One field is cultivated or one-way disked, immediately after harvest, while the other is left untouched until the following spring. In the spring both fields are given similar tillage treatment. Table 14 shows yield data for 1939-47 inclusive.

TABLE 14.—THE EFFECT OF AFTER HARVEST TILLAGE ON YIELDS OF SUCCEEDING CROPS

Crop	Year	Yield per acre after:	
		Harvest and Spring Tillage	Spring Tillage only
		bu.	bu.
Wheat	1939	19·1	12·4
Wheat	1940	24·7	19·4
Average 1939 and 1940	.....	21·9	15·9
Oats	1941	52·2	58·0
Oats	1942	69·3	67·2
Oats	1943	78·9	64·1
Oats	1944	69·4	60·1
Oats	1945	63·6	40·4
Oats	1946	26·2	18·4
Oats	1947	29·0	30·4
Average 1941-47	.....	55·5	48·4

As well as giving a higher yield of grain, after harvest tillage has been effective in reducing the numbers of annual weeds in the succeeding crops. This method has been effective in controlling Russian thistle as well as being helpful in controlling couch grass which has been the most persistent weed on the Station.

Couch Grass Eradication

Extensive investigation was undertaken in 1936 to compare methods of eradicating couch grass. The plough, one-way disk, and cultivator have been compared. The most effective method of eradication has been the persistent use of the stiff-tooth cultivator with narrow points. The one-way disk may occasionally be used to advantage especially when only small patches of couch are present in a field.

A bulletin entitled "Control of Couch Grass in Manitoba" containing detailed information on this subject has been prepared based on the work at the Melita Station and projects conducted at Brandon. This bulletin may be had on request from the Dominion Experimental Farm, Brandon, Man.

Cereals

Cereal tests conducted at the Reclamation Station were designed to obtain information on the following:

(1) The most suitable varieties of wheat, oats, barley and flax for the district.

(2) Optimum rates of seeding spring wheat, durum wheat, oats, and barley.

(3) Optimum dates of seeding hard spring wheat, durum wheat, oats and barley.

These tests are conducted in 1/125 acre plots in triplicate.

Variety Tests

Wheat.—Wheat variety tests date back to the first year of the Station and have included each year the common varieties grown throughout the province together with any new introductions or hybrids which appeared promising. The following table is a summary of wheat yields for the past eight years.

TABLE 15.—YIELDS OF WHEAT VARIETIES 1940-1947 INCLUSIVE

Variety	Yield in bushels per acre								Average 8 years
	1940	1941	1942	1943	1944	1945	1946	1947	
Regent	13·3	37·9	24·8	53·9	36·6	31·6	36·0	26·6	32·6
Renown	23·3	36·7	21·8	48·9	31·7	28·3	35·2	21·8	31·0
Thatcher	13·7	31·5	18·8	43·9	31·7	28·7	38·5	24·4	28·9
Redman	–	–	–	–	–	–	39·4	28·4	–
Mindum	28·3	32·3	27·4	28·3	44·9	42·1	39·6	34·3	34·7
Carleton	–	–	–	–	46·3	45·7	40·0	33·3	–
Stewart	–	–	–	–	–	44·9	42·7	35·7	–

Regent has given the highest average yield of the hard wheat varieties over the eight-year period. The new variety Redman tested for the first time in 1946 considerably outyielded Regent in 1946 and 1947. Durum varieties have generally yielded higher than common wheats.

Oats.—Oat varieties have been tested in the same manner as that outlined for wheat. The following table is a summary showing yields from 1942 to 1947 inclusive.

TABLE 16.—YIELDS OF OAT VARIETIES 1942-1947 INCLUSIVE

Variety	Yield in bushels per acre						6-Year Average
	1942	1943	1944	1945	1946	1947	
Ajax	45·9	87·5	98·9	93·2	89·3	92·2	84·5
Vanguard	70·9	78·1	89·8	91·0	85·7	89·7	84·2
Exeter	63·6	67·2	83·8	86·9	91·2	99·4	82·0
Gopher	53·5	70·8	75·1	80·0	85·1	–	–
Brighton	–	31·1	64·3	38·4	71·6	64·1	–
Laurel	–	–	67·0	50·4	69·4	68·6	–
Beaver	–	–	–	–	86·4	96·8	–
Beacon	–	–	–	–	90·9	88·7	–
Garry	–	–	–	–	–	73·5	–

In recent years oats have yielded well on the Station. Medium early maturing varieties, such as Ajax and Vanguard, appear to suit the soil and climatic conditions at Melita. The very early variety Gopher has yielded significantly lower. Exeter, which is several days later in maturity than Ajax, has yielded well in 1946 and 1947 but has not averaged as high as Ajax or Vanguard.

Barley.—Of the cereal crops barley ranks second in importance to wheat in this area. The barley test to determine the variety most suited to the Melita area has included seven named varieties and three Brandon hybrids for the past four years.

Because of the importance of strength of straw in barley the table below includes a comparison of the varieties for this character as well as for yield. The strength of straw is rated from 0 to 10; ten representing a plot that is standing upright and zero one that is completely lodged.

TABLE 17.—BARLEY VARIETIES—YIELD AND STRENGTH OF STRAW 1944-1947 INC.

Variety	Yield in bushels per acre				Av. 4 yrs.	Strength of straw (0-10)				Av. 4 yrs.
	1944	1945	1946	1947		1944	1945	1946	1947	
Br. 112	65·6	65·8	73·5	56·2	65·3	9·0	9·0	6·8	9·0	8·5
Plush	55·9	64·5	72·3	64·3	64·3	7·5	7·5	5·2	6·8	6·8
Sanalta	67·2	65·2	68·9	51·1	63·2	9·25	8·7	8·5	7·5	8·5
Montcalm	63·9	62·1	58·0	64·8	62·2	7·5	6·3	6·2	8·3	7·1
OAC.21	55·8	63·0	51·6	61·1	57·9	6·25	7·3	5·7	8·2	6·9
Wisc.38	46·6	64·7	56·0	56·3	55·8	7·25	3·3	3·3	5·8	4·9
Titan	51·9	54·3	55·1	59·3	55·1	9·5	8·3	8·8	9·3	9·0
Vantage	–	–	68·5	58·8	–	–	–	8·3	8·3	–
Br. 1136	–	69·2	57·6	–	–	–	8·5	9·5	–	–
Br. 1239	–	–	62·3	56·4	–	–	–	8·3	9·3	–
Br. 1986	–	–	–	68·0	–	–	–	–	9·2	–

Of the named varieties Plush has given the highest yield for the four years from 1944 to 1947 inclusive followed closely by Sanalta and Montcalm. Sanalta yielded considerably lower than the others in 1947. The hybrid Brandon 112 has outyielded these named varieties. Montcalm has yielded considerably above OAC. 21 and appears to have a somewhat stronger straw, but neither is outstanding in this respect. Titan and Sanalta and Brandon 112 have shown a greater strength of straw than the other varieties tested.

Flax.—Flax appears to be well suited to the Melita area and in recent years a marked increase in the acreage seeded has occurred.

The following table is a summary of the yields of the flax varities under test since 1940.

TABLE 18.—YIELD OF FLAX VARIETIES 1940-1947 INCLUSIVE

Variety	Yield in bushels per acre								Average 8 years
	1940	1941	1942	1943	1944	1945	1946	1947	
Royal	23·2	13·6	19·2	18·3	20·2	21·3	27·9	25·3	21·1
Redwing	20·5	12·9	14·1	19·8	24·2	16·2	27·1	25·9	20·1
Bison	17·9	13·0	16·6	14·7	–	–	–	–	–
Viking	–	–	–	–	–	13·7	29·1	14·9	–
Rocket	–	–	–	–	–	–	27·5	–	–

On the long-term average Royal has slightly outyielded Redwing and is probably preferable in this part of the province. Two recently licensed varieties Rocket and Dakota are now recommended in the province. They have not been tested sufficiently at the Melita Station to make any recommendation but in other tests throughout the province have shown up extremely well.

Rates and Dates of Seeding Grain

Rates of Seeding Wheat.—To determine the optimum rates of seeding hard spring wheat and durum wheat in the Melita district, experiments were carried on at the Station from 1938 to 1943 inclusive. The following rates were tested: ¾, 1, 1¼, 1½, and 1¾ bushels per acre for the hard wheat and 1, 1¼, 1½, 1¾ and 2 bushels per acre for the durum wheat. The variety of hard wheat used was Renown and the durum variety was Mindum. The following summary table shows the yields from seeding wheat at different rates for this six-year period.

TABLE 19.—YIELDS OF HARD SPRING WHEAT FROM VARIOUS RATES OF SEEDING—1938-1943 INCLUSIVE

Rate of seeding per acre	Yield in bushels per acre						Average 6 years
	1939	1938	1940	1941	1942	1943	
¾ bushel	14·2	9·4	26·7	24·8	19·4	46·1	24·1
1 bushel	14·2	11·0	26·7	26·2	22·4	46·0	24·4
1¼ bushels	15·0	10·8	23·5	24·2	24·9	42·3	23·2
1½ bushels	12·9	11·2	23·5	23·1	25·8	42·2	22·8
1¾ bushels	12·8	11·0	23·3	27·7	25·1	41·7	23·6

TABLE 20.—YIELDS OF DURUM WHEAT FROM VARIOUS RATES OF SEEDING—1938-1943 INCLUSIVE

Rate of seeding per acre	Yields in bushels per acre						Average 6 years
	1938	1939	1940	1941	1942	1943	
1 bushel	11·9	18·3	28·5	26·0	30·6	43·7	26·5
1½ bushels	12·5	19·2	31·2	25·9	33·2	43·5	27·6
1½ bushels	11·2	18·3	30·8	25·7	33·4	41·3	27·4
1¾ bushels	13·5	19·8	30·0	24·1	35·7	39·7	27·4
2 bushels	15·2	21·7	28·5	25·2	34·1	39·6	26·5

Rate of seeding does not have a marked influence on the yield of grain. Growing conditions in certain years appear to favour heavier seeding while in other years higher yields are obtained from medium or light rates of seeding.

Rates of Seeding Oats and Barley.—A similar test to determine optimum rates of seeding oats and barley has been conducted since 1944. The rates of seeding have been 1, 1½, 2, 2½, and 3 bushels.

TABLE 21.—YIELDS FROM VARIOUS RATES OF SEEDING OATS AND BARLEY 1944-1947 INCLUSIVE

Rate of seeding per acre	*Ajax Oats* Average yield 1944-1947 inc.	*Plush Barley* Average yield 1944-1947 inc.
	bu./ac.	bu./ac.
1 bushel	89·4	58·3
1½ bushels	93·7	59·9
2 bushels	96·7	63·8
2½ bushels	95·6	62·6
3 bushels	99·0	61·6

For the four years that this test has been conducted the optimum rate of seeding Plush barley appears to have been about 2 bushels per acre, although the difference in yield between the various rates has been small. Heavier rates of seeding for oats have given higher yields. These tests have been conducted on summerfallow and during the years that the test has been conducted rainfall was generally abundant.

Dates of Seeding Grain.—This test has been conducted since 1938. Durum wheat, hard wheat, oats and barley have been included. The purpose of the investigation has been to determine the optimum dates of seeding the various grains.

The first seeding is made as early in the spring as soil and weather conditions permit. Subsequent seedings are made at weekly intervals.

The first seedings have been made on the following dates: 1938-April, 14; 1939-April 14; 1940-April 25; 1941-April 29; 1942-April 23; 1943-April 21; 1944-April 19; 1945-May 2; 1946-April 25; 1947-May 3.

The tables below show a summary of the yields of grain from the various dates of seeding from 1938 to 1947 inclusive.

TABLE 22.—YIELDS OF HARD WHEAT FROM VARIOUS DATES OF SEEDING 1938-1947 INCLUSIVE

Seeding	Yield in bushels per acre										10 yr. Average
	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	
1st	6·9	13·5	39·2	38·5	36·3	41·9	39·2	27·8	43·4	26·5	31·3
2nd	7·7	15·2	40·4	29·4	31·0	43·4	41·8	26·4	39·6	27·1	30·2
3rd	7·7	13·9	39·2	26·8	24·5	41·3	44·7	26·7	38·7	20·8	28·4
4th	6·9	15·2	37·7	23·6	25·3	40·6	47·1	26·2	38·3	10·5	27·2
5th	4·6	8·3	33·7	15·4	20·8	36·8	32·1	21·0	34·2	7·0	21·4
6th	–	–	–	–	11·7	36·3	28·8	16·0	28·7	–	–
7th	–	–	–	–	5·1	28·8	26·9	11·6	23·1	–	–

NOTE.—1938-1943 inclusive—Variety Renown. 1944-1947 inclusive—Variety Regent.

TABLE 23.—YIELDS OF DURUM WHEAT FROM VARIOUS DATES OF SEEDING 1938-1947 INCLUSIVE

Seeding	Yield in bushels per acre										10 yr. Average
	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	
1st	4·4	16·7	30·4	33·4	28·8	42·1	41·0	43·9	39·8	40·3	32·1
2nd	3·5	15·2	27·1	25·1	31·1	38·2	38·0	40·8	39·2	37·9	29·6
3rd	4·6	15·4	28·3	20·5	35·8	39·7	39·1	46·2	39·2	37·3	30·6
4th	3·3	18·3	27·1	7·7	29·8	38·6	35·6	43·2	39·1	20·8	26·4
5th	1·1	9·2	21·9	1·8	25·6	33·6	33·6	35·2	39·2	11·5	21·3
6th	–	–	–	–	26·6	29·6	26·0	26·7	32·5	10·0	–
7th	–	–	–	–	22·6	19·2	–	–	27·8	–	–

NOTE.—1938-1943 inclusive—Variety Mindum. 1944-1947 inclusive—Variety Carleton.

TABLE 24.—YIELDS OF BARLEY FROM VARIOUS DATES OF SEEDING 1938-1947 INC.

Seeding	Yield in bushels per acre										10 yr. Average
	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	
1st	12·5	28·5	42·7	59·4	46·6	52·9	47·3	63·6	63·9	68·1	48·6
2nd	11·8	32·0	51·3	61·0	46·9	53·4	53·7	59·2	68·5	63·3	50·1
3rd	14·1	31·8	45·8	63·0	45·0	47·3	57·3	59·6	69·6	66·4	50·0
4th	14·5	33·9	36·5	52·0	39·7	49·0	60·6	43·9	65·3	53·7	44·9
5th	7·7	26·1	36·5	34·8	33·7	51·9	49·6	45·4	58·5	38·8	38·3
6th	4·3	19·5	–	–	29·0	56·6	48·1	45·6	49·8	27·0	–
7th	–	–	–	–	20·3	52·5	47·0	40·7	38·9	13·8	–

NOTE.—1938 and 1939 Wisc. 38 used. 1940-1947 inc. Plush used.

TABLE 25.—YIELD OF OATS FROM VARIOUS DATES OF SEEDING 1938-1947 INC.

Seeding	Yield in bushels per acre										10 yr. Average
	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	
1st	27·2	46·0	83·4	68·9	75·4	82·9	100·5	91·6	90·9	90·0	75·5
2nd	29·8	50·7	80·8	75·2	84·9	85·8	103·9	86·9	94·4	94·0	78·7
3rd	32·3	50·0	77·2	81·8	81·8	80·7	96·3	93·2	97·3	89·4	78·0
4th	29·0	49·6	76·4	63·0	73·5	81·4	107·7	84·1	92·5	84·3	74·2
5th	26·5	32·0	73·5	50·5	64·7	80·9	99·7	84·7	–	80·1	–
6th	16·2	23·5	–	–	58·3	76·6	90·6	69·9	–	72·2	–
7th	–	–	–	–	45·0	57·5	86·6	44·7	–	52·7	–

NOTE.—1938-1943 inc. Variety Vanguard. 1944-1947 inc. Variety Ajax.

Ten years results on dates of seeding trials of wheat, oats, and barley at Melita indicate the following:

1. Highest yields of wheat generally result from the earliest seeding. However, good returns have been obtained from seedings done up to three weeks following the first seeding.

2. The optimum period for seeding oats and barley to obtain maximum yields appears to be up to three weeks after the first seeding with highest yields generally resulting from grain seeded during the second and third week of the normal seeding period or about the middle of May.

Forage Crops

Forage crops have played an important role in the reclamation of blown-out soil at the Melita Station. Because the groundwater table in this area is relatively close to the surface and because alfalfa stands, when once established, do well the

Fig. 8.—Luxuriant growth of alfalfa on land that was formerly drifting sand.

tying down of the land by the use of alfalfa and grass can be effectively accomplished. By 1947 there were 362 acres of land on the Station which were seeded to grasses and legumes for hay and pasture.

Investigations in forage crops have included a comparison of various species, varieties, and strains of grasses and legumes, methods of seeding, the best time of year to seed forage crops and a comparison of yields from annual hay crops.

Comparison of Hay Yields from Grasses and Legumes

In tests to compare hay yields from the various grasses and legumes, sweet clover although a biennial, has generally given the highest tonnage, followed by alfalfa, brome grass, and slender wheat grass in the order given. Crested wheat grass has generally given the lowest yield.

When seeded in a mixture, those plots containing sweet clover again gave the highest yields. Of the perennial mixtures alfalfa and brome grass has proved to be the best in this area.

A test to compare yields of hay from different mixtures of alfalfa with brome grass and crested wheat grass and also brome, alfalfa, and crested wheat grass seeded alone, was laid down in 1943.

Table 26, indicates results of the test in 1944 and 1946 with the two-year average:—

TABLE 26.—YIELDS OF GRASSES AND ALFALFA ALONE AND IN MIXTURES

Crop	Yield of Hay in tons per acre		
	1944	1946	Av. 2 yrs.
Crested wheat grass 12 lb., alfalfa 4 lb./ac.	1·21	1·90	1·55
Brome 6 lb., Alf. 6 lb./ac. (Mixed)*	1·31	1·72	1·46
Alfalfa 10 lb./ac.	1·41	1·29	1·35
Brome 6 lb., Alf. 6 lb./ac. (Alt. Rows)*	1·23	1·28	1·26
Brome 14 lb., Alfalfa 4 lb./ac.	1·03	1·38	1·20
Brome 14 lb./ac.	0·90	0·92	0·91
Crested wheat grass 12 lb./ac.	0·60	0·53	0·55

* Mixed and in alternate rows—explained below under Methods of Seeding Grasses and Legumes.

The plots were cut only once in both 1944 and 1946. No yield data were taken in 1945. The plot of crested wheat grass and alfalfa mixed is largely alfalfa, which would account in part for the higher yield. The mixture of brome 6 pounds and alfalfa 6 pounds per acre, has outyielded that of brome 14 and alfalfa 4 pounds in both years of the test.

Crested wheat grass has not succeeded well in mixtures. In most seasons it is difficult to establish stands of crested wheat grass from spring seedings.

Methods of Seeding Grasses and Legumes

In the Melita area which is subject periodically to dry years and where most of the soil is light in texture and eroded by wind, there is a great need for studying methods of seeding grasses and legumes. Expensive seed is frequently lost because it is seeded too deeply, often at the wrong time of year, into soil that has been poorly prepared, or is too dry for seed to germinate. Grass and legume seeds should only be seeded one-half to one inch deep into a moist and firmly packed seed-bed.

An alternate row method of seeding grass and legume mixtures was developed at the station in 1938 and has been tested since that time. This method involves the use of a grass seeder attachment. The feed cups in the grain drill that supply

the back row of disks are blocked and the tubes from the corresponding runs of the grass seeder attachment connected to them are left open. The remaining feed cups in the grass seeder attachment are blocked. The legume seed is sown through the grass seeder attachment while the nurse crop and the grass seed are sown through the main drill box into the front disks. Pressure springs on the rear disks, which are seeding the legume seed, are released so that they penetrate only about one inch. The resulting crop is alternate rows of grass and grain, with legume and the following year is alternate rows of grass and legume.

This method has been tested for a number of years and has been compared with the system of mixing both the grass and legume seed with the grain and seeding the mixture in every drill row.

From the results of the experiment to date it would appear that when moisture conditions are satisfactory either system of seeding may be used with success. When moisture is a limiting factor, however, the alternate row method of seeding appears to have an advantage in better establishment of the grasses and legumes especially during the seeding year.

Dates of Seeding Grasses and Legumes

An experiment was conducted from 1938 to 1943 to determine the best time of the year to seed grasses and legumes in the Melita area. Seedings were made in early fall (September) late fall (November), and early spring (April). Alfalfa, sweet clover, crested wheat grass, slender wheat grass and brome grass were included in the test. All seedings were made in 1/50 acre plots in duplicate.

Results for the five years of the experiment favour fall seeding for grasses but for legumes early spring seeding is generally more satisfactory.

In many years considerable success was had with mid-summer seeding of alfalfa. This involved working the land as fallow until about the middle of June. Between then and July 15 preferably after a rain, the land should be cultivated to kill weeds, then packed, and the alfalfa seeded about ½ to 1 inch deep with about ½ bushel of oats. The oats are not cut but left to hold snow in winter and afford protection to the legume seedlings during the first year.

Annual Hay Crops

In dry seasons annual hay crops play an important role in the production of hay in the Melita area. Tests were commenced at the Station in 1939 to determine the kinds of annual crops best suited for hay production.

Table 27 records yields of dry matter from annual hay crops for the years 1940-1945 inclusive and for 1947, with the 7-year average.

TABLE 27.—YIELDS OF ANNUAL HAY CROPS

Crop	Yields in tons of dry matter per acre							Average 7 years
	1940	1941	1942	1943	1944	1945	1947	
Siberian Millet	1·77	2·49	1·85	2·11	2·80	2·93	3·54	2·50
Crown Millet	1·87	2·00	1·67	2·56	3·22	2·86	2·46	2·38
Vanguard Oats	2·06	2·04	2·37	2·16	3·62	2·36	1·95	2·37
Plush Barley	1·57	1·78	2·30	2·64	2·35	2·15	2·32	2·16

There has been little difference in the yield of dry matter among the four varieties tested for the seven-year period. The yields compared favourably with those produced from two cuttings of alfalfa. Alfalfa hay is, however, higher in digestible nutrients and minerals and much higher in protein. Alfalfa will produce several seasons without reseeding while annual hays have to be seeded each year. The yield data on the above tests were obtained from crops grown on summerfallow.

Corn

Corn variety tests for the production of fodder and grain have been carried on at the Station since 1938. The relatively low fertility of the soil does not produce high yields of either forage or grain from corn and in some years it is not sufficiently mature at the time of killing frosts to produce grain. Of the varieties under test for forage production in the past five years, Falconer has given the highest yield with an average of 2·02 tons per acre dry weight; Wisconsin 240 averaged 1·93 tons; Rainbow Flint 1·92 tons, and North Western Dent, 1·64 tons per acre. In recent years many of the varieties under test have been Morden hybrids. These have yielded well by comparison with the other varieties.

In the corn variety test for the production of grain no average figures are available because the varieties tested were changed from year to year and during several unfavourable seasons few varieties matured seed.

Livestock

There was a purebred Shorthorn herd of seventy-eight head at the Station in 1947. The maintenance of a cattle herd at Melita serves the following purposes:—

(1) To augment the cattle breeding project at the Experimental Farm, Brandon.

(2) To make use of the feed supplies produced from rotations including grasses and legumes on the Station.

(3) To produce an adequate supply of barnyard manure to be used in experiments in soil building.

(4) To supply information as to what pasture crops are best suited to the area.

Steer feeding tests were undertaken during the winters from 1941 to 1945 to compare the values of home grown feeds and to compare different feeding methods.

A quarter section of the Station provides pasture for the cattle. A fence divides the quarter so that rotational grazing can be practised. The pasture was seeded in strips of various grasses and alfalfa including the following:—brome grass, alfalfa, crested wheat grass, slender wheat grass, and brome and alfalfa in mixture.

Fig. 9.—Purebred Shorthorn cattle grazing alfalfa pasture at Station.

In addition to the perennial pasture an area has been seeded annually in the spring to oats and fall rye. The advantage of these annual crops as a supplementary pasture is that in the hot weather, when the perennial pasture becomes dry and dormant, the oats and fall rye continue to provide succulent feed.

The cattle have shown a preference for alfalfa, or brome and alfalfa by grazing these strips more closely than the others. Crested wheat grass has been less closely grazed.

Shelterbelts

Soon after the Reclamation Station was established a project was developed to test the effectiveness of shelterbelts as a measure for control of soil erosion by wind. One-quarter section of the Station was planted with a three-row belt of trees on the boundaries and also three intersectional hedges each forty rods apart running east and west dividing the quarter into four strips. Caragana, box elder, poplar, elm and ash were used.

The shelterbelts and hedges have thrived, some of the trees having reached approximately 30 feet in height by 1947.

Fig. 10.—Field shelterbelts planted 1936. Photo taken 1943.

There has been practically no soil drifting on this quarter section in recent years. This can be attributed in part to the protection afforded by the trees.

Horticulture

In years of sufficient rainfall the sandy loam soil of this area produces good yields and excellent quality of many garden vegetables.

Potatoes have been grown at the Station with marked success. Certified seed potatoes have been grown for several years. This soil tends to produce tubers of excellent cooking quality and gives fairly high yields. In 1946, 201 bushels of potatoes were harvested from one acre.

Field Demonstrations

Alfalfa has done well in the area of the Souris Basin where the water-table is relatively close to the surface of the ground. In order to demonstrate the yielding ability, hardiness, and feed value of alfalfa in this area, the Reclamation Station has selected locations and supplied seed to the farmers who have co-operated by growing five acre test plots of this crop. These plots are located wherever possible along highways or market roads for demonstration.

Fifteen plots were seeded in 1943 in the Melita, Napinka, Bede and Elva districts. These plots were highly successful and created interest in alfalfa growing. In 1945 sixteen additional plots were seeded in the Pipestone, Belleview Scarth and Woodnorth districts. These too have met with outstanding success.

Fig. 11.—Alfalfa Demonstration Plot.

ALFALFA DEMONSTRATION PLOTS

Name of Co-operator and Address	Estimated yields of hay.			
	1944	1945	1946	1047
Seeded 1943:—	Loads per plot	Tons per ac.	Tons per ac.	Tons per ac.
Robt. Banks, Elva	–	1·0	–	2·0
P. K. Bailey, Elva	–	1·2	–	2·2
A. W. Bodkin, Napinka	4	1·5	2·0	1·5
Harold Bugg, Napinka	10	2·0	2·0	1·5
Percy Brockinton, Melita	–	2·0	2·0	2·0
Ken Furtney, Melita	8	2·0	0·6	2·5
Jas. Gillander, Melita	–	–	1·0	seed
Wm. Kruger, Bede	8	1·8	2·0	1·2
W. V. McClure, Melita	14	1·0	2·6	3·6
R. H. Moore, Coulter	8	1·5	2·4	–
J. E. Shillington, Melita	7	1·0	cut for seed.	
Keith Sherman, Melita	Failure.	–	–	–
Carl Swanson, Melita	–	1·7	1·0	3·0
Milton Taylor, Melita	6	1·9	1·5	2·0
Robson and Holmes, Bede	–	1·2	0·6	not cut.
Seeded 1945:—				
Eugene Campion, Belleview			1·0	3·0
E. T. Campion, Belleview			–	0·5
W. A. Davis, Pipestone			1·8	4·0
T. L. Dempsey, Pipestone			1·6	–
T. L. Duncan, Deleau			Failure	–
J. S. Ellsworth, Pipestone			1·8	3·5
Rene Gabrielle, Virden			1·0	2·5
Gannon Bros., Bede			1·6	–
Chas. Lawrence, Pipestone			1·2	1·6
Henry Lobel, Scarth			1·0	1·5
D. J. McIntosh, Scarth			0·6	seed
Alex. McKenzie, Pipestone			1·0	2·3
Rene Plaisier, Oak Lake			2·2	seed
A. E. Shoemaker, Woodnorth			1·0	seed 50 lb. per ac.
Robt. Smithson, Pipestone			–	–
R. Dodds, Pipestone			1·0	seed 90 lb. per ac.

Yields of hay from these plots have been encouraging. The farmers are generally well pleased with the growth produced by the alfalfa and with the excellent quality of the hay. A number of co-operators have seeded additional acreages of alfalfa on their farms in varying amounts up to ninety-five acres.

Publications

Bulletins that have been published containing work of the Reclamation Station are:—

Eradication of Leafy Spurge	Publication	710
Hays and Haymaking In The Prairie Provinces	"	722
Control of Couch Grass In Manitoba	"	765

Active Projects at Dominion Reclamation Station, Melita, Manitoba, December 31, 1947

A Comparison of Various Species, Varieties and Strains of Forage Crops	Ag. 400
Cereal Varieties	Ce. 1
Control of Soil Drifting (Binder Stubble vs Combine Stubble.)	F.269
Summerfallow treatment (Surface tillage vs. ploughing)	F.144
Eradication of Farm Weeds (Russian Thistle)	F.278
Two-year rotation—Summerfallow, wheat	F.105
Three-year rotation—Summerfallow, wheat, wheat	F.107
Combination rotation—Summerfallow, wheat, hay, wheat, hay—4 years	F.532
Eight-year rotation	F.641
Manure vs. Commercial Fertilizer for Wheat	F.513
Methods of seeding down grasses and legumes	F.537
Green Manure Experiment (Sweet clover)	F.194
Dates of Seeding Grain Crops	F.155
Rates of Seeding Grain Crops	F.161
Chemicals for Weed Eradication	F.284
Leafy Spurge Eradication	F.594
Cost of Combining vs. Costs of Threshing	F.269
The Effect of Grasses and Legumes on Subsequent Grain Crops	F.622
Eradication of Farm Weeds—(Couch Grass)	F.220

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