CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS SERVICE

DOMINION EXPERIMENTAL STATION

SCOTT
SASK.

G. D. MATTHEWS, B.S.A., SUPERINTENDENT

PROGRESS REPORT
1937 - 1947

AN ORGANIZED GROUP OF FARMERS WHO ARRANGED A DATE AND VISITED THE EXPERIMENTAL STATION, SCOTT, SASK., TO EXAMINE THE WORK IN PROGRESS.

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DOMINION EXPERIMENTAL STATION
SCOTT, SASK.

Introduction

Experimental study of farm problems was begun in 1911 at the Experimental Station at Scott, Sask. With the 4 District Experiment Substations and 4 Illustration Stations supervised from Scott, the Station serves the central western and northwestern regions of the province.

A progress report from Scott was published in 1937, giving the results of experiments conducted during the years 1931 to 1936, inclusive. The present report summarizes the work done in the period 1937-1947, inclusive.

There have been many ups and downs in agriculture in central, western, and northwestern Saskatchewan during this period. Methods of farming have changed and become modernized and much has been learned by both technical and practical agriculturists.

It is intended that this report may assist the practical farmer in realizing a more profitable return from his farming operations. Many details are of necessity omitted in a report of this kind on account of limited space, but the reader should feel free to write to the Superintendent at Scott Experimental Station regarding any special point of interest.

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Meteorological Data

Weather is an all important consideration for the farmer, particularly in a semi-arid country where rainfall is light and uneven in distribution and where other climatic features are equally variable.

For the past thirty-six years meteorological data have been recorded at Scott in co-operation with the Meteorological Service of Canada. Because of the frequent inquiries from farmers and other sources for data on weather, four tables follow which give some figures relating to weather and certain farm operations which are influenced by the climate.

Table 1 contains a summary of the meteorological records giving monthly figures covering temperature, precipitation, sunshine, wind and evaporation. The highest temperature of 102.7 was recorded on June 16, 1933, and the coldest of 59 below on February 15, 1936. Under the heading "mean temperature" are given the average temperatures for each month which show January to be the coldest and July the warmest month of the year. In total sunshine July excels, with December being the lowest. April and May have the most wind, the latter being the only month to average over ten thousand miles. Consequently, May is the most dangerous month from the standpoint of soil drifting. The figures for evaporation are measured daily with a special instrument from an open tank sunk to ground level and serves as a comparative indication of the moisture efficiency in a given area.

TABLE 1.—METEOROLOGICAL RECORDS

Dominion Experimental Farm, Scott, Sask.

1912-1947 (36 years)

Month	Temperature degrees F.			Precipitation			Bright Sun (hrs.)	Wind (miles)	Evaporation* (in.)
	Highest	Lowest	Mean	Rain (in.)	Snow (in.)	Total Precip. (in.)			
January	44·5	−55·4	0·31	0·02	6·38	0·66	84·5	7,805	.....
February	53·4	−59·0	5·44	0·02	5·73	0·59	115·4	7,894	.....
March	65·0	−35·6	16·57	0·02	5·81	0·60	150·2	9,433	.....
April	92·0	−20·8	37·62	0·50	3·37	0·84	210·7	9,495	.....
May	98·7	12·0	49·74	1·45	0·25	1·48	257·3	10,365	4·01
June	102·7	20·2	57·33	2·26	.....	2·26	256·7	8,976	3·57
July	100·0	27·2	61·88	2·18	.....	2·18	315·8	8,164	4·58
August	98·2	22·1	59·19	1·79	.....	1·79	269·6	8,021	3·81
September	89·0	7·6	48·95	1·31	0·20	1·33	178·9	8,312	2·45
October	87·2	−19·0	37·75	0·52	2·13	0·73	148·9	8,893	.....
November	67·0	−28·2	20·00	0·07	5·74	0·64	91·0	8,000	.....
December	56·0	−47·5	6·88	0·02	6·45	0·67	72·3	8,289	.....
Annual	.....	.....	33·47	10·16	36·03	13·8	2,151·3	103,647	18·42

* Wind and Evaporation—25-year average.

Undoubtedly, the dominant weather consideration is precipitation which includes both snow and rain. One of the outstanding features of both snow and rain under conditions at this Station is the wide variation in any month over a period of years. The summer months are the most important from a crop production standpoint and in this connection it is interesting to note (see Table 2) that April has ranged from no precipitation in 1912 to 2·54 inches in 1921; May from ·20 inches in 1918 to 4·00 inches in 1941; June from ·29 inches in 1918 to 5·67 inches in 1923; and July ·26 inches in 1922 to 4·25 inches in 1923. Similarly, the total for these four months has ranged from 2·94 inches in 1918 to 11·30 inches in 1916.

Another comparison can be made in the total annual precipitation. It shows a range from 6·59 inches in 1918 to 20·79 inches in 1916. During the past thirty-six years only nine have had close to average precipitation with ten below and seventeen above average. This has been reflected in the yield of wheat on fallow which records show only three seasons to have given near the average of 15·9 bushels per acre, while in twenty of these years the production was lower and averaged 8·8 bushels per acre. Only thirteen of these years had higher production and averaged 26·6 bushels per acre.

TABLE 2.—ANNUAL PRECIPITATION

Dominion Experimental Farm, Scott, Sask.

1912-1947 (36 years)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1912	0·37	0·62	0·23	0·00	2·46	2·19	6·16	2·93	2·01	0·15	0·20	0·27	17·59
1913	0·68	0·42	0·23	0·15	0·95	1·28	2·98	2·62	1·24	0·46	0·25	0·08	11·64
1914	0·65	0·03	0·20	1·36	1·15	2·37	1·80	1·41	3·51	3·17	0·60	1·80	18·05
1915	0·10	0·15	0·05	0·90	1·40	3·54	2·11	0·48	0·98	0·25	0·40	0·10	10·46
1916	1·25	0·50	1·05	0·52	2·52	4·23	4·03	3·87	1·77	0·50	0·05	0·50	20·79
1917	0·60	0·15	0·03	1·10	0·41	0·88	1·03	1·78	0·46	0·13	0·25	0·55	7·37
1918	0·77	0·49	0·57	0·58	0·20	0·29	1·87	0·93	0·19	0·32	0·10	0·28	6·59
1919	0·73	0·30	0·90	0·79	0·88	0·91	0·75	2·56	1·56	1·22	0·15	0·43	11·18
1920	1·30	0·28	1·25	0·62	0·65	2·47	3·74	2·37	1·49	0·54	0·36	0·45	15·52
1921	0·53	0·80	0·95	2·54	1·39	1·66	1·65	0·56	2·51	0·00	0·68	0·23	13·50
1922	0·40	0·43	0·40	0·79	2·03	0·87	0·26	3·04	0·56	1·01	0·08	0·55	10·42
1923	0·35	0·52	0·22	0·29	0·95	5·67	4·25	1·45	0·65	0·32	0·06	0·30	15·03
1924	0·12	1·10	1·10	1·03	1·10	0·58	0·70	2·87	1·60	0·31	1·11	0·95	12·57
1925	0·94	1·08	0·81	1·41	1·51	3·48	2·68	1·31	2·05	0·72	0·30	0·56	16·85
1926	0·48	1·23	0·05	0·91	2·97	1·39	0·75	2·52	0·74	0·61	0·83	1·09	13·57
1927	0·11	0·08	0·51	1·42	2·54	2·14	3·10	1·18	2·46	0·74	0·59	0·02	14·89
1928	0·01	0·07	1·36	1·54	0·82	2·73	3·00	0·61	0·16	0·36	0·00	0·28	10·94
1929	0·54	0·49	0·44	0·94	0·63	2·64	0·67	0·45	1·32	0·22	0·80	0·83	9·97
1930	0·68	0·59	0·40	0·38	0·38	2·79	2·45	1·08	1·38	1·14	0·40	0·39	12·06
1931	0·20	0·30	0·83	0·27	0·12	2·41	3·13	0·83	2·21	0·52	0·83	0·95	12·60
1932	1·62	0·30	1·23	1·66	1·82	2·99	2·78	1·30	0·77	0·24	0·60	0·65	15·96
1933	0·65	0·78	1·22	0·91	1·34	1·78	0·86	1·67	1·80	1·11	0·70	1·75	14·57
1934	0·93	0·45	0·53	0·73	1·70	5·03	1·52	1·47	1·11	0·03	0·58	1·15	15·26
1935	1·15	0·25	0·78	1·25	0·82	2·30	1·98	1·26	0·66	1·28	2·20	1·20	15·13
1936	1·05	0·73	0·15	0·44	0·78	1·79	0·96	0·85	0·44	1·08	0·43	1·80	10·50
1937	0·85	1·10	0·70	1·20	2·28	0·77	2·91	0·65	0·71	1·44	1·35	1·08	15·64
1938	1·50	1·63	0·50	0·73	2·38	1·44	1·71	1·61	2·59	1·32	2·00	0·25	17·66
1939	0·90	1·75	0·45	0·32	1·56	4·44	1·20	0·84	0·60	0·49	0·32	1·13	14·00
1940	0·28	0·89	1·10	0·75	1·75	2·53	2·09	0·09	0·50	1·76	1·53	0·50	13·77
1941	1·40	0·05	1·38	0·53	4·00	1·10	0·78	2·33	1·21	0·37	0·56	0·17	13·88
1942	0·02	0·28	0·36	1·83	1·07	3·57	3·70	1·50	1·57	0·61	0·83	0·39	16·08
1943	0·41	0·86	0·28	0·12	2·92	1·45	2·81	2·28	0·77	1·66	0·75	0·08	15·06
1944	0·25	0·70	0·80	0·04	3·39	2·84	4·02	4·99	1·09	0·07	0·33	0·15	18·67
1945	0·75	0·64	0·22	1·12	0·61	1·11	1·37	1·68	1·93	0·28	0·59	0·51	10·81
1946	1·05	0·74	0·18	0·84	1·27	1·81	0·90	4·25	0·58	1·63	1·29	0·60	15·17
1947	0·49	0·14	0·24	0·35	0·45	1·85	1·70	2·89	2·60	0·33	1·02	1·40	13·06
Average 36 yrs.	0·63	0·59	0·60	0·84	1·48	2·26	2·18	1·79	1·33	0·73	0·64	0·67	13·8

Another dominant weather factor in this region is frost in relation to crop production. Records have been kept showing the last frost in the spring and the earliest frost in the fall. Dates of late spring frosts, as with rainfall, show a wide variation. In two years out of three, a light frost may be expected in June and as a general rule tender garden plants should not be transplanted outside until the tenth of that month. Similarly, in two years out of three, frost does not occur in August. Actually the frost-free period in one year out of two is less than ninety days.

In Table 3 is set forth the average frost-free period of ninety days. This is not quite correct because mid-summer frosts are not shown. Actually, there

have been frosts recorded in July in three years out of thirty-seven. These were in 1911 (with 31·6 on July 12), in 1918 (with 27·2 on July 24 and 29·6 on July 25) and in 1946 when the temperature dropped on July 23 to 31 degrees. Only in ten seasons out of thirty-six has the frost-free period been over one hundred days with two of these years, occurring consecutively, reaching one hundred and eighteen days.

TABLE 3.—THE OCCURRENCE OF FROST AND FROST-FREE PERIODS

Dominion Experimental Farm, Scott, Sask.

1912-1947 (36 years)

Year	Spring Frosts	Fall Frosts	Frost-Free Periods
	Date last frost in Spring	Date of first frost in Fall	Days frost free
1912	June 6	September 15	101
1913	June 14	September 2	80
1914	May 28	August 25	89
1915	June 6	August 23	68
1916	May 29	August 11	74
1917	June 20	September 6	78
1918	June 5	September 3	90
1919	June 9	September 2	85
1920	June 13	August 20	68
1921	June 4	September 9	97
1922	June 7	September 9	94
1923	May 18	September 11	110
1924	June 24	September 13	81
1925	June 4	September 13	101
1926	June 14	August 8	55
1927	May 21	August 8	79
1928	May 11	August 23	104
1929	June 4	September 4	92
1930	June 4	August 31	88
1931	May 27	September 17	113
1932	May 27	September 19	115
1933	June 2	August 1	60
1934	June 3	August 23	81
1935	June 7	August 16	70
1936	June 3	September 9	98
1937	June 8	August 29	82
1938	May 29	August 23	86
1939	May 12	September 7	118
1940	May 14	September 9	118
1941	May 22	September 8	109
1942	May 30	September 2	95
1943	May 26	September 8	105
1944	June 17	September 15	90
1945	June 16	September 12	88
1946	June 17	September 1	76
1947	June 10	September 9	91
Average	.....	.....	90 days

Weather conditions for any particular season invariably determine when farm work commences or finishes. In Table 4 earliest and latest dates for a period of thirty-seven years are listed, together with the date of freeze-up. Most of these operations have a range of three to four weeks. Spring ploughing is used as an index as to when work commenced on the land and freeze-up as to when operations on the land finished.

TABLE 4.—DATES OF FARM OPERATIONS

Dominion Experimental Farm, Scott, Sask.

1911-1947 (37 years)

—	Earliest	Latest	Average
Spring ploughing	April 7, 1913	April 29, 1911	April 18
Seeding wheat	April 17, 1930	May 16, 1921	April 30
Seeding oats	April 17, 1937	May 27, 1922	May 6
Livestock put out on pasture	April 30, 1946	May 30, 1929	May 11
Planting potatoes	May 7, 1936	June 6, 1912	May 18
Cutting grass hay	June 25, 1926	July 20, 1931	July 9
Cutting wheat	Aug. 5, 1914	Aug. 26, 1943	Aug. 13
Cutting oats	July 28, 1938	Sept. 24, 1918	Aug. 19
Harvesting potatoes	Sept. 8, 1930	Oct. 9, 1918	Sept. 22
Livestock taken off pasture	Oct. 3, 1946	Nov. 15, 1923	Oct. 24
Date of freeze-up	Oct. 9, 1919	Nov. 18, 1923	Nov. 5

Field Husbandry[1]

Rotations

During the past ten years drought and soil drifting have been major considerations in the field crop practices in west central Saskatchewan. From these standpoints, the cropping system of grain and fallow has shown itself to be one of the most suitable methods in tested crop practices, consequently it has become most popular with farmers. Such a system, in most years, provides sufficient stubble and other crop residue to form a wind resisting trash cover. The effectiveness of this trash cover can be augmented by the practice of strip farming, a method to which this cropping system is very well adapted. Less frequent tillage and the use of cheaper, large-scale power methods have permitted a larger proportion of the land to be fallowed. Furthermore, the practice of alternate grain and fallow permits the seeding of larger acreages, per unit of power, in the spring, since it does not require the preparation of stubble land for seeding. Despite the increasing use of this rotation, especially by farmers in the drier parts of the area served by this Station, it has not excelled the profit realized from the use of a three-year rotation of summerfallow, wheat and wheat, as tested on this Station.

While the second crop grown after fallow has often been a failure on many farms, this has usually been due to the use of unsatisfactory tillage methods and to the lack of attention given to the stubble crop. At this Station, the method of preparing stubble in the three-year rotation has been to spring plough and pack. On the medium loam or heavier soil types located in the dark brown soil zone the growing of a second crop after fallow is a common practice. The use of phosphate fertilizers with the crop seeded on fallow, in the three-year rotation trials at Scott, has resulted in a marked degree of success. The wheat yields on fallow, when fertilized, were nearly six bushels per acre higher than those on stubble, while the yields on unfertilized fallow were only two bushels higher than the stubble yields over the past ten years.

Rotations, involving the use of grass, have met with little success, especially during the drier years covered in this report. The use of nurse crops in this area has often resulted in complete or nearly complete failure of the grasses to become established. The hay crops, with few exceptions, have been very low in yield, as well as quality, thus giving lower returns than grain crops. Wireworm damage to the grain crop on fallow, following grass, has been prevalent, with a resulting reduction in yield of several bushels per acre.

[1] Prepared by H. A. Friesen, Assistant in Field Husbandry.

A definite cycle of grass in a rotation does not seem to fit into prairie agriculture. Many farmers in the drier areas served by this Station have discontinued the use of rotations containing grass because the hay yields are often near failures, and the returns from feeding hay to livestock have been considerably lower than the returns from growing grain. Although a definite rotation, involving the use of grass, has not been found to be practical, grass has been used to advantage in a number of different ways. It has been found to be a valuable aid in programs for weed control, for wind and water erosion control and for use as a pasture or a seed crop. Where grass is used for such purposes it is generally left unbroken for at least four years.

TABLE 5.—AVERAGE YIELDS OF THE VARIOUS ROTATIONS

Dominion Experimental Station, Scott, Sask.

Rotation	Average yield per acre of:		Average yield per acre 1933-42	
	Grain in bu.	Hay in tons	Grain in bu.	Hay in tons
"B" Alternate fallow and wheat	*27-year av.*			
1. Wheat on ploughed fallow	17·4	.....	.....	.....
	15-year av.			
2. Wheat on ploughed fallow	11·8	.....	11·7	.....
3. Wheat on cultivated fallow (not ploughed)	11·6	.....	11·2	.....
"C" Three-year rotation of fallow, wheat, wheat	*36-year av.*			
1. Wheat on fallow	15·9	.....	14·4	.....
2. Wheat on stubble	14·2	.....	8·6	.....
	18-year av.			
3. Wheat on fallow receiving 20 lb./acre A.P. 11-48-0	17·4	.....	14·4	.....
4. Wheat on fallow not fertilized	13·2	.....	10·6	.....
"D" Four-year rotation of fallow, wheat, oats seeded down to sweet clover, sweet clover hay	*22-year av.*			
1. Wheat on fallow	16·5	.....	11·2	.....
2. Oats on wheat stubble	27·3	.....	18·4	.....
3. Sweet clover hay	.....	·68	.....	·57
"J" Six-year rotation of fallow, wheat, wheat, oats seeded down to grass legume mixture, hay, pasture	*36-year av.*			
1. Wheat on fallow	17·8	.....	10·1	.....
	30-year av.			
2. Wheat on stubble	14·1	.....	8·7	.....
	36-year av.			
3. Oats on wheat stubble	33·3	.....	20·0	.....
	31-year av.			
4. Hay	.....	·75	.....	·53
5. Hay (instead of being pastured has been cut for hay)	.....	·76	.....	·46

The cost of production per unit of land declined during the ten-year period covered in this report. Tillage of fallow land was reduced to the minimum required for effective weed control. The one-way disk has almost entirely replaced the plough for both fallow and stubble operations, thereby resulting in a great economy of power. The advent of still larger tillage machinery, while as yet not available to many farmers, will undoubtedly further reduce production costs. The harvester and thresher combine has greatly reduced harvesting costs, especially during the last few years when labour costs rose to exceptionally high levels.

During the war years virtually all farm operating costs, particularly farm labour, rose sharply. Fortunately, these increased costs were offset by similar increases in the return value of farm products and by the use of more economical farming practices.

Cultural Experiments

The experimental work with various tillage practices, as they affect the production of field crops, is rather extensive. The trials include: treatments of summerfallow and stubble, cover crops, soil packers, summerfallow substitutes, weed control, and straw mulch. A three-year rotation was used for all experiments and most of them have been in progress long enough to permit the making of fairly definite statements as to the results of the various treatments.

Methods of Summerfallowing

Because of the semi-arid conditions prevailing on the prairies, some form of summerfallow is an essential part of any cropping system. A number of different summerfallow treatments have been tested at Scott for the past thirty-two years. The results of these tests have shown that early tillage is of first importance in the preparation of a good summerfallow. On fallow worked May 15, when the weeds were just starting to grow, wheat yielded an average of five bushels per acre more than it did on fallow not worked until July 15, after the weeds had made considerable growth. These results, which are given in Table 6, clearly show the need for good weed control throughout the summerfallow year. The seeding of one-half bushel of oats per acre on fallow, as a means of controlling soil drifting, after the land was ploughed in June, depressed the following wheat yield to the same extent as when ploughing was delayed until July 15. Unlike a cover crop, the oats were cultivated after pasturing, thus leaving no growth to trap snow, which would have partly replenished the moisture used by the oats. A series of plots was used to test the value of tillage treatments prior to ploughing the fallow plots in June. Spring cultivating gave better returns than either cultivating or ploughing in the previous fall. This project has also proven conclusively that the yields on ploughless or cultivated fallow were equal to those on ploughed fallow. In other words, timely weed destruction is more important than the method used.

Claims have been frequently made that deep ploughing creates a moisture reservoir in the soil and is, therefore, a superior method to shallow ploughing. There was little difference in yield between plots ploughed four, six and eight inches deep; indeed, the results slightly favoured the four-inch depth. Furthermore, shallow ploughing has been cheaper and has given better control of certain annual weeds. From the standpoint of moisture conservation the results have shown that any method of summerfallowing which keeps the land free of weeds and other growth accomplishes the desired purpose. Timely cultivation with sharp implements has given better weed control and has usually reduced the number of cultivations required.

TABLE 6.—THE EFFECT OF DIFFERENT DATES OF COMMENCING WORK ON SUMMERFALLOW

Treatment	32-year-average yield in bushels per acre of wheat on fallow
Fallow ploughed 6 inches deep on May 15	24·6
Fallow ploughed 6 inches deep on June 15	22·7
Fallow ploughed 6 inches deep on July 15	19·2

Cover Crops

This experiment was begun in 1935 to test the value of cover crops in the control of soil drifting on summerfallow land. Seedings of wheat at one-half bushel per acre were made at different dates in the summerfallow year. Soil moisture samples were taken at the time of seeding the cover crop, at the end of the growing season, and the following spring. The six-year-average moisture analysis showed that the cover crops reduced the moisture in the first two feet of soil, but did not affect the third foot. This reduction in soil moisture was reflected in the yeild since fallow carrying a cover crop yielded approximately three bushels per acre less than did the bare fallow. Fallow on which the cover crop was sown late (August 15) did not suffer quite as severely as fallow on which the cover crop was sown early (July 15).

In dry years it was very difficult to obtain a good stand of the cover crop. Furthermore, in years when there was a grasshopper infestation the cover crops were eaten off.

Because of the lowered yields, the difficulty of obtaining stands and controlling weeds, the practice of seeding cover crops has not been adopted by farmers and was discontinued at Scott in 1942.

The practice of simply mowing the weeds several times during the fallow year and giving no tillage was tried in conjunction with the cover crop experiment. This method resulted in yield reductions of almost ten bushels per acre as compared with tilled fallow over the six years that it was tested. It has, therefore, been discontinued.

Stubble Treatments

(See also discussion of stubble treatments on the rented land, under P.F.R.A.)

Several tillage methods have been tested in the preparation of stubble land for grain crops. Spring ploughing of the stubble land has resulted in higher yields than fall ploughing for both wheat and oats by two and one-half and five bushels per acre, respectively. In the case of oats, spring cultivating was next, with fall ploughing giving the lowest yield. For wheat, fall disking gave yields equal to those on fall ploughing and the cost was much less. Early fall disking before fall ploughing did not materially influence the yield, but fall disking reduced the yield on spring ploughing by almost one bushel per acre. The fall disking treatments in this project were made rather deeply thus destroying the stubble which otherwise would have acted as a snow trap. A study of the results of this project shows that any fall tillage, which destroys the stubble, reduces the yield of the succeeding crop. Therefore, if fall tillage for weed control is practised, it should be very shallow so that the stubble is not broken down or buried. Where stubble land was simply seeded without any previous tillage the yields were extremely low and in the majority of the years in which this test was conducted this practice resulted in a crop failure. Spring burning of stubble with no tillage prior to seeding gave yields just slightly lower than spring ploughing. However, this practice is highly conducive to soil drifting and is, therefore, not recommended.

The stubble treatments in this project have been conducted for the past thirty-four years and the results quoted above are based on the average yields over that period of years.

Straw Mulch for Wheat

The value of spreading straw on the wheat crop, just after seeding, has been tested at Scott over the past twenty-one years. The straw was spread at the rate of one and one-half tons per acre, immediately after seeding on both summerfallowed and spring-ploughed stubble plots. The straw mulch did not

increase the yield of the crop on fallow, but the residual effect from it gave an increase of three bushels per acre in the following crop on spring-ploughed stubble. Applying straw to the crop on spring-ploughed stubble gave an increase of two and one-half bushels per acre. The residual effect on the crop on summer-fallow, following this treatment, gave only a very slight yield increase. The maturity of the crop, in the year that the straw mulch was applied, was delayed by almost four days.

The results of this experiment are of particular interest because of the now common use of the harvester combine which necessitates the leaving of large quantities of straw on the land. The results also show that the application of straw to certain areas of fields to prevent soil drifting will not impair the yields of crops.

Manure for Sunflowers

The value of applying both rotted and fresh manure to sunflowers was tested at Scott from 1915 to 1940. A three-year rotation of fallow, wheat and sunflowers was used. The manure was applied at two different times, namely, in the fall and in the spring just prior to seeding sunflowers. The spring application gave an average fodder yield increase of twenty-four per cent while the fall application gave an increase of eleven per cent. Fresh manure resulted in yields equal to those from rotted manure.

Methods of Regrassing Depleted Native Pasture using Crested Wheat Grass

The results of this test have shown that early fall seedings usually produced better stands than late fall seedings and much better stands than early spring seedings. The results also showed that some form of tillage to destroy the growth of sage and other weeds is necessary. Where the sod was ploughed and packed, excellent stands of grass were obtained at all seeding dates. Where a road drag was used or the sod was double disked the fall seedings resulted in good stands but the spring seedings gave poor stands. Single disking, double harrowing and seeding without any previous tillage, all resulted in fair stands where early fall seeding was practised, but resulted in very poor stands when late fall or early spring seeding was used.

Methods of Seeding Down Grasses and Clovers

A good stand is of first importance in the production of forage crops. Since the seeds of nearly all of the forage crops suited to the open plains are small, they must be seeded very shallow. The semi-arid conditions, which prevail at this Station, generally result in a dry surface soil throughout most of the growing season. Hence, the time of seeding is a major consideration in the establishment of good stands of forage crops. Brome grass, crested wheat grass and alfalfa were the crops tested. The project was divided into five parts.

Part 1.—Three dates of seeding at monthly intervals were made in the fall, commencing September 1. The seedings were made directly into third-year stubble. The first date of seeding of forage and nurse crop in the spring was April 25, two seedings were then made on May 7, one ten days after and the other ten days before the nurse crop was seeded. As shown in Table 7, the late fall seeding, during the third week of October, resulted in much the best stands of crested wheat, brome and alfalfa. While the remaining dates all gave equally poor stands, seeding the forage crop ten days prior to seeding the nurse crop gave slightly better stands than seeding the forage at the same time or ten days later than the nurse crop. The fall seedings were made directly into the stubble with no previous tillage, while the spring seedings were on spring ploughed and packed stubble.

Part 2.—In this part the above seeding dates, plus a seeding date on June 8, were tested as in Part 1 with the exception that at none of the seeding dates was a nurse crop used. On the basis of this test, seeding without a nurse crop is definitely superior to seeding with a nurse crop insofar as stands are concerned. Early spring and late fall seeding produced excellent stands of each forage crop; however, the early fall and late spring seeding resulted in poor stands of alfalfa. Late spring seeding (late May and June) also gave poor stands of brome and crested wheat grass as shown in Table 7.

Part 3.—In this part of the project, three dates of seeding viz; April 25, May 10 and 25 were tested on summerfallow. A nurse crop of wheat was used at each seeding date. While the stands favoured the earlier seeding, the differences between the stands were not appreciable. In each case the stands obtained were lower than those in Part 2 where a nurse crop was not used and when the forage crop was seeded into unprepared stubble in the fall.

Part 4.—The results of this test, given in Table 7, showed conclusively that packing before seeding materially assisted in obtaining a good stand of grass or alfalfa. Seeding into loose soil or packing after seeding resulted in a reduction in stand of approximately twenty-five per cent.

Part 5.—Brome grass gave a better stand when drilled than when broadcast on summerfallow. The opposite was true of crested wheat grass and alfalfa. However, on the basis of the project as a whole, seeding on stubble in the fall is the recommended farm practice by virtue of the excellent stands of forage obtained and the protection against soil drifting afforded by the stubble before the forage crop becomes well established. Seeding forage on stubble by the broadcast method is not feasible and drill seeding must be used.

Cross seeding, that is seeding one crop lengthwise and the other crosswise on the same field has resulted in better stands of forage crops than when the forage crop and nurse crop were seeded together or sown in rows running the same direction.

TABLE 7.—THE EFFECT OF DIFFERENT METHODS OF SEEDING GRASSES AND ALFALFA AS MEASURED BY THE STANDS OF CROP OBTAINED.

Treatment	Stand of forage crop given in per cent		
	8-yr. av. brome grass	10-yr. av. crested wheat grass	5-yr. av. alfalfa
Sown into stubble September 1	37	73	24
Sown into stubble October 1	34	79	52
Sown into stubble November 1	48	80	75
Forage sown with 3rd year wheat April 25*			Sweet clover
	30	66	44
Forage sown 10 days after 3rd wheat May 7*	30	68	49
Forage sown 10 days before 3rd wheat May 7*	45	65	38
Forage sown without nurse crop September 1	69	82	6
Forage sown without nurse crop October 1	65	88	9
Forage sown without nurse crop November 1	67	84	41
Forage sown without nurse crop April 25	70	85	59
Forage sown without nurse crop May 9	73	76	52
Forage sown without nurse crop May 23	69	56	40
Forage sown without nurse crop June 8	61	53	41
Sown on loose soil (no nurse crop)	33	39	25
Packed before seeding (no nurse crop)	49	61	35
Packed after seeding (no nurse crop)	30	38	25

* The third year crop acted as a nurse crop.

Sequence of Crops

This experiment consisted of two parts, Part 1 was designed to test the value of various crop sequences while Part 2 was designed to determine (a) the effect of preceding crops on the yield of corn and (b) the value of manure and commercial fertilizers on corn.

Part 1.—This test was set up as a four-year rotation to test the effect of seven preceding crops on the succeeding crop of wheat. The twelve-year average yields of wheat have been lowest, when this crop followed brome and crested wheat grass. Wheat following peas resulted in the highest yields. The yields following sweet clover, flax, sunflowers and wheat were essentially the same and about two bushels per acre lower than the wheat yields after peas. This experiment is of particular interest in view of the many claims made that flax depresses the succeeding yields of wheat. Furthermore, where farmers prefer to seed wheat on stubble in a three-year rotation, instead of coarse grains, this test shows that the practice would not have a depressing effect on the yield.

Part 2.—After seven years of testing, this part of the project was considered unworthy of further investigation. The corn fodder yields after all treatments were too low to be of any economic value and the response obtained from the use of either manure or commercial fertilizer was not significant. Hence the test was discontinued in 1944.

Losses from Ensiling Various Crops

This project was designed to determine the extent of the losses incurred due to fermentation, leaching and spoilage in the process of ensiling. The silage was weighed when put in the silo and only the unspoiled silage was weighed when taken out. The two-year average shrinkage for a mixture of sunflower and corn silage was forty-five per cent.

Commercial Fertilizers

Experimental work with commercial fertilizers was begun at Scott in 1918, when nitrogenous, potassic and phosphatic fertilizers were applied to corn and later to wheat. These early tests showed phosphate fertilizers to be the only type which lead to increased wheat yields. Subsequent tests confirmed the early findings to hold true for oats and barley as well as for wheat. Extensive phosphate fertilizer trials were conducted during the years from 1931 to 1940. Unfortunately, these tests were located on extremely variable soil, hence in an effort to obtain a more uniform test the location of the plots was shifted in 1942. The six-year average yield results of these experiments are outlined in the following sections.

Rates of Applying Commercial Fertilizer for Wheat

Experimental work, with rates of application ranging from eighteen to eighty pounds per acre, previous to the period covered in this report, showed the light rates to be more economical than the heavy rates. These findings were confirmed by work carried on from 1942 to 1947, when rates ranging from fifteen to forty pounds per acre of ammonium phosphate 11-48-0 were used. As shown in Table 8 the forty-pound rate gave slightly higher yield increases than the twenty-pound rate, yet required a considerably greater cash outlay. Furthermore, in seasons when spring conditions were good, but summer conditions were extremely droughty, the forty-pound rate tended to suffer relatively more than did the twenty-pound rate. Since the twenty-pound rate

has given returns almost equal to those from the heavier forty-pound rate at a considerably lower cash outlay, the light rate is recommended for use by the farmers in this area.

TABLE 8.—RATES OF APPLYING PHOSPHATE FERTILIZER WITH WHEAT ON SUMMERFALLOW—SIX-YEAR AVERAGE, 1942-47

Rate of application per acre		6-year average yield	6-year average increase	Value of increase[1]	Cost of fertilizer[2]	Profit per acre
	lb.	bu.	bu.	$ cts.	$ cts.	$ cts.
Ammonium phosphate (11-48-0)	15	17·5	4·4	5 03	0 50	4 56
" " "	20	18·6	5·5	6 32	0 66	5 66
" " "	25	17·9	4·8	5 42	0 83	4 69
" " "	30	17·8	4·7	5 40	0 99	4 41
" " "	35	18·0	4·9	5 63	1 16	4 47
" " "	35	18·0	4·9	5 63	1 16	4 47
" " "	40	20·0	6·9	7 93	1 32	6 61
Check—no fertilizer		13·1				

[1] Price of wheat taken as $1.15 per bushel in 1947.

[2] Price of fertilizer in 1947 was $66.00 per ton.

The margin of profit between the twenty and forty-pound-per-acre rates is greatly influenced by the price of wheat and seasonal conditions. On the basis of the 1947 price of wheat the forty-pound rate has shown an average of ninety-five cents per acre more profit than the twenty-pound rate. In 1942 when the price of wheat was seventy-two cents per bushel and fertilizer $62.00 per ton the difference would be only thirty-eight cents per acre in favour of the forty-pound rate. The average price of wheat over the period of years in which this test was conducted was $1.02 per bushel. On the basis of this price the profit from the forty-pound-per-acre rate exceeded the profit from the twenty-pound rate by eighty cents per acre. During periods of high and stable prices and in areas of adequate moisture, the forty-pound per acre rate is somewhat more profitable than the twenty-pound rate. Because of the higher cash outlay required in the spring and the wide fluctuation in yield increases as the result of seasonal conditions, farmers in the drier parts of the area served by this Station prefer the twenty-pound rate. In the moister parts of the area the forty-pound rate is recommended.

Rates of Seeding Wheat with Phosphate Fertilizer

Because of the more vigorous growth, when phosphate fertilizer was used with wheat, a study was made of the effect of seeding grain at different rates per acre. Wheat was sown at three, four, five and six pecks per acre with and without twenty pounds per acre of ammonium phosphate 11-48-0. The yield increases observed for each of the above rates with fertilizer were 5, 6, 2·1, 1·8 and ·6 bushels per acre, respectively. While the highest increase per acre was from the low seeding rate the highest total yield, however, was realized from the five peck rate, which is the recommended seeding rate without fertilizer for this area. The results of this test show that when phosphate fertilizer is used with wheat on summerfallow, the recommended seeding rate may be reduced by one peck per acre.

Dates of Seeding Wheat with Phosphate Fertilizer

The plots, in this test, were sown with and without twenty pounds of ammonium phosphate 11-48-0 commencing as early as possible in the spring. Subsequent seedings were made at weekly intervals until six seedings were made. The first seeding date usually fell in the third week of April. Six years' results have shown the last two seedings to give the lowest yields. The second date, which is at the time when wheat seeding becomes general, gave the highest yield increase as well as the highest yield. While fertilizer hastened the maturity of the wheat by about two days, its use on late seeded crops to help avoid frost damage was not warranted.

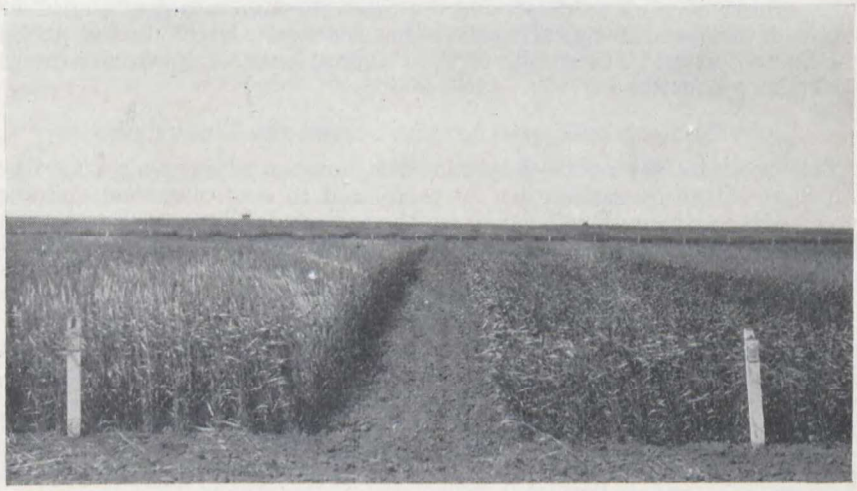

Fig. 1.—Note earlier and more even heading on left where phosphate fertilizer was applied.

The Response of Different Varieties of Wheat to Phosphate Fertilizer

Three varieties of wheat namely, Marquis, Apex and Thatcher were each sown on plots with and without twenty pounds per acre of ammonium phosphate 11-48-0. On the basis of the six-year average yields, Thatcher has given a yield increase of 4·6 bushels per acre as the result of fertilizer, and Marquis and Apex each gave a yield increase of 2·6 bushels per acre. Thatcher ranked highest in yield while Marquis ranked lowest, Apex was intermediate between these two.

The Response of Wheat to Different Brands of Phosphate Fertilizer

This project was designed to test six brands of phosphate fertilizer on a basis of equal rate, equal phosphate content and equal cost per acre. The fertilizer was applied to wheat fallow using twenty pounds of ammonium phosphate, 11-48-0, as the standard of comparison. Triple superphosphate 0-43-0, sulphro-phosphate 0-18-0, ammonium phosphate 16-20-0, 2-19-0 and 4-15-0 were the other brands tested. On the basis of equal rates, ammonium phosphate 11-48-0 excelled all brands by at least two bushels per acre. On the basis of equal costs, ammonium phosphate 11-48-0 and triple superphosphate 0-43-0 gave yield increases of 4·0 and 3·5 bushels per acre respectively. None of the other brands gave yield increases in excess of two bushels per acre. Ammonium

phosphate 2-19-0 and 16-20-0 gave the lowest yield increases in both the rate and cost studies. On the phosphate basis, the yield increases for all brands were essentially the same; however since farmers are primarily interested in the most economical returns, ammonium phosphate 11-48-0 and triple superphosphate 0-43-0 are the brands recommended by this Station.

NOTE.—All fertilizer trials reported in this section have been conducted over the past six years of the period under review and the results are based on the six-year average yields. The trials were run as a two-year rotation of summerfallow and wheat.

EXPERIMENTS WITH WEED CONTROL

Experimental work to determine the most effective means of weed control by both cultural and chemical methods has received a great deal of attention at the Scott Station. The results of these experiments are given and discussed in the following section.

LIGHT TILLAGE OF WHEAT AFTER SEEDING FOR WEED CONTROL

This test was set up to determine the number of days after seeding at which light tillage operations can be performed to control annual and winter annual weeds in wheat. Operations with the rod weeder, harrow, Eureka weeder and Mills wire weeder were made at intervals of four, five, six and seven days after seeding. On the basis of six-year average yields and weed counts the rod weeder, wire weeder and Eureka weeder were essentially equal, with the exception of the rod weeder, which excelled all treatments when used five days after seeding. The harrow, while an effective weed killer, tended to root out a fairly high percentage of the sprouted grain, hence the yields were no higher than those on the untilled check plots. While light tillage after seeding has possibilities as a means of weed control, seasonal conditions greatly influenced its effectiveness. Cold, dry spring weather is not conducive to early weed germination and light tillage is of little or no value under such conditions. Chemical weed control is replacing this practice.

THE CONTROL OF LAMB'S QUARTERS

This experiment was begun in 1934 to determine the effectiveness of various methods of controlling lamb's quarters. The project was conducted in four parts, the results of which are outlined below.

Part 1.—Ten different summerfallow treatments were tried. With the exception of two treatments in which the grain was harrowed after the weeds had reached the two-leaf stage, none of the treatments significantly affected the yield or the number of weeds. The harrowed plots showed a remarkable reduction in weed population. However, the harrow killed a large proportion of the wheat, resulting in a yield reduction of two bushels per acre. The reduction in weed population was also noticeable on the following wheat crop on stubble.

Part 2.—Wheat, oats and barley were sown at three different rates on both summerfallow and spring-ploughed stubble: (1) with phosphate fertilizer drilled in with the seed; (2) with phosphate fertilizer broadcast before seeding; (3) with no fertilizer. The rates of seeding per acre were: wheat—1, 1½ and 2 bushels; oats—1½, 2½ and 3½ bushels; barley—1, 2 and 3 bushels. Phosphate fertilizer when drilled in with seed on fallow land gave fair yield increases, which, however, decreased as the seeding rate increased. Where the fertilizer was broadcast prior to seeding the grain, the yields were not materially influenced; this was also true of fertilizer drilled in with the seed on spring-ploughed stubble. In general, all crops decreased in yield, height, and days to mature with increased rates of seeding, both with and without fertilizer. The weeds were noticeably reduced in size

with the heavier seeding rates, particularly, where heavy seeding was combined with fertilizer. Barley, and oats to a lesser extent than barley, were more effective in this respect than was wheat.

Part 3.—This part was designed to test the effect of dates of seeding wheat on the development of lamb's quarters. Seedings were made on April 25, May 10 and 25 at the rate of one and one-half bushels per acre on fallow and spring-ploughed stubble. The results of this test have shown the later seeding to have fewer and smaller weeds. However, the mid-May seeding gave the highest yields on both fallow and spring-ploughed stubble.

Part 4.—This part was designed to study the effect of weeds on wheat yields. One set of plots was kept weed free, the second set had only a light to medium stand of weeds, while the third set of plots carried a very heavy stand of weeds. When compared with plots which were kept weed free, the light to moderate infestation reduced the wheat yield by twelve per cent while the heavy infestation reduced the wheat yield by fifteen per cent.

Observations on Weed Control by Cultural Methods

1. Tillage must be timely to be effective. The weeds should not be allowed to become too large.

2. Any tillage method on a summerfallow should kill the annual weeds in one operation; this requires that the implements be sharp and properly adjusted.

3. Summerfallow tillage should be done only when the weed growth requires it.

4. Uniform seeding of viable and weed-free seed is highly important.

Chemical Weed Control

Since the recent coming on the market of the dinitro and, particularly, the 2, 4-D products, interest in weed control by scientists and farmers alike has reached unprecedented levels. At the Scott Experimental Station, work with Sinox and 2, 4-D began on a small scale in 1945 and was expanded to include the "uniform experiment" for the control of annual weeds in growing crops in 1946. Work with the use of 2, 4-D on perennial weeds was also begun in 1946.

In 1947 a number of the "uniform experiments", as outlined by the North Central Weed Control Committee, were undertaken on annual and perennial weeds. Other experiments were also outlined and conducted by this Station. An outline of the results of this work follows.

Rates of applying 2, 4-D and other Selective Herbicides on Annual and Winter Annual Weeds in Cereals and Flax

Plots of Rescue wheat, Ajax oats, Prospect barley, Prolific spring rye and Royal flax were used in this test. Eleven treatments, involving the three types of 2, 4-D at each of the three concentrations $\frac{1}{4}$, $\frac{1}{2}$ and 1 pound of active ingredient per acre were used, as well as a five per cent sodium salt dust at eight pounds per acre and Sinox at one gallon per acre.

Because of the abnormally cold, dry spring in 1947 the germination of the weed seeds was so much delayed that the plots of wheat, oats, barley and spring rye were practically free of weeds. Observations and weed counts showed no significant differences between the treated and untreated plots. Observable damage to the crops, as a result of the treatments, was confined to oats. Where the $\frac{1}{2}$ and 1 pound rates of 2, 4-D were used, the active ingredients resulted in a lodged appearance of the crop. Some plants were also found to have thick short internodes and club-like panicles. The treatments did not significantly affect the yields of wheat, oats, barley or spring rye.

The results were quite striking with flax. Because of the delayed seeding, stinkweed, lamb's quarters, wild buckwheat and especially Russian thistle were abundant. The stinkweed and lamb's quarters were controlled by all formulations and rates. Russian thistle was controlled quite effectively by the ½ and 1 pound rates of the ester and the 1 pound rate of the amine. Yields on these plots were approximately four times as great as the yields on the other treatments and the checks. The ½ and 1 pound rates delayed maturity in flax from eight to ten days as compared with the check. Wild buckwheat was not effectively controlled by any of the treatments.

The Effect of Dosage and Stage of Growth in the Control of Annual and Winter Annual Weeds

The dosages, viz; 4, 8 and 16 ounces per acre were applied at four stages of growth of spring wheat. Three formulations of 2, 4-D were used.

Treatments made two days previous to emergence of the grain were effective in destroying the few seedlings of stinkweed and Russian thistle already emerged but had no effect on the further emergence of the ungerminated weed seeds in the soil. Consequently weed growth was equally dense on the treated and untreated plots.

Treatments at the three leaf, the shot blade and flowering stages of the crop were quite effective against stinkweed and lamb's quarters. The most effective control of Russian thistle resulted from the use of the butyl ester at the early shot blade stage of the crop before the thistle had branched extensively. The butyl ester tended to be twice as effective in the control of Russian thistle, at all stages of growth, as was the amine or sodium salt type.

Wild buckwheat was stunted but not killed by any of the formulations or dosages at any stage of growth.

On the basis of both weed control and yields, the three leaf stage, (the crop then was about four weeks old and eight inches tall), gave the best results. Each treatment made at this stage was significantly higher in yield than its untreated check. While the two later treatments gave reasonably good weed control, especially where the ester was used, the crop was already too far advanced to benefit from the eradication of the weeds.

Varietal Difference in Crop Tolerance to 2, 4-D

Four rates of butyl ester—¼, ½, 1 and 2 pounds per acre—were used when the grain was about 4 inches high. No varietal differences were apparent on any of the four crops for the two lowest rates. However, the 1-pound and, especially the 2-pound rate, gave rise to some observable differences between varieties of the same crop.

In wheat, Rescue was affected the most, Apex somewhat less, while Thatcher and Redman did not appear to be affected. The latter three varieties reacted with larger kernel and higher bushel weights. Rescue was adversely affected in this respect.

In oats, Exeter was most affected, Victory next, then Garry with Ajax appearing to receive a stimulus. In all varieties, kernel and bushel weights were increased.

In barley, Titan and Velvon were both adversely affected with Vantage and Plush only slightly damaged. In all cases, kernel and bushel weights were increased.

The Use of 2, 4-D as a Dust

This method of applying 2, 4-D was tested at Scott for the first time in 1947. In these tests, dusts tended to give very similar results to sprays, and further testing will be necessary before definite statements favouring one or the other of these methods can be made.

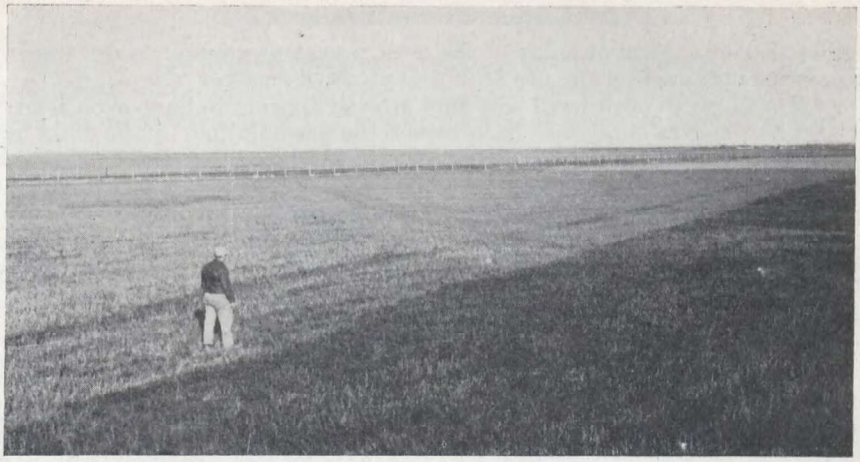

FIG. 2.—Light coloured area treated with six pounds per acre of 2, 4-D ester dust resulting in excellent kill of young Russian thistle.

THE USE OF 2, 4-D ON PERENNIAL WEEDS

The results obtained after two years of testing at Scott have shown that stands of Canada thistle, perennial sow thistle and blue lettuce can be greatly reduced, up to eighty per cent, with one application of 2, 4-D. Re-treatment, however, was found necessary for complete control. To be most effective, treatment should be made when these weeds are in the early bud stage and a minimum rate of one pound of 2, 4-D acid equivalent per acre used. The ester type of 2, 4-D has been found to be much more effective against perennial weeds than has the sodium salt. The amine type was more or less intermediate between the two.

The results with 2, 4-D on hoary cress were disappointing. Although 2, 4-D gave good control of the top growth, the tough creeping rootstocks appeared to be only slightly affected.

FIG. 3.—Light coloured area of barley in heavy stand of Canada thistle was sprayed with 2, 4-D in growing crop in 1946 and resulted in an almost thistle free crop in 1947.

Observations on the Use of 2, 4-D

1. Efficient control of many of the most prevalent annual weeds in growing crops can be obtained by the use of 2, 4-D at a low cost per acre.

2. The stage of both weed and crop growth appears to have even a greater effect on the action of 2, 4-D than either the formulation or the rates used. This is due to the tendency for even susceptible plants to develop resistance with age.

3. Some of the perennial weeds can be effectively controlled.

4. The use of 2, 4-D as a substitute for tillage in the preparation of summer-fallow as yet does not seem warranted. This being due to the host of resistant weeds such as peppergrass, wild oats and wild buckwheat prevalent in the prairie areas.

Drought and Soil Drifting Studies

In 1934 a section of land, adjacent to the Scott Experimental Station was rented under the Prairie Farm Rehabilitation Act for the purpose of studying some aspects of the drought and soil drifting problem which, since 1929, had continued to become increasingly acute in west central Saskatchewan. These studies were conducted under the supervision of this Station and the results follow.

Strip Farming Study

This study consisted of twenty strips eight rods wide and four strips sixteen rods wide. Each strip received exactly the same treatment during the fallow year. During the years in which drifting conditions prevailed the alternate strips of crop and fallow were much less inclined to drift than were the large blocks of fallow land nearby. The eight rod strips were somewhat more resistant to drifting than were the sixteen rod strips. A rotation of alternate grain and fallow was used.

Super-imposed upon the strip farming study were a number of different pre-seeding treatments for fallow land. The results as given in Table 9 for these treatments showed the use of either manure or phosphate fertilizer to give yield increase of about three bushels per acre for wheat, oats and barley; packing after seeding and rod weeding seven days after seeding each increased the yields of wheat and oats by almost two bushels per acre but did not increase the yield of barley. The use of the one-way seeder and packer gave the same results as the cultivator and drill, but the one-way seeder alone resulted in patchy stands and reduced yields of wheat and barley. Of particular interest was the high average yield of oats, when the fallow was cultivated in the spring and then left for ten days before it was seeded. In 1947 an experiment was begun to determine if possible the nature of and the reasons for this remarkable yield increase.

TABLE 9.—THE EFFECT OF SPRING TREATMENTS ON UNIFORM FALLOW

Spring Treatment	6-year average yield in bushels per acre, 1941-46*		
	Wheat	Oats	Barley
1. Manure 10 tons per acre	17·2	39·8	25·6
2. Ammonium phosphate 11-48-0 20 pounds per acre	16·5	41·2	26·7
3. Pack after seeding	13·1	38·2	21·4
4. Check—cultivate and drill	11·6	36·8	21·1
5. Rod weed—7 days after seeding	14·2	39·3	21·0
6. One-way disk seeder combination	9·6	37·6	21·5
7. One-way disk seeder and packer	11·6	42·3	23·6
8. Cultivate—seed 10 days later	13·7	41·8	23·0
9. Check—cultivate and drill	12·3	32·1	21·8

* The 1947 yields are not given because one-half of each strip was treated with 2,4-D, hence the results are not comparable.

Summerfallow Treatments

This test consisted of eight methods of preparing summerfallow. The test was arranged according to the Modified Latin Square Plan with four replications. The plots used were 1·3 acres in size and sown to each of wheat, oats and barley. Each of the eight treatments provided efficient weed control during the fallow year, which largely explains the lack of significant yield differences between the treatments, as shown in Table 10, over the past twelve-year period during which the test was conducted. During the first four years one of the treatments consisted of no tillage, the weeds being mowed twice in the fallow year. This treatment resulted in extremely low yields and hence was changed to consist of one-way disking in June and rod-weeding as required thereafter for weed control.

During the course of this experiment a careful study was made of the ability of the different treatments to resist wind erosion. By means of a system of soil screening, it was found that ploughed fallows contained more lumps, which were larger and harder, than did the ploughless fallows. Observations showed that these lumps were responsible for the greater resistance to wind erosion shown by the ploughed fallows. A further finding was that fallows which received light tillage (cultivated or shallow one-way disked) in May prior to ploughing late in June, had a lumpier more wind resistant structure than fallows ploughed in May and then cultivated as required for weed control thereafter.

TABLE 10.—THE EFFECT OF D IFFERENT METHODS OF PREPARING SUMMERFALLOW

Treatment	12-year average yield in bushels per acre 1936-47		
	Wheat	Oats	Barley
1. Minimum cultivation	11·6	31·2	16·1
2. One-way disk May 15, plough June 15, cultivate	11·8	30·3	17·3
3. Cultivate—rod weed—cultivate	11·2	29·9	16·0
4. Cultivate, plough July 15, cultivate	11·7	33·3	17·8
5. Fall disk, spring cultivate, plough June 30, cultivate	12·1	34·0	17·5
6. Cultivate, one-way disk, cultivate	11·5	31·1	16·4
7. One-way disk 2 inches, one-way disk, 4 inches deep	11·5	30·7	17·7
8. One-way disk, rod weed as required*	13·4	33·7	19·8

* 8-year average yield only.

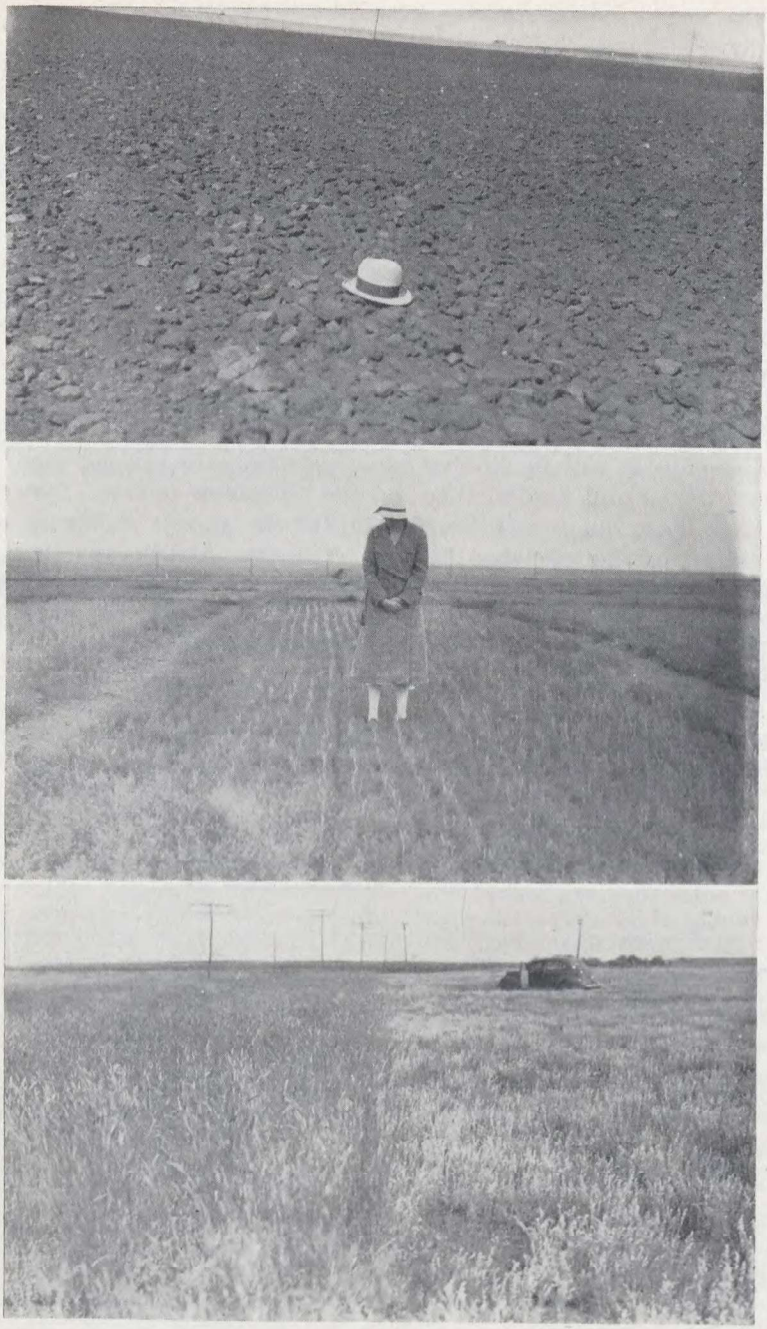

FIG. 4 (Top).—A lumpy surface after working summerfallow in spring helps prevent soil drifting.

FIG. 5 (Middle).—Seeding grain into stubble without tillage often results in failure.

FIG. 6 (Bottom).—Five years after seeding, brome grass on right was conquered by prairie sage while crested wheat grass on left is free of this weed.

Indian Fallow

On the lighter soil areas, served by this Station, the practice of allowing the fallow land to lie untilled and grow up to weeds was used as a means of preventing soil drifting. The weeds were then burned in the following spring and the land ploughed, packed and seeded. The resulting crop on this land appeared to be higher in yield and freer of weeds than were neighbouring fields, which had received regular tillage during the fallow year.

The apparent success of this method of fallowing prompted this Station to begin tests in 1945 of Indian fallow (so named because the method has been practised by the Indians) compared with ploughed and cultivated fallow. While the results as yet are not conclusive, they are nevertheless striking. Wheat on Indian fallow has shown a yield increase of over three bushels per acre and the plots were remarkably free of weeds.

The reasons for the increased yields are as yet not too clear. The accumulation of snow would, to a considerable extent, replenish the moisture used by the weeds in the fallow year. The warming action of the sun's heat absorbed by carbon black, which evenly coats the soil surface after the weeds are burned off, might possibly be the explanation of this phenomenon. Since these soils are too cold to promote vigorous spring growth, this explanation, while as yet not proven, appears to be worth considering. Tests to determine the reason for the remarkable success from the use of Indian fallow were begun at the Scott Station in 1947.

Stubble Treatments

Eight different methods of preparing stubble land for seeding (see also discussion of stubble treatments on the main farm) were arranged according to the Modified Latin square plan with four replications. The plots were 1·3 acres in size and were sown to each of wheat, oats and barley.

With the exception of disking in the spring and seeding with the drill, which resulted in the lowest yield of wheat (9·3 bushels per acre), all treatments gave very similar yields. Spring ploughed and packed stubble gave the highest yield of wheat, 10·8 bushels per acre. Seeding with the one-way disk and packer combination gave the next highest yield, 10·6 bushels. Fall disked and one-way seeded; one-way disked and drill seeded; one-way disk seeded; cultivated and drill seeded; and fall disked and spring-ploughed were the remaining treatments. The average yield of each of these treatments over the past eleven years was slightly over 10 bushels per acre. The average yields of oats and barley followed a very similar pattern with the exception that seeding with the one-way disk without the packer attached gave yields equal to those on spring ploughed and packed stubble and slightly higher than those on stubble seeded with the one-way disk and packer combination. In view of the slight yield differences between the plots which were spring ploughed and seeded and those which were seeded with the one-way disk, the latter method is recommended in this area for sowing grain on stubble. This method is also recommended for preparing stubble land for wheat but the one-way disk seeder should then be followed immediately by packing.

The Utilization of Grasses

Any program of field experiments dealing with the control of drought and soil erosion on the prairies must necessarily include studies in the utilization of grasses. The results of experiments with the use of grasses are included in this report.

Cultivated Grasses versus Oats for Hay.—Alfalfa, brome, crested wheat and western rye grass were compared with oats on the basis of hay yields. During

the ten years in which this experiment was conducted oats excelled the cultivated grasses in forage yields in all but one year. The average yield difference was approximately one-half ton per acre.

Row Spacing Test.—In this test, alfalfa, brome, western rye and crested wheat grass were used. Each crop was sown in rows spaced six inches apart for purposes of comparison with the same crops sown in rows spaced thirty-six inches apart. The effect of the wide spacings was reflected in taller stands, more luxurious and greener growth. Although the field appearance was greatly improved, the hay yields were only slightly increased. Wide spacing for crested wheat grass resulted in higher yields after the fifth crop year.

The Effect of Snow Ridging on Hay Yields.—Spring moisture is vital to successful forage production in this area. To augment the often scanty spring moisture, the snow on plots of alfalfa, brome, crested wheat and western rye grass was ridged with a snow plough. The ridges trapped the moving snow thereby causing deep drifts to form on the plots. All crops except brome showed an increase in height and hay yield as a result of the extra moisture. Alfalfa showed the greatest response, its average yield was increased by fifty per cent and its height by forty per cent. Western rye and crested wheat grass showed increases of about ten per cent in both height and yield, while brome showed no increase in height and a very slight decrease in yield.

The Effect of Different Sods on Succeeding Crops of Grain.—The original purpose of this study was to determine the effect of these sods in the control of soil drifting. Soon after the experiment was under way it was found that wireworm damage to wheat and flax was excessive, and for this reason the use of fertilizer, ammonium phosphate 11-48-0, and soil packing were added to this study. Wireworm studies made by the Dominion Entomological Laboratory at Saskatoon showed that of the four forage crops used brome and western rye grass sods contained the most wireworms while crested wheat grass sods contained a slightly lower number. Alfalfa had a very low wireworm population.

Where the sod was broken and fallowed for one year prior to seeding with no further treatment given, wheat yielded best when on alfalfa sod, slightly lower after crested wheat and brome grass, and about three bushels lower on western rye grass sod. The use of fertilizer both increased and completely reversed the order of the yields. Packing did not influence the yields. Flax gave the highest yield on crested wheat grass sod. The yields of flax were not materially influenced by packing or fertilizing. The use of Sinox in 1945 increased the flax yield by one hundred per cent; the yield of wheat was not increased sufficiently to cover the cost of spraying and was well below the increase obtained from the use of twenty pounds per acre of ammonium phosphate, 11-48-0. Weed control, mainly of stinkweed, by the use of Sinox in 1945, was excellent; however, in the hot dry seasons of 1946 and 1947 Sinox gave very poor control of stinkweed and other weeds. Consequently, the yield increases obtained were only slight.

Reclamation

The term reclamation is used to describe the process of converting land which is unsuitable for any type of agriculture into productive usefulness. During the past fifteen years, but mainly in the drought years of the thirties, many parcels of land in west central Saskatchewan reached such a condition through soil drifting that farmers were unable to cope with the situation.

When such land got out of control as the result of almost continuous drifting from spring until late fall, it was not only abandoned but became a menace to surrounding areas. In many cases, nearby productive farm land was not only menaced but had to be saved from impending ruin. In other cases, roads and

highways were blocked with drifting soil. Appeals for help came from individuals, organizations, rural municipalities and departments of the Government concerned.

The general plan was to co-operate with nature using special implements and crops suitable for establishing an adequate cover on the land into which grass could be sown to complete the job.

The first requirement was an agreement that the Department of Agriculture have control of the land for a period of five years. On land where soil moisture conditions were satisfactory, a start was made in early spring. In most areas, however, it was necessary to wait until there was sufficient rainfall to promote crop growth. Some work was undertaken in the early spring but the bulk of the work was carried out in 1939 during June, when effective, repeated rains fell following several years of continuous drought. In preparation for such welcome rains special implements were ready and seed by the carload was on hand.

FIG. 7.—Reclaiming badly drifted land, May, 1939.

Caterpillar tractors equipped with wide tracks were used as no type of tractor on wheels could move in many of the badly eroded areas, particularly in loose silt and sand. In addition these areas contained soft spots and deep holes and loose soil accumulated around large Russian thistles. A special furrow drill equipped with staggered shovels through which the seed was sown left the surface in a ridge and often a rough condition. Most of the land because of deep "blow-holes" was too dangerous for night operations, but two shifts were in progress during daylight hours. This drifted soil was so abrasive that two sets of heavy shovels were worn out in one season.

During the first season a mixture of spring rye and barley was used but the latter was not adapted for the purpose of establishing cover in drifted soil. The bulk of the reclaimed areas was sown with spring rye and when all available seed was used fall rye was planted. A mixture of spring rye and barley was used on 217 acres, spring rye on 1453 acres and fall rye on 502 acres. Of this total, amounting to 2172 acres, there were 104 parcels reclaimed varying in size from 3 to 116 acres.

Spring rye had several advantages over fall rye. Growth was faster and provided quicker protection for the eroded surface soil. Even under desert-like conditions of moving sand when moisture was received during the early

summer, spring rye grew forty-eight inches in as many days. In a few places spring rye could not make any growth in the subsoil as the plants were continually cut off by drifting sand. No difficulty was experienced with volunteer grain in spring rye which was harvested for grain except where the stand was thin and left standing for protection of the surface soil. When growth did not become established on a few spots because of drifting sand these were sown to winter wheat in early September. Volunteer fall rye did not permit success with fall seeding of grass to complete this reclamation program as described in the forage section of this report.

FIG. 8.—Growth of spring rye on land reclaimed in 1939.

SNOW UTILIZATION

Snow constitutes approximately twenty-five per cent of the annual precipitation received in this area. Most of this snow is of little value in crop production because it is swept from the open fields and deposited around obstructions such as fence rows, shelterbelts, buildings and coulees by the winter winds. Shelterbelts of trees around gardens accumulate large drifts of snow and the beneficial effect of the resulting moisture has long been realized and its value appreciated. Because of the marked benefits received by garden crops, as a result of the accumulated snow, this Station initiated a number of studies designed to trap the snow, which ordinarily was blown from the open fields.

A number of different methods to artificially accumulate snow on the open fields were tested. Snow fences of various types were used but these were found unsatisfactory because of the very non-uniform snow cover produced. The result was strips of very wet and almost dry soil which prevented normal working of the land and non-uniformity in the succeeding crop. Attempts at arranging the fences close together so that the resulting drifts would cover the entire field surface were found to be too expensive to be of any practical value, except for certain specialized purposes.

To overcome these difficulties attempts were made at ridging the snow with the hope that the ridges would accumulate an even snow cover over the fields. In order to produce the ridges a cheap workable snow plough was the first requirement. Two types of ploughs were evolved at this Station, a pull-type, suitable for use with horses or tractor, and a push-type mounted on a tractor.

Operations with the snow plough, especially on bare fallow, should be commenced as soon as the snow is three or four inches deep. The direction of the ridges should preferably be at right angles to the prevailing winds. The ridges should be close together, about ten feet, to insure complete filling of the space between the ridges. After the ridges are completely full, which in this area usually requires a period of several weeks, a second operation may be performed. Where two operations have been performed, a uniform snow cover two to three feet deep has been accumulated over entire fields in this area.

Extensive sampling of the artificially accumulated snow showed that twenty-four inches of the compact snow was equivalent to seven inches of rain. Similar tests in the early spring showed that although the snow depth was decreasing, the moisture content was still nearly the same, hence there was little loss due to evaporation.

FIG. 9.—Ridging to accumulate snow in fields.

Until the present time yield increases as a result of snow ploughing have been inconsistent, especially for the cereal crops. Hay crops, which require abundant spring moisture to produce good yield, have consistently benefited from snow ploughing at this Station. Cereal crops, on the other hand, benefited markedly in the early spring, but the available moisture as a result of snow conservation was not sufficient to carry them over the entire growing season. Therefore, when the summer months of June and July were dry and warm no benefits have resulted on Weyburn series of clay loam soils on the Station.

Further information on this subject may be obtained from publication 696 of the Dominion Department of Agriculture entitled "Snow Utilization in Prairie Agriculture".

Cereals or Grain Crops[2]

Since the last progress report of this Station, published in 1937, there has been a great change in the cereal variety picture for the area served by this Station. This is borne out by the fact that in 1947, not one variety of wheat, oats, barley or flax recommended for the area, was recommended in 1936. The introduction of rust-resistant wheats, oats and flaxes and of smooth-awned barleys have been the chief factors responsible for this complete changeover, but higher yields, earlier maturity and resistance to other cereal crop diseases have played their role.

[2] Prepared by A. J. Kusch, Assistant in Cereals and Forage.

Cereal work on the Station, until 1942, was mainly concerned with testing varieties and hybrids for their suitability to the area. However, in 1942, a start was made in actual breeding and selection work in an attempt to obtain varieties especially of wheat, oats and barley which would be better suited to the semi-arid conditions and short frost-free periods experienced in the area. Since only five years work has as yet been spent on breeding and selection, there is not a great deal to show; in addition, progress was held up to some extent during the war by shortage of help and equipment. However, at present, there are on hand a few quite promising hybrids of each of the three above mentioned crops which might possibly develop into varieties suitable for growing in the area. In this work, emphasis is being placed on regional adaptation of varieties while at the same time keeping in mind resistance to various diseases.

During the past eleven years, there has been a wide variation in the yield of grain crops at the Station and these are fairly well representative of the whole area served by the Station. The seasons of 1942 and 1944 produced good crops, while 1938, 1939 and 1940 produced paying crops, about average for the area. In 1941, 1943, 1945, 1946, and 1947, the crop was well below average and in the season of 1937 there was a complete failure. Thus, in the past eleven years under review, there have been five paying crops, five poor crops and one complete failure. Table 11 shows average yields of wheat on summerfallow on the Station for each of the eleven years. These yields are indicative of the area during that period and illustrate the need of cereal varieties which will yield fairly well under the prevailing dry conditions.

TABLE 11.—WHEAT YIELDS
Dominion Experimental Station, Scott, Sask. 1937-47.

Year	Yield, bu. per ac.	Remarks	Year	Yield, bu. per ac.	Remarks
1937	0	Failure	1943	8·0	Poor
1938	12·9	Average	1944	23·2	Good
1939	14·2	Average	1945	8·0	Poor
1940	12·9	Average	1946	5·5	V. Poor
1941	7·7	Poor	1947	6·5	Poor
1942	30·1	V. Good	.....	.....	.....

FIG. 10.—Banner oats—1940.

Breeding and Variety Testing

In 1937, when testing only, of cereal varieties was being done, replicated yield tests of 74 wheat, 49 oat, 25 barley, 9 flax, 8 pea and 8 bean varieties and hybrids were being conducted. These numbers increased only slightly until 1942, when a start was made on breeding and selection work. By 1947, the work had expanded to such an extent that there were 298 wheat, 205 oat, 75 barley and 35 flax varieties and hybrids in regular replicated rod-row yield tests plus some 5000 wheat, 2200 oat, 1500 barley and 600 flax hybrids grown for observation and selection.

In addition to testing on the Station itself, a number of tests of standard varieties and promising hybrids are carried on in the area served by the Station. There are usually about 20 of these tests located in such a way as to sample the various soil and climatic differences in the territory. The results of these tests are used as a basis for recommending the growing of certain grain varieties in the different cereal variety zones which have been set up for this purpose.

Fig. 11.—Ajax Oats, 1944.

The breeding and selection work entails a lot of detailed work which all has to be planned for over a period of years. In the case of hybridization, the parents used have to be carefully selected with a view to incorporating in the hybrids the desirable characteristics of both. Then years of selection and testing under the environmental conditions, for which the proposed new variety is intended, follow.

Introductions from all over the world are grown for observation under Scott conditions and those screened out which are promising or which possess some characteristic which is valuable and could be used in a hybridization program.

Spring Wheats

Many named varieties as well as large numbers of unnamed selections and hybrids have been tested and are continuing to be tested to determine if they will be suitable for growing in the area. In this report, only the varieties which have been grown and recommended for the area will be considered.

Common Wheats

In 1937, Thatcher wheat was first recommended for growing in the area. Thatcher was introduced by the University of Minnesota. It is resistant to stem rust and loose smut, moderately resistant to common root-rot but susceptible to leaf rust and bunt. It has wide adaptability, has strong straw and high resistance to shattering. Since 1937, this variety has continued to grow in importance until now it is recommended in every cereal zone in Saskatchewan and occupies more acreage than all the other wheat varieties combined. Its general adaptability and inherent high yielding qualities have been the main reasons for its rapid spread. Marquis and Reward which were recommended for growing in the area in 1937 are no longer recommended and very little of either variety is now being grown.

Reliance is one variety recommended in 1937 which is still recommended. It is an awned variety which is susceptible to rusts, bunt and loose smut and is later maturing than Thatcher. It possesses considerable resistance to spring frosts and its kernels have less tendency to bleach and shrink under dry conditions. At the Station, it has yielded well under Thatcher but in the very dry area of southwestern Saskatchewan, where rust is not a hazard, it yields well enough and is recommended for growing in that very limited area. It is expected to be replaced in the near future by Rescue, which besides being resistant to sawflies, possesses considerable drought resistance.

Apex, a stem rust resistant variety developed at the University of Saskatchewan, came into prominence in 1937. It has somewhat weaker straw and is slightly later in maturity than Thatcher. It is moderately resistant to root-rot bunt and loose smut and moderately susceptible to leaf rust. It was grown to quite an extent on the heavier soils in the area but is now being gradually superceded in these areas, because of its susceptibility to sawfly attack, by the new sawfly resistant variety, Rescue.

Rescue is a wheat stem sawfly resistant variety developed at the Dominion Experimental Station, Swift Current, and was first distributed in 1946. It is slightly later in maturing than Thatcher. It is resistant to stem rust, moderately susceptible to common root-rot and leaf rust and susceptible to bunt and loose smut. Under sawfly-free conditions, it tends to yield less than Thatcher, but where the sawfly population is a serious problem, it is definitely superior to Thatcher in yield. Unfortunately, Rescue is deficient somewhat in milling and baking quality. However, a breeding program is now underway in an endeavour to produce a high yielding, sawfly-resistant wheat, suitable for growing in the area which will possess good milling and baking qualities. It is hoped that this breeding program will produce such a wheat in the not too distant future.

Regent was produced at the Laboratory of Cereal Breeding in Winnipeg. It is resistant to the common races of stem rust and to some races of leaf rust. It has been tested at Scott against Thatcher for the past twelve years and during that period has yielded about two and a half bushels per acre less than Thatcher. It has large kernels which fail to fill out properly under the semi-arid conditions prevailing here. It is not recommended for growing in the area.

Redman is a new stem rust resistant variety developed at the Dominion Laboratory of Cereal Breeding at Winnipeg. It was first distributed in 1946. It is resistant to many races of leaf rust but is moderately susceptible to those prevailing at the present time. It is resistant to bunt, moderately resistant to loose smut and moderately susceptible to root-rot. It also possesses large kernels which do not fill properly under dry conditions. In tests on the Station, it has tended to yield slightly better than Regent but still about two bushels less than Thatcher. It is recommended for growing on the heavier type soils of the northern areas where moisture conditions are better.

Red Bobs is a totally bald variety which is susceptible to both stem and leaf rust and to bunt. It is resistant to loose smut. It possesses large bright kernels but has a tendency to shatter readily. It has yielded only slightly less than Thatcher on the Station because of its susceptibility to rust. Moreover, because of its propensity to shatter and since combining is used almost exclusively for harvesting, it is not recommended for the open prairie area. However, on the heavier soils of the northern area it has yielded very well and is recommended for growing there. These areas are limited in extent so that large acreages are not involved. From the quality standpoint, this is just as well for the variety does not quite measure up to the present standard of quality for Canadian export wheat.

Breeding and Selection Work in Spring Wheat

A fairly large breeding program has been initiated in an endeavour to obtain a good quality wheat which will stand up under the semi-arid conditions prevailing in the area. An effort is also being made to incorporate sawfly resistance.

There are on hand 32 advanced lines, from the cross Regent × Canus, a number of which are quite promising. They have outyielded Thatcher consistently, possess a larger, brighter kernel and higher bushel weight. Some of the better of these lines have been crossed with Rescue in an endeavour to incorporate sawfly resistance. From these lines there are now 82 selections which are undergoing preliminary yield tests. Some 300 other selections are ready for such a test this year.

A few of the better yielding and more promising hybrids on hand from the cross Regent × Comet, which were a little on the late side for this region, have been reselected for this character with the result that there are now 24 early maturing lines from this cross.

There are 25 fourth generation lines on hand involving Rescue and two of the more promising hybrids mentioned above. It is hoped to retain their yielding ability while adding sawfly resistance.

Approximately 800 plant selections were made in 1947 from a cross involving Apex and Comet, from which it is hoped to obtain a high yielding wheat possessing considerable drought resistance.

Finally as a part of the project group for breeding a high quality, drought and sawfly resistant wheat for the area, there are on hand 800 plant selections from a Rescue × Redman cross. These plants were rigidly selected for solidness of stem and good head and kernel characteristics. They are in the fifth generation and during the winter of 1947-48 were increased in California.

Durum Wheats

In tests carried on here for the past number of years durum wheats have not yielded as well as the better varieties of bread wheats. However, they are proving to be of value in the wheat stem sawfly infested areas because of their moderate resistance to this pest.

Pelissier, a variety having smooth chaff and long black awns, is the only variety up to the present, which appears to possess enough drought resistance to be grown successfully in the area. It has averaged three bushels less than Thatcher in yield. It matures considerably later than Thatcher and has longer, weaker straw. It is inferior in quality and not eligible for grades above 3 CW. It is recommended for growing in the drier areas where sawflies are a menace.

Stewart is a new durum variety on which, at time of writing, the Station had only two years testing. It is of good quality and eligible for the top grades. It is resistant to stem and leaf rust but susceptible to bunt. On the basis of two years' results, it has yielded at the Station four bushels less than Thatcher and one bushel less than Pelissier.

Mindum and Carleton are two other durums which do not appear to be suited for even the limited growing conditions for which durums are recommended in the area.

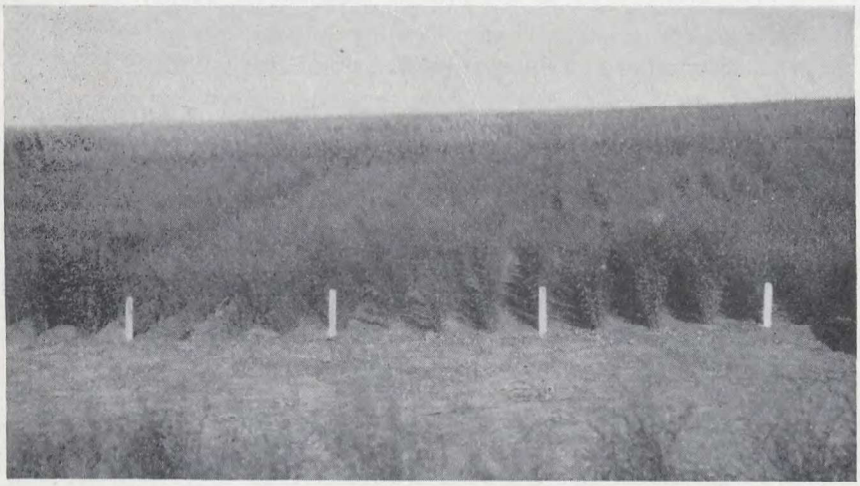

FIG. 12.—Cereal Plots. Studying Drought Resistance.

OATS

Oats are an important crop in the northern half of the area served by this Station. Not only are they grown to supply feed for the livestock population on the farms in the area, but they are also grown as a cash crop. Often the returns per acre from oats are greater than from wheat. However, in the southern portion and especially on the heavier soils, wheat is still the important cash crop.

Numerous varieties and hybrids of diverse types have been included in the tests on the Station. However, all but the white seeded, open-panicled types have now been discarded.

In the past the varieties, Banner and Victory, have been the two leaders in the area. Now however, Banner is not recommended and Victory is recommended only for growing in two isolated areas, both heavy soils, one in the north and one in the south. These varieties have been replaced by newer, higher yielding, rust resistant sorts.

Ajax, an early maturing variety developed at the Laboratory of Cereal Breeding in Winnipeg, is at present the most widely grown variety in the area. It is resistant to most races of stem rust and has moderate resistance to leaf rust and smuts. Its main defect is its small kernel. It yields well in the drier areas and, because of its earliness, is useful in areas where frost is a hazard.

Exeter is a late maturing, large-seeded variety with a kernel much similar to Victory. It was developed at the Dominion Laboratory of Cereal Breeding, Winnipeg. It is resistant to several races of stem rust. It yields best in the cooler, moister areas of the north but has also yielded well on the open plains.

Victory, as mentioned previously, is recommended for only a limited area of heavy soils. It is a late maturing, plump-seeded variety which yields well where rust is not a factor, being susceptible to rusts. It is also susceptible to the smuts.

Valor is a very early maturing, plump-kerneled variety put out by the University of Saskatchewan. It is not generally recommended because of its lower yielding ability. It is recommended as a special-purpose oat variety which is useful as a cleaning crop for wild oats because of its earliness and large seed.

Brighton is the Stations highest yielding hulless oat variety. It possesses large kernels, is susceptible to rusts but moderately resistant to smuts. It is recommended for special-purpose feeding of young pigs, poultry and calves.

Breeding and Selection Work in Oats

The breeding and selection work in oats being carried out at the Station is mainly concerned with obtaining an oat which will possess a plump kernel with high bushel weight, along with good yield under the semi-arid conditions prevailing in the area.

At the time of writing there are on hand 48 very promising lines selected from four of the best hybrid populations, Ajax × R.L. 1486, Cartier × Ajax, R.L. 1273 × Ajax, and R.L. 1225 × Early Miller, and approximately 2000 plant selections from two crosses involving rust and smut resistance in addition to high yield, high bushel weight and drought resistance. These two crosses are Ajax × Valor and (Valor × Ajax) F_1 × R.L. 1276. Finally, there are 60 true-breeding hybrids in yield tests compared with standard varieties. A few of these are very promising on the basis of three years testing. Another couple of years testing should suffice to determine if any of these are sufficiently good enough to be put out as varieties for growing in the area.

Barley

Barley has not been a very important crop in northwestern Saskatchewan up to the present. It has been used chiefly as a cleaning crop and for feeding purposes on the farm. The ability of barley to fight weeds has led to its use as a cleaning crop. The capacity of barley to mature in fewer days than wheat or oats has resulted in its being sown after these crops. Thus, competition with weeds and seeding late on poorly prepared land has been detrimental to the reputation of barley. However, it has been shown, that in most years, if barley is treated in the same way as wheat or oats, it will produce as many or more feed units per acre. The fact remains though, that barley varieties grown in the past, have been more susceptible than wheat or oats to injury from heat and drought, conditions often prevalent in the area during July.

The introduction of newer varieties in the past few years has intended to lessen this objection. The Station now has a few varieties which seem to stand up pretty well under the hot dry conditions of mid-summer. In addition, all of the newer varieties are smooth-awned which makes them superior to the rough-awned varieties for fodder. Another requirement for a barley variety for this area is ability to hold heads and resist shattering so that it can be combined, the method of harvesting now used by most farmers in the area.

Hannchen is a two-rowed nodding barley with white kernels and rough awns. It has been grown to a considerable extent in the area in the past but is now no longer recommended. It possesses considerable drought resistance but is excelled in this respect now by newer varieties which have smooth awns.

Titan is an early maturing, smooth-awned, six-rowed variety with exceptionally strong straw. It yields well on the dry open plains and is suitable as a combine barley because it retains its heads well and does not shatter readily after ripening. It is susceptible to rusts but is resistant to both loose and covered smut. It is eligible for the feed grades only.

Plush is a medium late, smooth-awned, six-rowed variety with moderately strong straw. It is moderately resistant to stem rust and susceptible to leaf rust, loose and covered smut. It has shown wide adaptability and has yielded well. It is eligible for the feed grades only.

Regal is a medium late, smooth-awned, six-rowed variety which is susceptible to rusts and smuts. It has done well in parts of the area in the past but is now no longer recommended, being excelled in yield by newer varieties.

Montcalm is a six-rowed, smooth-awned, blue-seeded variety of high malting quality. It has moderately weak straw and is poor for combining. It is susceptible to rusts and loose smut but moderately resistant to covered smut. It will not yield well under the dry conditions of the open plains, and is recommended for growing only in the more moist northern areas. It is eligible for grades 1 C.W. six-row.

Warrior is an early, hooded variety, recommended for special purposes. It has strong straw and is satisfactory for combining. It is susceptible to rusts, moderately resistant to covered smut and resistant to loose smut. It is eligible for the feed grades only.

Other barley varieties recommended in the past but now no longer recommended are listed as follows:

(1) Prospect, a smooth-awned, six- rowed variety put out by the Dominion Experimental Station at Swift Current. It has yielded well under the dry conditions of the open plains but is now being replaced by Titan and others.

(2) Rex is a smooth-awned, two-rowed variety put out by the University of Saskatchewan. It was used as a combine barley, especially on the heavier type soils on the open prairie but is now superceded by Titan.

(3) Newal, a six-rowed, smooth-awned variety has yielded very well in many parts of the area but is not grown to any great extent mostly because it is a poor combine barley and is very susceptible to loose smut.

(4) Trebi, a six-rowed, rough-awned variety was the standard variety for the area some years ago but is now being grown only in isolated cases. Main objections to its use are its rough awns and lower yielding capacity.

(5) O.A.C. 21 has been the standard malting barley for years. It is rough-awned and six-rowed. It never did well on the open plains and is being replaced by Montcalm in the moister northern areas where malting barley can be produced.

Newer barley varieties coming into prominence include the following: Vantage a variety very similar to Plush but possessing resistance to rust and put out by the Brandon Experimental Farm as a replacement for Plush. Tregal, Velvon, Glacier, Gem, and Compana are all U.S.A. releases of the past few years, which have showed up well so far in tests carried on in the area. Of these Tregal and Velvon 11 would appear to be the most promising for this area. Tregal possesses exceptional yielding ability, is resistant to loose smut, somewhat susceptible to covered smut but is not too good a combine barley. Velvon 11, although yielding on the average slightly below Tregal, is an excellent combine barley. It possesses resistance to loose smut but is somewhat susceptible to covered smut.

Breeding and Selection Work in Barley

The barley breeding program now just nicely underway is mainly concerned with obtaining a variety which not only possesses the ability to yield under our semi-arid conditions but also has the attributes of a good combine barley, in addition to possessing resistance to the rusts and smuts. At present there are on hand 58 lines from seven different crosses which show promise in the above mentioned characteristics. From these lines there are 200 plant selections on hand at time of writing. The following is a list of the crosses involved: Titan × Newal, Glacier × Newal, Glacier × Titan, Newal × Titan, Plush × Titan, S.C. 3823 × Titan and Plush × Glacier.

Flax

Flax is grown to a limited extent only in the area surrounding the Scott Station, chiefly because the soil and climatic conditions do not appear to be conducive to even fair yields. However, on the heavier soils to the south and southeast of the Station, considerable acreages have been seeded to flax in the past. The acreage in flax in these areas reached its peak in the 1943-44 crop year. Since that time there has been a steady decline until, at the time of writing, the acreage in flax on these heavy clay soils is negligible compared with wheat. The main reasons for this decline, given by the farmers themselves, is that flax growing tended to increase the weediness of their fields and also seemed to depress yields of cereals for about three years or more after a flax crop had been grown. The Station has not as yet been able to test the truth of this latter theory on the substations which are located on these heavy clay soils but has set up experiments to do so. If it is true that flax does something to the soil on these heavy clays which ruins the soil for cereal grain production for a number of years afterwards, then, of course, flax will become a very unimportant crop in these areas, where, in the past, the best flax yields were obtained.

Flax acreages have been increased in northern areas in the past few years, mainly because of the introduction of varieties which mature early enough to escape the prevailing early fall frosts. Since the quality of northern grown flax has been found to be high, farmers in these areas have been urged to grow flax as a cash crop rather than wheat—the quality of the latter in many northern areas being poor and unsuitable for export. In these areas where distances to market are usually great, flax has the advantage of considerably less transportation cost per unit dollar return.

In recent experiments using 2, 4-D on flax, it has been found that thorough weed kills could be affected without injuring the flax to any appreciable extent. In fact it was observed that the 2, 4-D appeared to stimulate the growth of the flax. If weeds can be successfully controlled in flax fields by the use of this chemical weed killer, then it can be expected that a considerable increase will occur in the acreage seeded to flax in all areas.

At present there are only two flax varieties recommended for this area. These are Royal and Redwing, both wilt resistant.

Royal is a late maturing variety moderately resistant to wilt and rust. It has medium sized light brown seeds shading off toward very pale brown at the big end. It possesses high yielding ability and is recommended for growing throughout the area where the frost-free period is long enough to enable it to mature.

Redwing is resistant to wilt but susceptible to flax rust. It has small brown seeds. It is lower in yield than Royal but it matures about a week earlier and is therefore recommended where early maturity is essential.

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Bison was the standard variety grown in this area up until a few years ago when flax rust invaded the area. Then, because of its susceptibility to this disease, it was taken off the recommended list and little of it is now grown.

Dakota is a new flax variety licensed in Canada in 1947. It is highly resistant to both wilt and rust. It has medium-sized brown seeds and matures earlier and more uniformly than Royal. In tests so far in the area, it has outyielded Royal at many places on the open plains and has outyielded Redwing in the north. If it continues to show up as well in tests, it will probably be recommended for both northern and prairie regions.

Other newer varieties which have been tested fairly extensively but which do not seem to possess enough merit to recommend for growing in the area are: Rocket, Viking, Custer, Victory, Arrow and Crystal.

Breeding and Selection Work in Flax

Only a limited amount of breeding and selection work is being done with flax because of the unsuitability of the soil here for this crop. However, there are on hand 200 fifth generation lines from the cross Bolley's Golden 976 × Redwing and 75 plant selections from the variety Viking, selections for long straw and early maturity.

Fall Rye

The acreage devoted to the production of fall rye in the Scott territory is very small and is confined chiefly to the lighter-textured, poorer soils. However, since the price of this grain has skyrocketed during the past year, the acreage has increased somewhat, but this is only a temporary situation. Tests of fall rye varieties over a number of years failed to show any large yield differences. Winter-killing is the limiting factor in the production of this crop in the area served by the Station. In this respect, Dakold proved superior to other varieties and is recommended as the most suitable for general use. The varieties, Advance and Crown, have yielded well enough in most seasons but are not quite as dependable as Dakold. No tests are now being carried on nor is any breeding or selection work being done with this crop.

Spring Rye

Tests of spring rye varieties were carried on for a few years, during which time the variety, Prolific, was a consistently high yielder. Even less spring rye than fall rye is grown in the area and so it can be classed as an unimportant crop. No work is at present being done here on this crop.

Field Peas

Field peas are of no importance as a crop in the area served by this Station. A few farmers have tried growing a few acres of them in the past few years but have gone out of production because of low yields and the difficulties of harvesting during the adverse weather conditions which usually prevail in the fall. No comparative tests of pea varieties have been carried on for some years past. The merits of the varieties showing up best are reviewed as follows:

Dashaway is an early maturing, small seeded, good yielding yellow pea. The blossoms are white and the vine has medium length.

Arthur is a medium large yellow pea. It is comparatively high yielding and medium late in maturity. The blossoms are white and the vine is fairly long.

Early Blue is early maturing and has given the highest yield of any pea variety on the Station. It is distinctly short in the vine. The kernels are medium in size, wrinkled and have a pale greenish-blue colour.

Mackay is a medium late maturing variety with white flowers and long vines. The peas are creamy white with a black eye. Because of its long vines it is sometimes grown with oats as a hay crop.

Field Beans

Field beans have been tested at the Station for a number of years but have been discontinued lately because it was felt that the work was waste effort since there is no likelihood of this crop being grown in the territory. A few farmers in the north have tried this crop but have discontinued growing it, mainly because of low yields, weeds and unfavourable growing conditions. Two varieties have proven superior to others in tests carried on. These are Norwegian, a very early maturing large brown bean, and Great Northern, a medium late maturing large white bean.

Tests of Farmers Seed Grain for Purity

Samples of seed wheat sent in by farmers of the area and by various grain companies have been grown and rated for purity of variety. The number of these samples has averaged around 350 per year. This work has resulted in considerable improvement in the purity of seed grown by farmers in the area and has also been instrumental in getting farmers to grow recommended varieties.

Co-Operative Work in Cereals

Rod-row tests of cereals are conducted on all substations and Illustration Stations in the territory, and also with a number of co-operating farmers, each selected carefully as to location. This is an endeavour to obtain information on the reaction of different cereal varieties to the various soil and climatic conditions found in the territory. Because of the many different conditions of soil and climate, the number of these tests average around twenty per year and the data obtained is used in making variety recommendations for different districts or "cereal zones" as they are called. In addition to data on named varieties, these tests are useful in evaluating promising hybrids.

Production of Elite and Registered Seed

As a service to farmers in the district served by the Station, elite and registered seed of recommended varieties is produced. The quantities produced are never very large as it has been the policy of the Station not to compete with seed growers. The quantities are usually sufficient, however, to let farmers have a few bushels to enable them to get a start with pure seed of recommended varieties.

Varietal Reaction to 2,4-D

Owing to the intense interest of farmers in the use of the new selective weed killer 2, 4-D, it was decided to set up an experiment to determine if there was any differential reaction of different varieties of cereal crops to 2,4-D. This experiment was set up in 1947 and contained four standard varieties of each of wheat, oats, barley and flax. As only one year's results are available to date, no definite conclusions can be drawn. However, it would appear from these results, that varieties of the same crop are affected differently by 2,4-D.

Forage Crops[3]

Yields of forage crops vary considerably in northwestern Saskatchewan from poor in the south to quite good in the north. In addition, the type of forage crops suitable for growing in the drier areas of the south are altogether different from the types suitable for growing in the north where summers are cooler and there is better moisture efficiency.

Since this Station is located in the drier part of the area, the tests carried on relate to that portion and hence it is necessary to depend upon tests on Illustration Stations to determine the suitability of forage crops and strains for the northern areas.

The main forage crop work consists of comparative testing for hay yields of various strains of grasses and legumes to determine their suitability. Very little work has been done to date on seed yields. No breeding program has been initiated but a nursery has been maintained to determine the value of various introductions as forage crops for the area.

FIG. 13.—Types of sod after breaking—(left) slender wheat grass, (right) crested wheat grass.

PERENNIAL GRASSES

To date, only three perennial grasses have been found to be suitable for growing in this area. These are crested wheat grass, brome grass and slender wheat grass. Of these, crested wheat grass has proved to be the most suitable for the generally dry conditions of the open prairie, while brome grass has done better where moisture conditions are more favourable. Slender wheat grass is not grown to any extent in the area now but was found to produce quite satisfactorily for a number of years after the land was broken.

Crested Wheat Grass. This grass was introduced into Western Canada in the early thirties. It has become quite popular on the open prairie because of its ability to maintain a stand and produce some crop even under very unfavour-

[3] Prepared by A. G. Kusch, Assistant in Cereals and Forage.

able moisture conditions. Its ability to persist over a period of years is quite valuable in dry areas where stands are difficult to establish. It has proven to be suitable as a pasture grass because of its ability to supply fodder early in the spring and its ability to endure dry conditions and to revive quickly when moisture and cool conditions in the fall become more favourable. It has excellent feeding value but care must be taken in the spring when pasturing milk cows on it because of its propensity to impart a taint to the milk. When used alone for hay, pasture or seed, a rate of five pounds per acre in twelve-inch rows is recommended.

Brome Grass.—A creeping rooted grass, brome has become quite popular in the northern half of the area, not only as a hay and pasture crop, but also as a seed producing crop. For hay, it yields about as well as crested wheat grass when the stands are young and the moisture supply is normal, but is inferior in this respect on the drier portion of the prairie when the stands become older. While the stand will persist almost indefinitely, it becomes sod-bound after a period of years with the result that yields fall off markedly. This condition may be remedied by shallow ploughing, one-way disking heavily, or having alfalfa growing in a mixture with it.

Slender Wheat Grass.—Commonly called western rye grass, it has been a high yielding grass when yields are based on the first and second year hay crops. After the second crop, the stand begins to thin out, weeds enter and finally dominate. This necessitates ploughing up and reseeding quite frequently. This is costly and hazardous in an area where good stands are difficult to obtain. Because of this lack of persistance and because it begins growth rather late in the spring, it is less suitable for pasture purposes.

Alfalfa and Clovers

Alfalfa.—On the open prairie, alfalfa has failed to produce a satisfactory yield, but in the northern areas it produces very well. It is grown extensively there, not only as a hay and pasture crop, but also as a seed producing crop. However, when seeded with grasses, it has been found to not only increase the yield of the grass with which it is sown but also to improve the quality of the hay and pasture. Hence, it is now a standard recommendation to seed down a mixture of perennial grasses and alfalfa. Grimm has been the standard variety for many years but recently there has been a movement on foot to increase seed of the variety, Ladak, to have it replace Grimm. The reason for this is that Grimm is susceptible to alfalfa wilt disease, which is becoming quite serious in killing out alfalfa stands. The variety, Ladak, is itself not entirely resistant to this disease although fortunately it has tended, in the past, to produce slightly higher hay yields when one cut only is taken. As it is usually possible to get one cut only under conditions prevailing at Scott, this is a further point in favour of Ladak.

TABLE 12.—ALFALFA HAY YIELDS AT SCOTT, 1939-1946

Yields of hay in tons per acre

Variety	1946	1945	1944	Average 1944-46	1943	1942	1941	1940	1939	Average 1939-46
Ont. Variegated.	0·63	0·97	1·14	0·91	0·88	0·40	1·25	0·41	1·04	0·84
Ladak	0·63	0·53	1·00	0·72	1·12	0·46	1·62	0·51	0·93	0·85
Grimm	0·47	0·42	0·97	0·62	0·97	0·40	1·35	0·37	0·72	0·71
Canauto	0·55	0·77	1·17	0·83	.....	.....	.....	.....	.....	.....
Viking	0·66	0·68	1·02	0·79	.....	.....	.....	.....	.....	.....
Hardistan	0·58	0·65	1·03	0·75	.....	.....	.....	.....	.....	.....

Table 12 shows the two varieties, Ontario Variegated and Ladak, to be the top yielders over a period of eight years with Grimm inferior in this respect. However, for the three years, 1944 to 1946, when three additional varieties were added to the test, Ontario Variegated still held top place but Ladak was outyielded by the varieties Canauto, Viking and Hardistan in that order. Canauto is a comparatively new variety recently named. Ontario Variegated has always yielded fairly well at Scott but there never has been a demand for seed of this variety and very little of it is being grown in the area.

Sweet Clover.—A number of different varieties of sweet clover have been tested at this Station for hay yield over a period of years. The results of these tests show that two tall growing varieties, Arctic A and Erector, give the highest hay yields. Both of these varieties are coarse stemmed. Alpha, a fine stemmed and shorter growing variety, has not yielded very well, although the quality of hay from it has been superior. The variety, Common White, is a little coarser

FIG. 14.—Cutting crested wheat grass for hay.

than Arctic, is a little shorter growing and a little lower yielding. In dry years, sweet clover will yield more than alfalfa. This is important in a dry area where quantity of feed is important. In spite of this, however, sweet clover has not been grown to any extent in the area. It is grown to some extent in flats and low-lying areas where the soil is slightly alkaline in reaction because of its tolerance to small amounts of alkaline salts, but is not used generally on the farms in the area. The main objection of farmers to this crop seems to be its habit of volunteering in their fields for years after it has been seeded, thus making it more or less a weed. This may now be no longer an objection due to the introduction of 2, 4-D sprays.

Mixtures of Grasses and Legumes.—The results of experiments carried on over a period of years indicate that wherever possible it is advisable to grow a grass-legume mixture. Because of its perennial habit, alfalfa is the legume most generally used although sweet clover may be used under certain conditions. Compared with grass alone, the mixture has proven to be higher yielding and to produce a better quality feed whether used for hay or pasture. Compared with the legume alone when used for hay, the mixture is more easily cured and there is less chance of losing the legume leaves. When used for pasture, there is less

danger of bloating. It has also been found that some species of grasses, which yield very poorly in the area, will yield quite well when grown in a mixture with alfalfa.

Annual Hay Crops

A number of cereal grain crops, millet and peas have been tested for their suitability as hay crops. The results of a number of years of testing show that the late maturing varieties of oats produce the highest hay yields. Long-vined varieties of peas, such as Mackay and Arthur, do not produce good yields by themselves but increase the yield and quality of oat hay when seeded with oats. Early varieties of oats yield less hay than late-maturing ones, but do as well as wheat. Smooth-awned barleys are next to late-maturing oats in hay yield and produce a fair quality hay. From the standpoint of the awns, the smooth-awned hay was not objectionable as was the hay from the rough-awned varieties. Hooded barleys come next in hay yield, followed by wheat, then peas, and finally millet. Both Crown and Siberian millets were tried. Crown proved to be very unsatisfactory and was dropped early in the testing period. Siberian has been carried along in the test but has not proved satisfactory. It fails to make much growth in the dry seasons which predominate in the area. It may be said that the seasons are too short and dry for the successful growing of millet in the area.

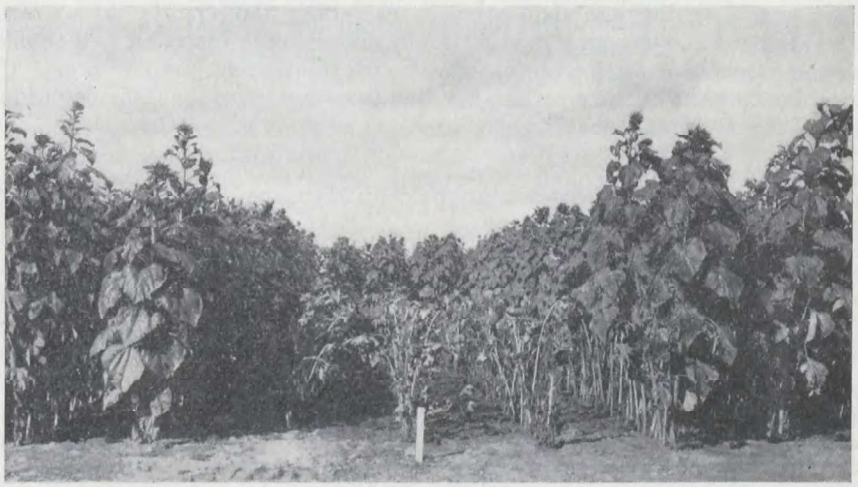

Fig. 15.—Comparison of seed and forage type sunflowers.
Scott Experimental Station, September 19, 1942.

Silage Crops

Sunflowers and corn cut up with green oats have been the crops used at Scott for silage during the past eleven-year period. However, not much success was obtained with the growing of corn, although various cultural practices such as manuring, use of commercial fertilizers, and tests on both summer-fallow and stubble were tried. The yield per acre in tons is a third or less of what may be expected from sheaf oats. One advantage of corn, however, is the fact that it has provided feed in years when grasshoppers severly damaged or completely destroyed other feed crops.

On a dry matter basis, sunflowers have produced about the same average yield as sheaf oats, but the late-maturing varieties such as Mammoth Russian and Giant Russian must be used. The seed producing sorts such as Mennonite Sunrise and Advance do not grow sufficiently tall, nor remain green long enough, to take advantage of fall rains. When compared for green weight, which is the important weight for silage, the late-maturing sunflowers yield about twice the tonnage of sheaf oats. The main objection to growing these late-maturing varieties for silage, however, is that seed has to be purchased each year because they are too late to mature seed in this area. Sunflowers, grown in rows on summerfallow, will stand much drought and have stood light frosts without material damage.

Argentine Rapeseed

When seed of this crop was brought from Argentine during the second great war to determine its possibilities as an oil producing crop in this country, the Scott Station undertook experiments to find out if it could be economically grown in the area. It was found that in years of good summer rainfall, yields as high as 1300 pounds per acre were obtained when about twenty pounds of ammonium phosphate 11-48-0 fertilizer were used. Without fertilizer, yields of 1000 pounds per acre were obtained. However, in years when summer rainfall was deficient, yields dropped to as low as 150 pounds per acre. Over a period of four years, the average yield per acre was about 350 pounds. Many farmers in the area are now growing it as a supplementary cash crop and find that they make as much on it as they do on wheat with the present support price. Using a combine to harvest the crop has resulted in overcoming the difficulty of losing much of the crop from shattering.

Triticum Agropyron Hybrids

Three different attempts were made to grow these hybrids which resulted from crossing common wheat with an Agropyron grass. They grew quite well during the summer but always failed to come through the winter, indicating lack of hardiness. The object of the cross was to obtain a larger seeded grass which would not have to be seeded shallowly as the present small-seeded grasses do. Thus, there could be more assurance of obtaining a stand in an area where the surface soil is dry most of the time.

Farm Pastures

Pastures are very important on the farm when livestock forms part of the farm economy. The value of pastures may be visualized from the fact that, on this Station, approximately one-third of the sustenance of the cattle is derived from pasture at about one-seventh of the cost of the total feed consumed.

It has only been in comparatively recent years that farmers in the area have begun to use adapted cultivated grasses for pasture purposes. Previously, it was the common practice to set aside rough land with native grass for pasture and this always proved to be inadequate because of its limited carrying capacity. A comparison of the relative carrying capacities of native and cultivated grasses may be obtained from the fact that on the Station between one and a half and two sections of native pasture land would be required while one-quarter section of properly managed cultivated grasses suffices for the Station's needs.

Grasses make up the bulk of the pasture in the area but during the hot dry weather of midsummer the present cultivated grasses do not as a rule supply sufficient grazing. This problem can be solved by the use of an annual pasture of cereal grains. On the Station, a mixture of oats and barley was sown at the rate of about one bushel per acre each, at two dates, one about the end of May and the other about the middle of June. This mixture has served satisfactorily as a supplementary pasture to grasses during this midsummer period. This type of pasture will be ready about the time the pasture from grasses begins to fall off and will bridge the gap until the permanent grass pastures are again able to supply pasture requirements.

In the past, this Station has used for pasture purposes three grasses adapted to this area, namely crested wheat grass, brome grass and western rye grass. These were sown separately and a record kept of the carrying capacity of each. Over a three-year period, one-fifth of the pasture came from western rye grass, one-third from brome grass and about one-half from crested wheat grass. At the end of three years, the western rye grass had practically disappeared and prairie sage had taken possession. The brome grass was doing well in the low spots and on northern slopes, while the crested wheat grass maintained a good cover and good grazing.

In more recent years, experiments have been conducted with mixtures containing various proportions of crested wheat grass, brome grass and alfalfa. This change was made because a grass legume mixture would supply more and a better balanced pasture than grass alone. In these experiments, one of the objects was to determine the proper proportions of the two grasses and the alfalfa to seed, in order to balance the respective competitive abilities of each component so that a proper balance of each would be maintained over the period of time it was intended to leave the pasture down. After testing many mixtures of various proportions of the two grasses and alfalfa, it was found that the most suitable in all respects for this area was the following mixture: brome grass—5 pounds per acre, crested wheat grass—3 pounds, alfalfa—2 pounds. Higher rates of seeding crested wheat grass in such a mixture resulted in brome grass being choked out after two seasons of pasture. Increasing the rate of alfalfa made the cost of seed in the mixture too high. The above mixture has been tested for pasture purposes against both of the grasses alone and was shown to provide not only a better pasture but also to extend the pasturing period. Another important feature noticed was that the alfalfa tended to prevent the "sod-bound" condition of both brome grass and crested wheat grass.

As a result of this work, it is now recommended that, wherever possible, it is advisable to seed a grass legume mixture for pasture purposes. Compared with grass alone, the mixture is higher yielding over a period of years and produces a better balanced feed; also there is less danger of bloating than when the legume is pastured alone. On the degraded and grey soils of the North, the mixture proves superior because the legume supplies much needed nitrogen.

Drill Settings for Seeding Forage Crops

Farmers are advised to seed certain rates of forage crops in order to obtain optimum results but are often at a loss on how to set their drills to seed at the desired rate. Table 13 contains drill settings for seeding and cultivated grasses, legumes, and grass legume mixtures at the rates recommended for the area. As there are two types of drills now in use, namely, the new so-called "forced feed" drill and the old type "fluted feed", it has been necessary to work out settings for both of these types where feasible, the settings as set forth in the table are for reasonably plump and well cleaned seed using comparatively new drills. They may have to be varied somewhat, according as to whether the seed is light or poorly cleaned, or as the feeding mechanism of the drill is worn.

TABLE 13.— DRILL SETTING FOR VARIOUS RATES OF SEEDING FORAGE CROPS

Forage Crop	Rate of seeding per acre	Spacing	New forced feed	Old fluted feed
	lb.	in.	lb.	
Crested Wheat Grass	5	12	35 wheat	½ bu. wheat
	8	6	28 wheat	1¼ pk. wheat
	10	6	35 wheat	1 bu. wheat
Brome Grass	8	6	35 wheat	6 pk. wheat
	10	6	48 wheat	7½ pk. wheat
Alfalfa, Sweet Clover (Mixed 3 of cracked wheat to 1 of legume by weight)	6	6	20 wheat with reducer	2 pk. flax
	7	6	24 wheat	2¼ pk. flax
	8	6	28 wheat	2½ pk. flax
	10	6	35 wheat	3 pk. flax
Brome 8 lb., Alfalfa 3 lb.	.....	6	35 wheat	1½ bu. wheat
Brome 4 lb., C.W.G. 4 lb.	.....	6	48 wheat	2 bu. wheat
Brome 4 lb., C.W.G. 3 lb.	.....	6	28 wheat	1½ bu. oats
Alfalfa 2 lb.	.....	.....	.....	.....
Brome 5 lb, C.W.G. 3 lb.	.....	6	35 wheat	2 bu. oats
Alfalfa 3 lb.	.....	.....	.....	.....
Brome with Oats (1 part brome to 2½ parts oats by weight)	8	6	.....	5 pk. oats
Brome with Spring Rye (1 bu. spring rye with 8 lb. Brome)	8	6	.....	1¾ bu. wheat
Argentine Rapeseed (2 of cracked wheat mixed with 1 of rapeseed by weight)	4	6	.....	1¼ pk. wheat
	6	6	.....	2 pk. wheat
	8	6	.....	2½ pk. wheat
	10	6	.....	3½ pk. wheat

Large-Scale Regrassing

When community pastures were established in Saskatchewan in 1937, this Station undertook the seeding down of those located in the area served by the Station. Crested wheat grass was used for this purpose and in the beginning had to be purchased. However, as stands became established seed was harvested from these pastures and used to re-seed additional acres.

The seeding was done on land which had been under cultivation at one time but which had been abandoned. In the beginning, seeding was done only where adequate weed cover existed, which on most areas consisted mainly of Russian thistle. Every other disk and seed-sprout on the drill was removed and the corresponding openings in the seed-box covered. This meant that the seeding was done in rows spaced twelve inches apart, using a setting of two pecks for wheat for the well cleaned seed. The rate of seeding was five pounds per acre and, with a few exceptions, the drills were pulled with tractors using tandem hitches. The tractors were equipped with lights and operated continuously in three eight-hour shifts. The passage of the drills through Russian thistle was greatly facilitated by having every second disk removed.

All seedings were done in the fall, that is, during September, October and the early part of November. This work began in 1937 and was continued yearly until 1943. During that period a total of 43,562 acres were seeded and excellent stands of grass obtained. In a few instances, the fall seedings were pastured the following year. This resulted in an almost complete elimination of the young grass seedlings and hence a destruction of the stand. On areas which were kept bare by soil drifting, the seeding to grass was done after the land was reclaimed as described under "Drought and Soil Drifting" in the Field Husbandry section of this report.

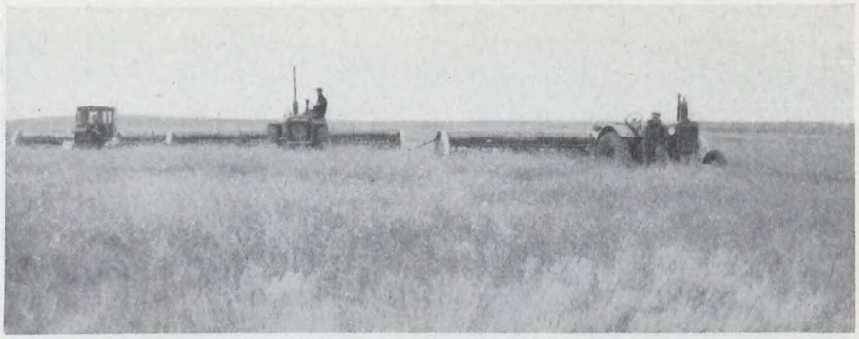

FIG. 16.—Drilling crested wheat grass into annual weeds. October, 1939.

LARGE-SCALE HARVESTING OF CRESTED WHEAT GRASS SEED

Ordinarily on an Experimental Station harvesting of forage seed is confined to plots or small increase fields. In 1941 an opportunity presented itself to carry out extensive harvesting of crested wheat grass seed in community pastures where seeding of this grass had been in progress since 1937.

Approximately thirty-thousand acres were drilled to crested wheat grass in these pastures by this Station. The reseeded area consisted of abandoned farm land much of which had rough physical features. Of the twenty-six thousand acres which had been sown a year or longer, over five thousand acres were selected early in May in three community pastures for harvesting. Where feasible, the areas selected from which to harvest seed were not pastured during the early summer. A further check on these areas was made early in July and a careful watch was kept on them as the summer advanced so that a start could be made when the seed was filled, at which time the heads usually turned brown.

After examining harvesting methods suitable for large-scale harvesting, swathers were selected and hired from farmers. Swathing commenced in one pasture on July 18, four days later in the next pasture, and continued until October 6. Actually, however, the bulk of the work was completed in midsummer as ten of the fifteen cars were loaded between the seventh and twenty-third of August.

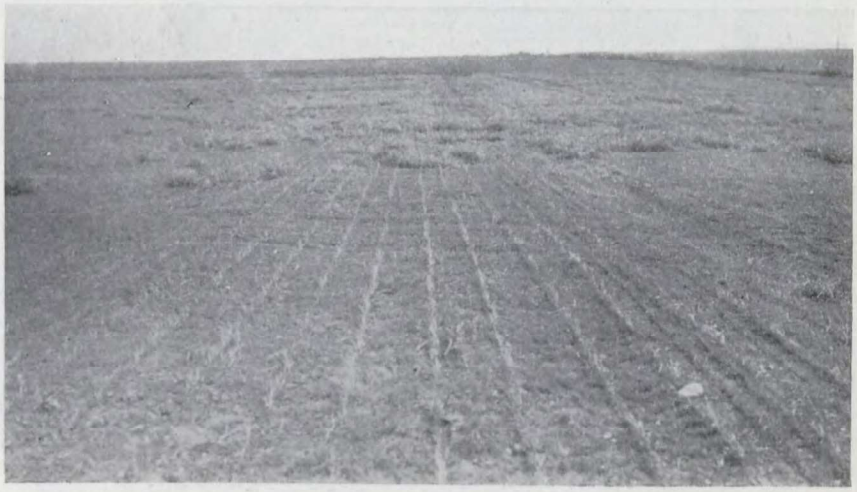

FIG. 17.—Rows of grass showing green in May, 1938, from October seeding 1937, after wind had swept off Russian thistles.

FIG. 18.—Crested wheat grass lying in swath on rows a foot apart.

Swathers performed successfully in cutting crested wheat grass for seed and, as with grain, the laying of swaths was much improved in a heavy crop. Grass to a height of fourteen inches was required and a five-inch stubble was necessary to carry the swath on the twelve-inch spacing used in seeding these pastures. Where the grass was two to three feet high an almost perfect swath was laid. In no case did swaths of clean grass roll with winds of moderately high velocity.

The swather with a fast moving knife and reel gave the best satisfaction. Swaths from a sixteen-foot machine laid up better on the stubble after a few days than those from a twelve-foot cut. Particularly, in fairly heavy growth, the centre-delivery swather was preferable to the end-delivery type because the stems and heads were almost interwoven and rested better across the stubble.

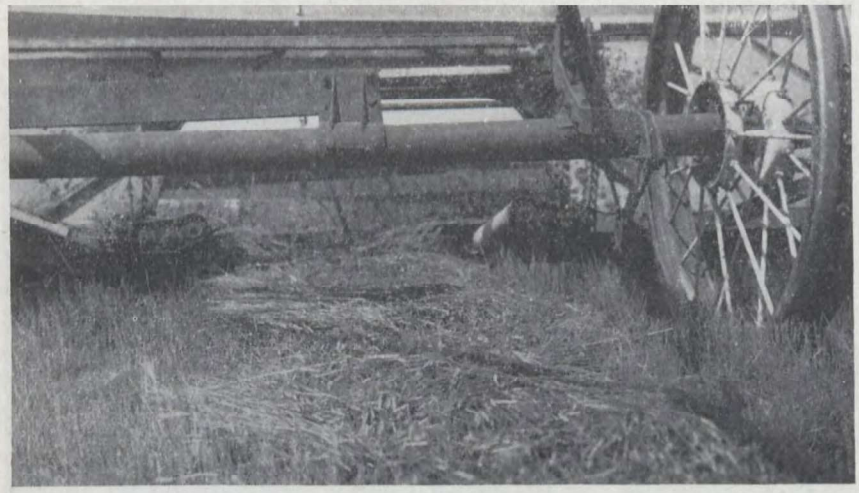

FIG. 19.—A centre delivery swather interlocks crested wheat grass so that it stays well up on the stubble.

FIG. 20.—Combines picking up swaths and threshing seed of crested wheat grass.

Continuous, even speed of swathers gave best results as the slow moving machine left an uneven stubble with considerable uncut. All machines were equipped with rough (serrated) knives so that no comparisons with smooth knives were obtained. In cutting crested wheat grass for hay, frequent gumming of the knives is experienced, but only in three low lying fields with heavy growth did this happen in swathing 5450 acres in three community pastures. In swathing crested wheat grass, best results were obtained by setting the reels slightly lower and a little further back than for grain, in addition to having them parallel with the knife.

Combines with pick-up attachments were used to thresh the seed as soon as drying was completed. Among the nineteen combines used for this operation, there were a number of different makes including rub-bar cylinders, spike-

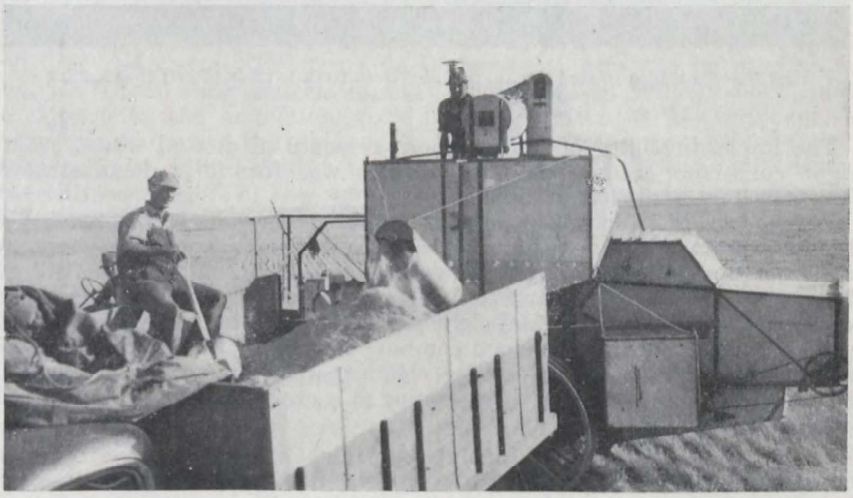

FIG. 21.—Loading crested wheat grass seed into truck from combine Mariposa pasture—August 15, 1941.

tooth cylinders, engine driven and power take-off types. Actually, there was no essential difference in the various makes when machines of the same type and capacity were compared. The rub-bar cylinder was preferable to the spike-tooth because the latter had a tendency to break up the straw (even with concave teeth removed), thus causing too much overloading of the sieves for efficient separation of the seed. In picking up and threshing swaths of crested wheat grass, the spacing for bar cylinders which gave best satisfaction was $\frac{3}{8}$–inch in front and $\frac{1}{2}$-inch at the back, making sure the widths were even on both ends. Under the prevailing conditions where variations occurred in roughness of land and amount of grass in swaths, the engine-driven combine was preferable in maintaining the desired even speed. Less wind was required than for grain and it was found that it should be directed to the front of the riddles and the chaffer in sufficient quantity to keep the seed and chaff floating, but not enough to carry the seed over. It was necessary to have the hoppers on the combines covered with canvas during winds of moderate intensity. Wetting and drying of swaths associated with showers continued to loosen seed with decreasing yields of seed during pick-up operations.

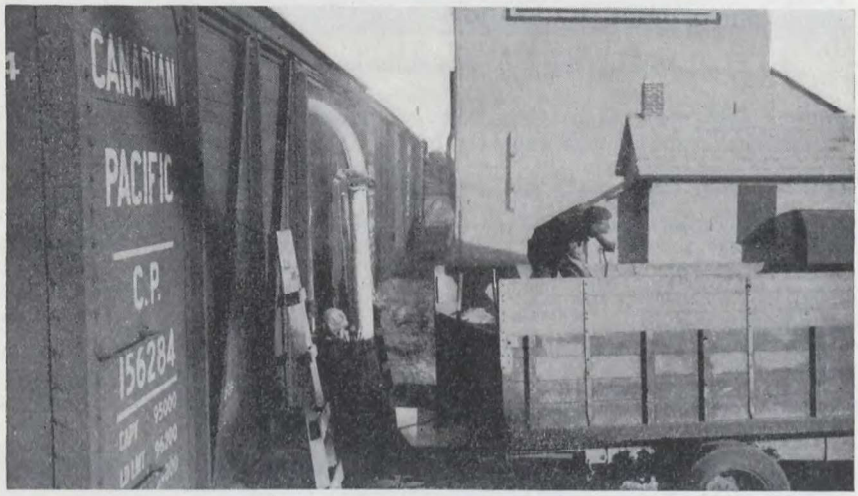

FIG. 22.—Shovelling crested wheat grass seed from truck to grain blower thus loading directly into railway cars without sacking.

The impracticability of leaving large acreages of crested wheat grass for straight combining under prairie conditions was forcefully demonstrated in 1941 when 1500 acres left standing lost all its seed in stormy weather before the seed was ready to combine. In seasons when there is a lack of strong wind and absence of inclement weather, seed of crested wheat grass can be successfully straight combined cheaper than by swathing. This was possible in 1942 when 80,240 pounds of seed were harvested with three self-propelled combines during seven complete working days and eight part days. With a yield of one hundred pounds per acre, each twelve-foot combine harvested three hundred pounds of seed per hour in actual cutting time. High speeds were not found economical and best results were obtained by operating at a ground speed of one and a half miles per hour.

Loading operations for shipment were also a part of these operations. The seed from the hoppers on the combines was dumped into trucks which delivered the grass seed to the nearest railway yard where it was bulk loaded by blowing into cars. Unloading the hoppers into trucks was much faster with

thc auger-type hopper because the gravity-type hopper required mechanical assistance to start and keep the seed flowing. A two-ton truck hauled the seed (amounting to eight tons) from three sixteen-foot combines a distance of five miles in a twelve-hour day. It was necessary to have a tarpaulin over each truckload of grass secd when moving on the road even in calm weather. A two-ton truck hauled about 2600 pounds of uncleaned crested wheat grass seed, but with a foot-board around the box the average load was raised to 3200 pounds. Loading the grass seed directly from truck to grain cars, using a blower, was simple and efficient. The type of blower used had the seed fed to the centre of the fan and could handle the seed as fast as it could be shovelled off the truck. The unloading time for a ton and a half of seed, by this method, was ten to twelve minutes. By directing the curved hood in the end spout, cars were completely filled without any shovelling.

Cost of harvesting seed of crested wheat grass varies with the yield and also depends on the prevailing rates of pay. Men were paid fifty cents and tractors one dollar per hour. Swathers were paid on the basis of width of cut but a farmer operating a tractor and sixteen-foot swather was paid $2.46 per hour which was six cents per foot of cut. Combines with pick-up attachment were paid on the basis of the area of the chaffer which determined the rate at which the sced could be efficiently threshed. A sixteen-foot combine was, therefore, paid $5.50 per hour which equalled the prevailing rate when used for grain. Truck rates varied with capacity from $1.25 for a one-ton machine to $1.75 for a three-ton unit including operator. Ten cents per hour was the rate for the grain blower used in loading.

Taking all expenses into consideration, the cost of harvesting crested wheat grass seed was three cents per pound for over half a million pounds of seed under somewhat unfavourable conditions in these community pastures. Cost varied with yield in that where the yield per acre was fifty-four pounds, the cost was 6·1 cents, with eighty-eight pounds the cost was 3·3 cents and with yields of slightly over one hundred pounds the cost of harvesting seed of crested wheat grass was 2·4 cents per acre.

Animal Husbandry[4]

Horses

From fifteen to twenty purebred Percheron horses have been kept at the Station during the eleven-year period covered by this report. Four horses were supplied to the Cattalo Enclosure at Wainwright, Alta., to be used as work horses, while four registered mares and the stallion, Sir William Laet (14499), were shipped to the Dominion Experimental Station at Beaverlodge, Alta. In turn four mares and the stallion, Chief Laet (14452) were received from the Dominion Experimental Station at Morden, Man., in 1946 and four additional registered mares in 1947. The number on hand at the end of December, 1947, was fifteen which included four foals born in the spring of that year.

Four Percheron stallions have stood for service at this Station under the Federal Premium Mare Policy giving free service to high class purebred mares which were classed as Premium Mares. Those from a distance greater than ten miles were given pasture and necessary service at one dollar per week for a period of eight weeks.

Non-premium mares included purebred mares which did not qualify as premium and grade mares of good type and in good breeding condition. For all non-premium mares the service fee was five dollars, each payable at time of service, and any mares not proving in foal at the end of the season were entitled to free service the following season or a substitute mare was accepted if the owner desired.

[4] Prepared by E. Van Nice, Assistant in Animal Husbandry.

TABLE 14.—STALLIONS USED AND OUTSIDE MARES SERVED

Name of Stallion	Registration Number	Years Used	Outside Mares Served
Mel Laet 2nd	(14498)	1937	30
	210068	1938	44
	.....	1939	45
Lethbridge Donald	(16719)	1940	40
	.....	1941	37
	.....	1942	20
Sir William Laet	(14499)	1943	17
	211593	1944	5
	.....	1945	3
Chief Laet	(14452)	1946	2
	20952	1947	0

Prior to 1940, some mares came from points over one hundred miles distant but there was a gradual decline in interest as indicated by the number of mares served. The improvement in farm tractors and power machinery has reduced the popularity of the horse as a source of farm power. It appears doubtful if the draft horse will be able to maintain his reduced status, but most farmers retain three or four horses for small jobs around the farm and for winter use when cars and trucks are snowbound.

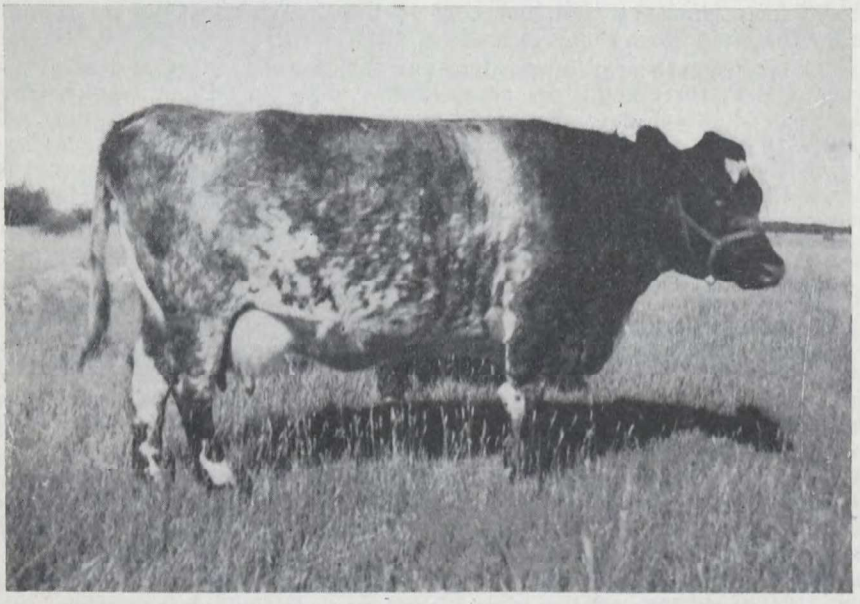

FIG. 23.—Scott Aughlish Ada—279468—R.O.P. Test, 365 days, two-year old class, 9894 pounds of milk containing 366 pounds of fat.

CATTLE

During the past eleven years the purebred Shorthorn herd has varied in numbers from approximately forty head in 1937 to seventy-five head in 1947. A policy of Dual Purpose breeding was followed with reasonable success from 1921 to 1944 when a beef or Scotch bred bull was introduced, namely Killearn Monarch 39th 286360. The purpose of this change was to improve the general beef type of the herd but selections are still made with careful consideration being given to the heavier milking families in the herd.

During the period covered by this report, the two most valuable Dual Purpose sires used were Aughlish Captain 221136 (261570) and Rayalta Bell Comet 217805. Aughlish Captain sired ninety-eight calves while in the herd, sixty-two males and thirty-six females. A total of fifty-seven males were sold for breeding bulls including one to each of the following Experimental Farms or Stations: Kapuskasing, Ont., Beaverlodge and Vermilion in Alberta, and Smithers, B.C. The greater number of the females were held in the herd and for the most part were a credit to their sires in both type and production. Rayalta Bell Comet came to the herd in 1942 as a mature sire. He sired forty-seven calves in the herd, twenty-four males and twenty-three females. His grandsire on his sire's sidé had three R.O.P. daughters and on the dam's side thirty-one R.O.P. daughters. Females sired by this bull have compared favourably with those sired by the imported bull Auglish Captain mentioned above.

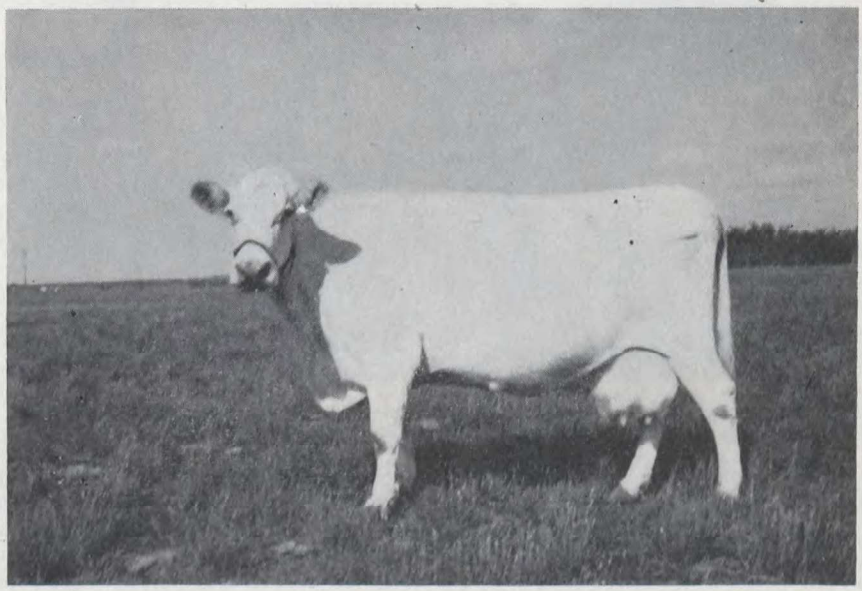

FIG. 24.—Scott Star Snowball—265719—Average production in ten lactation periods 9,084 pounds of milk containing 391 pounds of fat.

The Scotch-bred bull, Killearn Monarch 39th, has sired sixty-nine calves in the herd to the end of December, 1947. These calves show a marked improvement in beef type. It is expected that the average milk production may be reduced but all females are tested on Record of Performance during the first lactation period to give a basis for culling and those having the higher milk records are retained providing the type and conformation are not inferior. It has been observed that some of the highest producers in this herd have been from Scotch-bred ancestors.

The heaviest producer in the herd to date is Scott Star Snowball 267519 born September 19, 1934, sired by Neralcam Star 171592, a Dual Purpose bred bull but out of a Scotch-bred cow, Prairie Red Rose 32nd 233329 sired by Berserker. This beef-bred cow gave 36,210 pounds of milk in five lactation periods with an average fat test of 4.6 per cent, or an average of 7,242 pounds of milk containing 333 pounds of fat. Her daughter, Scott Star Snowball, mentioned above, and still in the herd, gave 90,836 pounds of milk in ten lactation periods

containing 3,906 pounds of fat, an average of 9,084 pounds of milk per period containing 391 pounds of fat. This cow gave birth to twelve calves in ten gestation periods including two sets of twins. She was thirteen years old in September, 1947, and was due to calve again in May, 1948.

While this cow is rather outstanding in the herd for consistent production she does not conform to the typical beef type; in fact, she is more of a Dairy than a Dual Purpose type. Her Scotch-bred dam mentioned above was of a good beef type and her daughter, Scott Aughlish Hope, shown here is superior in beef type to her dam, Snowball.

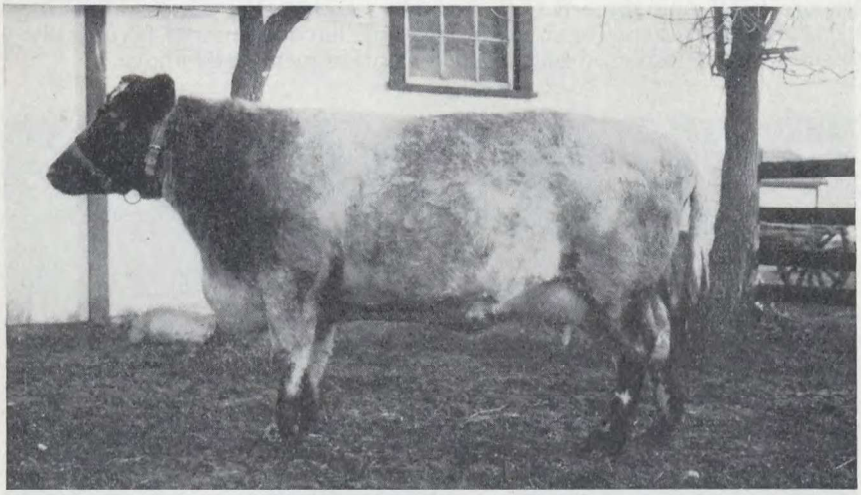

FIG. 25.—Scott Aughlish Hope—279469—daughter of high producer (Snowball) but only produced 5,438 pounds of milk as a two-year-old.

After twenty-three years of Dual Purpose breeding, such a middle course seems uncertain in attaining uniformity in either type or production. When a herd is being started, serious consideration should be given to the merits of both dairy and beef production or if a Dual Purpose breed would be more suitable under the conditions than either a dairy or beef breed. Many experienced stockmen contend that there are rare conditions where a Dual Purpose breed is indicated.

During the eleven-year period covered by this report, there was a summary made each year of individual lactation periods for cows and heifers being milked and Table 15 gives some of the important averages made annually.

TABLE 15.—SUMMARY OF INDIVIDUAL LACTATION RECORDS

Year	Number Cows	Average Wt. lb.	Average Prod. lb.	Fat	Feed Cost per		Index of fat production
					100 lb. milk	lb. fat	
1937	10	1352	5524	4·1	·88	·21	·56
1938	6	1351	5677	4·2	·96	·23	·85
1939	10	1342	5977	4·1	·68	·17	·58
1940	12	1305	6351	3·9	·56	·14	·58
1941	10	1338	6108	4·0	·63	·16	·61
1942	14	1264	6237	4·2	·78	·19	·63
1943	10	1287	4964	4·0	·88	·22	·51
1944	7	1272	6503	3·9	·84	·21	·65
1945	7	1206	6104	4·2	·91	·21	·65
1946	10	1067	4971	4·1	·91	·22	·58
1947	9	1054	5282	4·1	·91	·22	·56
Totals	115	13838	63698	44·8	8·94	2·18	6·76
Average	10	1258	5791	4·0	·81	·20	·61

The reduction in average weight of cows during the latter part of the period was largely due to the fact that more heifers were being milked and that more of the mature cows were being used to nurse calves. The average production of 5,791 pounds of milk testing four per cent fat is perhaps high enough for a Dual Purpose herd where a good beef type is to be maintained.

Table 15 may not be a true cross-section of the herd since many of the mature cows having qualified on Record of Performance were raising calves but it represents rather the junior herd most of which were on test.

In 1938, four representative bull calves sired by the imported bull Aughlish Captain were castrated quite young and started on feed at six months of age and fed 144 days to determine the feeding qualities of this strain of Shorthorn. The self-feeder was used and the chop was supplemented by pasture during most of the period which resulted in an average daily gain of 2·64 pounds per head.

The steers were slaughtered on the Station. The price of Baby Beef on the market was $6.50 per hundred live weight and the average price of grain was one cent per pound. At these prices, the average increase in value of the calves per head, above cost of feed, was calculated at $18.81, representing the profit per head in feeding such calves under the conditions mentioned.

In 1937, the rainfall was light until late in the season when heavy rains caused a rank growth of pigweed in the crop. It appeared that feed would be scarce hence a test was made to ascertain the value of pigweed for silage. A trench silo was used and comparisons were made with sunflower silage.

The pigweed silage did not seem so palatable as sunflower silage but the same quantity of twenty pounds per day was consumed in each case. The pigweed silage seemed to stimulate the kidneys slightly, but no harmful effects were observed. The chemical analysis showed the pigweed to compare quite favourably with sunflowers, being slightly higher in protein and lower in carbohydrates.

The use of pigweed silage for thirty days, alternated with sunflower silage, to milch cows did not result in any significant variation in body weight or milk yield. It was thus demonstrated that pigweed silage could be profitably used when sunflower silage was not plentiful. Of course, it is not often that the season is favourable for such a heavy development of pigweed and it should be stated that for this test the pigweeds were cut when the seeds were just forming and taken promptly to the silo. It is possible that an earlier cutting would have given better silage.

Sheep

In 1937, fifty Rambouillet ewes were on hand and the lambing season was quite successful without a single loss of lambs born alive and an average of one and a half lambs per ewe were weaned.

The wool clip averaged fourteen and a half pounds per ewe and the ram sheared twenty-eight pounds. The wool was sold through the Canadian Co-operative Wool Growers Association and ninety-eight per cent of the clip graded fine staple—the top grade.

Sunflower silage was fed to the ewes from about two weeks before lambing until they went out to pasture. Several years prior to this time, it was found necessary to feed a small quantity of potassium iodide during the gestation period to avoid heavy losses of lambs with goiter at birth. Approximately one-quarter of one percent dissolved and mixed with the loose salt kept before the ewes proved to be adequate.

In 1938, the entire flock was sold. After twenty years work with sheep at this Station, it seemed unnecessary to continue the work under difficulties of pasture limitation and in view of the small number of farmers in the area who were interested in sheep.

In addition to the goitre control experiments mentioned, lamb wintering tests were made, also management experiments in age of weaning and of breeding ewe lambs, and different methods of preparing weanling lambs for market.

Comparisons of Cheviots, Shropshires and Rambouillets seemed to indicate that Rambouillets were preferable in several ways under prairie conditions, particularly in fleece and flocking instinct. Mutton qualities were not quite equal to either of the other breeds but the difference was not great.

Swine

The swine herd has included approximately twenty Yorkshire brood sows with adequate renewal of sires. Wintering of breeding stock has been satisfactorily done in small straw sheds housing from eight to twelve mature sows. These straw sheds are located about fifty yards from the feed trough which provides some exercise each day during the winter. A windbreak is usually provided at the feed trough. A pig brooder is used, providing six pens for farrowing at suitable temperatures at any time of year.

A Swedish Yorkshire boar was used for several seasons and the pigs were compared on the slaughter test with pure Canadian Yorkshires. After several tests, it appeared that Canadian-bred pigs were equally satisfactory for the production of Wiltshire sides for export. During the second world war, experimental feeding largely gave place to the production of young breeding stock for farmers who were helping to increase the quantity of "Bacon for Britain".

Previously, tests were made to ascertain the value of salt for growing pigs. After mixing salt in the chop at different rates and providing loose salt separately in a small feeder, the latter method proved to be much more profitable and pigs consumed less than one per cent as much salt as chop. Salt self-fed was worth over twelve dollars per hundred as measured by extra gains produced.

In testing mineral mixtures for growing pigs, nothing was gained by adding minerals when ten per cent tankage was mixed in the chop or milk was given at the rate of two pounds per pound of chop. It was also found that when milk was fed liberally to pigs until they weighed sixty pounds the feeding of tankage after that time failed to increase gains. Milk is rich in calcium and tankage contains several minerals of animal origin which are readily assimilated; however, tankage is usually considered to be a protein supplement and should not be confused with the mineral supplements which contain no protein.

In testing the value of lamb's quarter seed for growing pigs, four and a half pounds of this seed replaced one pound of grain when a maximum of twenty per cent of the lamb's quarter was mixed with the grain before grinding. While it is possible to use lamb's quarter seed in this way it would seem unwise unless grain is scarce or high in price.

In comparing the regular feed mixture with a commercial hog concentrate mixed with chop it was found that the cost of gain was lower in the case of the concentrate by forty-four cents per hundred and the feed mixture was more easily prepared. During recent years, special tests have been conducted in feeding grains in different proportions. Each pig was slaughtered at approximately 200 pounds and scored according to the Advanced Registry slaughter standards. In 1947, the test included wheat, oats and barley combined in different proportions, as indicated in Table 16, with adequate supplements used uniformly in each lot.

TABLE 16.—WHEAT-OAT-BARLEY MIXTURES

—	Lot 1	Lot 2	Lot 3
Wheat.....%	20	20	20
Oats.....%	30	40	50
Barley.....%	50	40	30
Average daily gain.....lb.	1·52	1·71	1·39
Cost per 100 lb. gain.....$	7·27	7·10	7·47
Average carcass score.....	70	75	76

This simple test indicates that higher gains may be expected where higher proportions of barley are used, but the higher percentages of oats seem to give a higher carcass score than where a small proportion of oats was fed.

In 1946, an extensive swine breeding test was begun in co-operation with other Stations and the Advanced Registry Board. Families testing high in the Advanced Registry slaughter test are crossed with low-testing families and the Low-Low families are compared with the High-High strains. Up till the time of writing, results have not been quite as would be expected, but results will be valuable as more information is obtained and sufficient data is gathered to warrant definite conclusions.

Poultry[5]

During the eleven-year period ending December 31, 1947, the poultry breeding flock has included from 350 to 400 chickens and a dozen turkeys. The turkeys have been handled as a separate unit and are reported separately. The chickens were barred Rocks until 1945 when New Hampshires were introduced to be compared with Barred Rocks. Due to limitations in housing, the Barred Rocks were reduced in number to make room for the new breed, but both were hatched, brooded and reared together in approximately equal numbers in order that conditions would be identical.

Pedigree work was continuous with the Barred Rocks and an excellent strain has been developed showing good size and colour with an average production of 250 eggs weighing 24·3 ounces per dozen.

During the eleven-year period, a total of 18,724 chicks were hatched, or an average of about 1700 per year. Approximately half of these were shipped from the incubators to Illustration Stations and District Substations where new Barred Rock flocks were being established.

In 1937, a change in methods was well under way among breeders in purchasing day-old chicks rather than hatching at home. This preference has increased until the hatching of chicks has become quite unusual even on the smallest farm. Under these changed conditions, breeding stock and eggs for hatching are wanted only by commercial breeders and hatcheries and the business of raising poultry is commercialized to a greater extent than ever before. As a result of experimental feeding at various institutions, chick starters as well as growing and laying concentrates have been developed and have simplified the feeding of all kinds of poultry. The enquiries received concerning the feeding of poultry have been greatly reduced since the use of starters and concentrates has become general. The killing and dressing of poultry for market has also become largely commercialized as the work is more uniformly and more neatly done by experienced hands and the birds sell at a higher price.

For a period of nine years (1937-1945), fifty Barred Rock pullets were entered each year for R.O.P. tests. The average production per bird per year was 236 eggs, having an average weight of 24·9 ounces per dozen. Thirty-two per cent of all pullets entered fulfilled the requirements for the Record of Performance and were certified.

Annual blood tests taken for many years for Pullorum, have shown the flock to be one hundred per cent negative.

Poultry House Ventilation

The ventilation of poultry houses under winter conditions in Saskatchewan has always been a problem and in order to obtain some information a test was planned in 1940. The house used was twenty by thirty-six feet and divided in the centre by a solid partition. In the east half of the house, sixteen per cent of the ceiling was slatted and covered with several feet of straw but in the west

[5] Prepared by E. Van Nice, Assistant in Animal Husbandry.

half the ceiling was solid. The east pen was provided with a ventilation flue starting eighteen inches from the floor in a vertical position through the roof with no bends. Adjustments were provided to close the flue according to weather conditions. The flue measured nine and a half inches square inside. There were eight windows, each measuring twenty-seven by twenty-four inches, in the front of this half of the house. Four of these were above and four below. Two of the upper windows were of cotton and made to open from the top as desired in mild weather.

The west half of the house had the same area of ceiling slatted but no flue was used. There was the same window space as in the east half of the house but, in this case, a space of four inches was provided at the top of the windows which could be opened or closed as desired. The lower four windows were hinged at the bottom and boards were provided at the sides to prevent air currents from entering around the sides of the windows when opened. Maximum-minimum thermometers were placed in both pens and the highest and lowest temperatures were recorded daily in each pen. Hair hygrometers were also placed in the pens but stood at 100 most of the time hence could not be used under such moist conditions. The test was carried from November 1 to April 17 but an analysis of the temperatures in each section of the house failed to indicate any significant differences.

After giving further consideration to the two methods of ventilation under test, and with the advice of officials from the Poultry Division at Ottawa, changes were made in both pens. The ceiling was made solid in both pens and the west pen was altered to be ventilated through a long opening above the windows on the south flush with the ceiling. No flues or other openings were used.

In the east pen, an outlet flue was installed at one side from the floor level vertically through the roof with an adjustment for closing as necessary during windy weather. An intake flue was constructed from the straw loft well above the winter covering of straw and ending a few inches below the ceiling. A box-shaped cover was constructed to fit over the opening at the ceiling to regulate the air intake and prevent a down draught to the floor. Windows were not opened in cold weather but on warm days they could be opened if required.

During the winter of 1946-47 the greatest variation in temperatures was in the west pen, ventilated by a single opening, and the production was slightly lower in the same pen but differences were too small to be significant and the trial is being repeated.

Concentrates for Laying Pullets

In 1942 a feeding trial was started to compare the value of a home-prepared laying mash, proven by years of use, with a commercial concentrate for laying pullets. Tests were conducted from November 1 to April 17, through three winters, with average results as follows. The average weight of eggs laid was eight per cent greater where concentrates were used as compared with the home preparation. Two different brands of concentrates were used in case one should be found superior to the other but results were unchanged. The average feed required per pound of eggs produced for the three tests was 4·73 pounds of the home-prepared mixture and 4·21 pounds of the feed including a concentrate. The cost of each was practically the same, pound for pound, but it was much easier to prepare the concentrate mixture. In the case of a small flock, the concentrate mixture would be more satisfactory and the owner would have the assurance that the needed ingredients were included. To purchase all of the ingredients separately and combine them in the exact proportions is unnecessary detail for a busy farmer or breeder, when the concentrate mixed with his own chop is equally satisfactory.

Barred Rocks vs. New Hampshires

Beginning in 1945, New Hampshire eggs were obtained from the Central Farm at Ottawa and hatched with Barred Rock eggs. The chicks were brooded and reared together so that the conditions would be the same. However, in September it was necessary to seperate the cockerels as the New Hampshires could not hold their own in fighting and growth was being retarded. The same condition has re-occurred each year, including 1947. For the three-year period, the growth rate has been practically the same. The New Hampshires were faster feathering and appeared to be growing faster but monthly weighings each year during the growing periods showed practically no difference in rate of growth.

Cockerels in the fattening crates showed slightly over one pound difference in the gains of eighteen birds in three weeks, which was in favour of the New Hampshires for two seasons and one for Barred Rocks by about the same amount. Dressed gradings showed little difference.

Mortality during the three years was equal for the most part, with the exception that several Barred Rock pullets died from leucosis while New Hampshires seemed to be immune. Egg production varied from twelve to thirty per cent but was always in favour of the Barred Rocks. This, the only significant difference, may be due to strains of the breeds on hand, as at some institutions the production has been in favour of the New Hampshires.

The two breeds were crossed both ways in 1947 for the first time in this test but there have been no differences great enough to date to warrant any conclusions.

Turkeys

The turkey production program at the Scott Station has been to carry from ten to twelve Bronze females and one male as breeding stock. The flock has been confined to yards where annual crops were seeded at different times to provide fresh green feed over a greater part of the summer. A different yard was used each year and consisted of approximately two acres. The breeding stock was held in a small portion of the yard during the summer and from seventy-five to one hundred poults were reared in the remaining part of the yard. The poults were hatched and reared artificially and, by use of trap nests for the hens and pedigree baskets in the incubator, the stock from each female could be identified in the fall by leg band numbers when the flock was being graded.

When grain was at normal prices the cost of feed per bird, in addition to oat and rape pasture, was about $1.60 per bird to market weight. It required from four to five pounds of grain for each pound of gain which is similar to the requirement for hogs, but turkeys give a higher dressing percentage and sell at a higher price per pound.

It was found, when stock was changed, that some strains were less inclined to use the trap nests and required more fencing to prevent the young pullets from flying out of the yard. On several occasions, the breeding flock was retained for a second season which saved the expense of purchasing a new sire for twelve months. As soon as the second hatching season was over, the breeding flock was disposed of at once and breeding females were selected from the young birds in the fall to be mated with a new male the following spring. Heavy canvas saddles were used on the females during the breeding season to save injury from the claws of the male.

Pullets began laying earlier and laid more eggs than yearling hens and the average size of stock was not noticeably greater from yearling hens.

Graded breeding stock sold readily to breeders with small grade flocks while the prices were low but when Association prices were adopted many breeders of small flocks made other arrangements for breeding stock and no doubt used inferior material.

At the end of 1947, a period of eighteen years of growing turkeys under partial confinement was completed. It has been demonstrated that the method reduces disease to a vanishing point, also the hazards of accidental death of young turkeys so frequent when allowed to run at large.

The chief principles of success were the isolation from chickens or chicken runs, the use of sires from disease-free flocks and regular care and cleanliness in feeding and housing, with a change of yard each year as the poults came from the incubator.

Horticulture

Irrigating a Vegetable Garden from a Dugout

Water has been described as liquid gold for the prairie farmer and perhaps nothing provides a greater thrill in an arid country than using last winter's snow in the form of water during hot, dry summer weather. Few prairie areas are blessed with an irrigation system that permits the use of water on large fields, but most farms can store enough water from the spring run-off in a dugout to irrigate the farm garden.

In 1936, a dugout was constructed adjoining the vegetable test garden storing enough water to irrigate half an acre. The following year work was commenced with vegetables comparing their production under natural rainfall alongside the same varieties having water supplied. This work was conducted on a comparatively level area, inside a shelter of caragana. The land was carefully levelled before starting and each fall has been manured, ploughed, disked and levelled again for the next season.

Too much stress cannot be put on the necessity of having the land level for this purpose. This is the first requisite for furrow irrigation, the system used for row crops such as vegetables. Unless the land is level, erosion occurs and when it is not level pools will accumulate, with consequent losses, as most vegetables will not stand flooding for more than a few hours.

In a well sheltered prairie garden, early growth is generally assured and irrigation is not usually given until the crops are at the best stage to use this extra moisture. Water is applied to keep the crops, as nearly as possible, growing at the maximum rate. Unless the crop shows signs of wilting, water is not applied to vegetables which bloom until they flower, or tassel in the case of corn. This rule applies to potatoes as well as peas and beans. For most other vegetables, the first application is given three to five weeks after thinning or setting.

To distribute the water, a main ditch may be opened with a walking plough along the ends of the rows. Small furrows are opened between the rows of vegetables to distribute the water. The water is held back by a damming device such as a sack with stakes on each side against which earth is thrown. A few rows are irrigated before moving down several more rows. If there is a slope at right angles to the rows irrigation should start at the higher end.

The water was lifted and distributed to the highest point by means of a centrifugal pump which had a three-inch intake and two-inch outlet. Strategic location of the dugout, in relation to the area to be irrigated, reduced the amount of pipe required to convey the water. A farm tractor was used for power. After skill is obtained in irrigating, about four hours will be required to apply water in rows on a quarter of an acre of vegetables.

As soon as possible after the land begins to dry without puddling the soil, the trenches between the rows are filled in and light tillage given. This stops cracks developing and prevents the soil becoming hard if there is a tendency for the land to bake. As the amount of clay increases, soils become more difficult to

irrigate but annual manuring or the addition of organic material which makes the soil more friable improves this condition. Applying water in no way eliminates the necessity for careful tillage.

An inch of rain is more effective than several inches of irrigation water for growing crops. For vegetables, at least three inches of water is given with each application. Only one irrigation is required for such crops as peas, beans, corn, onions, citron, melons, peppers and beets as required for home use. Two applications are sufficient for carrots, cauliflower and tomatoes for domestic purposes. A third irrigation can be used effectively for cabbage, celery, cucumbers, parsnips, Swede turnips and potatoes. This suggests grouping these crops in relation to the number of irrigations required. If conditions remain dry, about three weeks will be required between applications. The careful irrigator will watch not only the condition of the plants but also the soil moisture. A good practical test is to dig down six inches and if the soil at that depth makes a firm moist ball in the hand it is not yet time to irrigate again. The beginner in irrigation usually makes the mistake of being too late and applying too little.

FIG. 26.—Furrow irrigation of vegetables on level land.

It is not quite true to say the drier the season the greater the increase in yield of vegetables from irrigation. A few timely showers do not fill the requirements of vegetables. Differences vary with the seasons, but a decade gives a fair average of what might be expected. Over that period, irrigation has approximately increased the yield of onions twenty-five per cent, beets and cauliflower thirty per cent, beans forty per cent, celery and turnips sixty per cent, potatoes, tomatoes and parsnips seventy-five per cent, cobs of corn and cabbage ninety-five per cent, peas one-hundred and twenty per cent and cucumbers one-hundred and thirty per cent.

Yield is only part of the story of the effect of water on the growth of vegetables. Often the garden crops under dry conditions are hard, coarse or definitely off flavour. Under irrigation, the vegetables are crisp, tender and juicy with a consequent higher intake of those hidden qualities so essential to health.

It is a common saying on the prairies that all we need is water but this should not be taken too literally in the case of vegetables. All known requirements which contribute to the success of a good garden must be included. These embrace adequate shelter to provide protection and warmth, continual improve-

ment in the production and tilth of the soil, good tillage and weed destruction to promote crop growth and all the loving care that a gardener's hand can bestow. A simple and effective system of irrigation from a dugout will greatly increase the yield and quality of vegetables and provide a pleasing variety of healthy food.

TABLE 17.—SUGGESTED LIST OF VEGETABLES

PERENNIALS	
Asparagus:	Argenteuil, Colossal, Martha Washington
Rhubarb:	Canada Red, McDonald, Ruby, Sunrise, Valentine
ANNUALS	
Beans:	*Wax-podded:* Davis White Wax, Round Pod Kidney Wax
	Green-podded: Bountiful, Masterpiece, Refugee, Super Green Stringless Green Pod.
	Pole: Kentucky Wonder, Oregon Giant, Blue Lake (Black Seed).
Beets:	Detroit Dark Red
Cabbage:	*Early:* Copenhagen Market, Golden Acre, Early Jersey Wakefield.
	Main Crop: Danish Ballhead, Penn State.
Carrots:	Chantenay, Nantes, Oxheart
Cauliflower:	Dwarf Erfurt, Early Snowball
Celery:	Cornell 19, Golden Plume, Utah
Citron:	Red-seeded, Colorado Mammoth
Corn:	Banting, Dorinny, Sugar Prince
Cucumbers:	*Table:* Davis Perfect, Early Fortune, Long Green, Straight 8, White Spine, Mincu.
	Pickling: Chicago Pickling, Early Russian.
Egg Plant:	Extra Early Dwarf
Lettuce:	*Leaf:* Curled Simpson, Grand Rapids
	Head: Crisp as Ice, Iceberg, New York No. 12, Imperial No. 44.
Marrow:	English Vegetable, White Bush
Musk Melon:	Bender's Surprise, Champlain, Far North
Onions:	*For bulbs:* Ailsa Craig, Yellow Danvers, Sweet Spanish, Cranstons Excellsior.
	For pickling: White Berletta, White Portugal
Parsnips:	Guernsey, Hollow Crown, Short Thick
Peas:	*Early:* American Wonder, Little Marvel, Wisconsin Early Sweet.
	Medium: Laxall, Thomas Laxton
	Main Crop: Lincoln, Stratagem, Telephone
Potatoes:	Bliss Triumph, Early Ohio, Irish Cobbler, Warba
Peppers:	Harris Earliest, King of the North
Pumpkins:	Connecticut Field, Sugar
Radish:	Crimson Globe, French Breakfast, Saxa, White Icicle
Spinach:	Bloomsdale, King of Denmark, New Zealand
Squash:	Green Hubbard
Swiss Chard:	Fordhook Giant, Lucullus
Tomatoes:	*Non-staking:* Bison, Bounty, Early Chatham
	Staking: Abel, Bestal, Earliana, Harkness, Stokesdale, Redskin
Turnips:	*Summer:* Early Snowball, Early Purple Top
	Swede: Laurentian
Watermelon:	Cole's Early, Early Canada.

Phosphate Fertilizers for Vegetables

The response from phosphate fertilizers with grain at this Station suggested that a similar reaction might be expected in the case of vegetables. Accordingly, commencing in 1937, ammonium phosphate was used on eleven kinds of vegetables to obtain information on this subject. Tests were conducted under natural rainfall and with irrigation.

Application of fertilizers for cereal grains is simple because both can be sown together in direct contact and efficient machines have been developed for this purpose. In the case of vegetables, commercial fertilizers cannot be placed in direct contact with the seed or the germination will be destroyed or seriously impaired. Accordingly, the fertilizer was placed in a narrow band or strip about an inch from the seed and slightly below the seed level. The operation was carried out carefully by hand applying half the amount on each side.

The rate was two hundred pounds per acre. For rows forty feet long and two feet apart, this meant an application of three ounces on each side of the row. The rate was increased half an ounce on each side for every six inches in width of row having the same length.

The tests were conducted in a garden area having a shelterbelt of trees and receiving ten tons of rotted manure each fall before being ploughed.

Unlike grain, there was no marked difference during early growth in density of green colour in the leaves or in the vigour of the plants as a result of using phosphate fertilizers on vegetables. The differences in height of plants like corn were scarcely visible to the eye although there was a slight advantage for the fertilized plants when measured.

Under the prevailing conditions, the average increase from irrigation of vegetables (seventy-two per cent) was three and a half times as great as the average increase from the use of phosphate fertilizers. No increase was obtained from fertilizing beets or onions either under natural rainfall or irrigation. Beans, carrots, corn, cucumbers, parsnips, peas, potatoes, tomatoes gave a larger percentage increase from fertilizers under natural rainfall in this test, than when fertilized under irrigation. However, turnips show practically no difference in the slight increase under the two methods. The vegetable which gave the largest increase from phosphate, under both natural rainfall and irrigation, was peas.

Average percentage increases under the garden conditions cited over a ten-year period have been (with irrigated in brackets): beans 35—(21); carrots 40—(15); corn 37—(6); cucumbers 65—(25); parsnips 49—(14); peas 75—(41); potatoes 24—(18); tomatoes 57—(39); and turnips 15—(16).

In a sheltered garden which was manured annually, irrigation gave greater increases than phosphate fertilizers with practically all vegetables, but where water was not applied phosphate fertilizers when carefully applied, with few exceptions, gave increased yields.

The Home Fruit Garden

Experimental work in fruit and attempts on farms to produce it suggests four essential requirements. These are selection of adapted varieties, a suitable shelterbelt, maintaining interest in their care and protection against rodents.

Hundreds of varieties have been tested at this Station but only comparatively few varieties have performed well enough to be recommended for hardiness, earliness and quality. The varieties suggested are for the area lying north of the South Saskatchewan River. One of the essential requirements in tree fruits is to have at least two different varieties of the same kind of fruits which will assist in setting fruit.

Apples do not provide a wide selection. Heyer 12 and Rescue are two which should be included in all fruit gardens in this area. Both were bred in Saskatchewan. Rescue, produced by this Station, is extremely hardy, early, attractive bright red, about two inches in diameter and can be eaten out of the hand or used for pie, jelly or sauce.

Crabapples offer a much wider choice and selections can be made from Adam, Amur, Bedford, Columbia, Dolgo, Florence, Anaros, Osman and Robin.

Plum varieties which have given a good performance are Assiniboine, Bounty, Dandy, Mammoth, McRobert and Tecumseh. Selections from hybrids of plums with sandcherries can be made from Brooks, Champa, Compass, Ezaptan, Heaver, Manmoor, Opata, Ruby, Sapa and Sioux.

No cherries or grapes have performed satisfactorily enough at this Station to recommend growing in the home orchard.

Among the small fruits, currants and gooseberries perform fairly well under natural rainfall and do not require Winter protection. Raspberries and strawberries, however, should have attention before winter sets in and both give generally unsatisfactory results unless irrigated, particularly strawberries.

Suggested varieties of small fruits provide ample selection from nurseries offering this material for sale and include the following; Red Currants—Fay's Prolific, Perfection, Red Lake and Stephens; White Currants—White Grape; Black Currants—Climax, Kerry and Magnus; Gooseberries—Abundance and Pixwell; Raspberries—Chief, Sunbeam, Trent and Rideau; Strawberries—Dunlap, Dakota, Gem and Pixie.

Fruits cannot be expected to stand the hazards of our prairie climate unless inside a well protected shelterbelt. Vigorous rooted trees like poplar, maple and even caragana are quite unsatisfactory as a shelter on the inside of a small home fruit garden. In the fruit plantation at this Station, rows of caragana were planted every thirty-six feet but their roots overlapped and were removed and replaced by spruce some ten years ago. The white spruce are almost ideal in providing much of the comfort required and are so easy on soil moisture. In addition, the weed menace is greatly simplified because most of the common weeds found in the garden can be destroyed by spraying with 2, 4-D without damaging the spruce.

FIG. 27.—Rescue apple is a heavy producer.

There is little use starting a home orchard unless one is prepared to look after such details as weeding, pruning, insects, diseases and winter protection where required. A common failure is not giving adequate space for fruits. A suggested spacing is apples and crabs—twenty feet; plums—sixteen feet; raspberries, currants and gooseberries—eight feet, and strawberries—four feet between the rows.

Rabbits, particularly the bush rabbit, cause much destruction to tree fruits, those in the apple family being attacked most severely. Too many home fruit gardens on the prairies have reached bearing age only to be ruined in their peak years by rabbits.

A fence of poultry netting provides good protection if it is checked carefully for holes in the fall and patrolled periodically during the winter. Poisoned sheaves suspended on such a fence will destroy rabbits but even this should be supplemented by shooting this pest.

Various preparations have been tried as repellants for rabbits on fruit trees. Out of eleven repellants tested for rabbits at the Scott Station, the best for the purpose appears to be a mixture of rosin and alcohol. This seems to

meet the requirements in that it is easy to prepare, the rabbits do not eat the bark where it is applied, and it does not injure the trees. Like most things around the farm, there are a few details which must be followed to obtain the desired results.

The alcohol used must be denatured ethyl, available through a hardware or paint company. Lump rosin is used but it must be finely powdered before dissolving. The lumps can be crushed by placing it in a sack and using a wooden mallet. It can then be sifted through a piece of fly screen. The proportions are eight pounds of powdered rosin to a gallon of denatured ethyl alcohol. It is preferable to mix two pounds to a quart and use it right away as it must be kept in an airtight container after mixing. The rosin and alcohol are stirred until all dissolved. Under no circumstances can the solution be heated. It is well to keep in mind the size of the container when mixing, as the addition of the rosin in these proportions practically doubles the volume of alcohol.

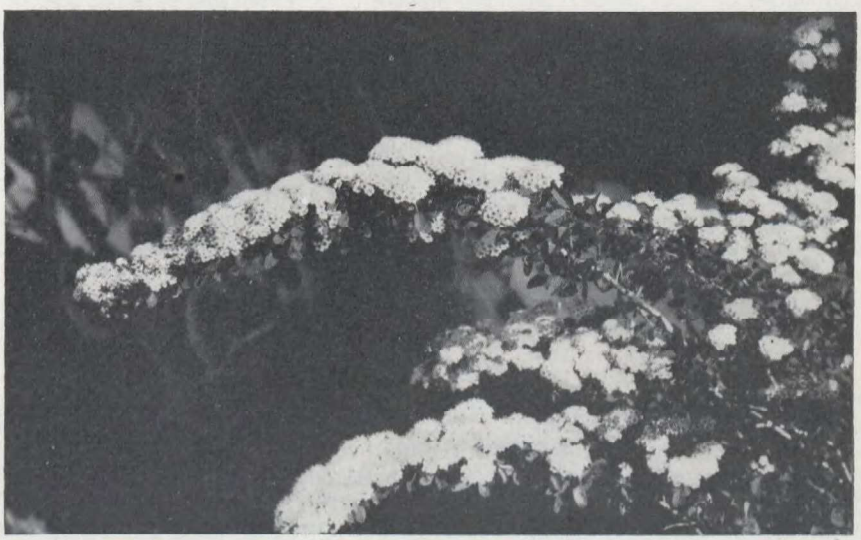

FIG. 28.—The hardy Oriental spiraea is graceful when in bloom.

A small paint brush is used to apply this repellant to the trees. If it becomes gummy while using, a small amount of alcohol can be added to restore the original condition. When applying, the bark must be absolutely dry, without mist or falling snow being present at the time. All parts of the trees which can or may be reached by the rabbits during the winter are treated. It is advisable to treat as early as possible in the fall for protection during the winter.

TREES AND SHRUBS

Approximately two hundred kinds and varieties of trees and shrubs are under test at this Station to determine hardiness, drought resistance and suitability for the prevailing conditions. About half of these are hardy and have sufficient drought resistance to be suitable for the beautification of home grounds in northwestern Saskatchewan. Even the hardy specimens cannot be expected to withstand the competition of weeds or grass.

Most persons who wish to select shrubs for beautifying their home grounds are anxious to have some guidance in a few important points. With this idea in mind, a list is presented giving common names, height to nearest foot, colour of bloom, along with some remarks.

TABLE 18.—HARDY SHRUBS AT SCOTT, SASK.

Common Name	Height (Feet)	Colour of bloom	Remarks
Albert Regal Honeysuckle	5	pink	Flopping, ragged bush.
Amur Cherry	9	white	Similar to chokecherry.
Bird Cherry	12	white	Does not sucker.
Chokecherry	9½	white	Tendency to sucker.
Common Lilac	8	white to purple	Many varieties available.
Cutleaf Elder	5½	white	Finely cut leaves. Red berries.
Flowering Crab	9	white to red	Available with ornamental leaves.
Flowering Plum	6½	pink	Attractive rose-like blossoms.
Glossy Cotoneaster	3	pink	Glossy leaves. Black berries
Horsechestnut	7	white	Quite hardy. Attractive leaves.
Hungarian Lilac	9	violet	Not particularly attractive.
Juneberry	2½	white	Dwarf form of Saskatoon.
Littleleaf Peashrub	4½	yellow	Graceful kind of caragana.
Missouri Currant	5	yellow	Fruit used for pie and jelly.
Mountain Ash	9	white	Bright red berries.
Nannyberry	10½	white	Flowers in flat clusters.
Oriental Spiraea	5	white	Attractive, hardy shrub.
Peking Cotoneaster	4½	pinkish	Colourful leaves in Fall.
Pincherry	10½	white	Fruit used for jelly.
Preston Lilac	7½	white to red	Highly attractive late lilacs.
Red Elder	3½	white	Large cluster of scarlet fruit.
Red Osier Dogwood	6½	white	Does well in shade.
Russian Almond	2½	pink	First shrub to bloom.
Russet Buffaloberry	4½	white	Leaves green above, russet below.
Saskatoon	14	white	Blooms early—edible fruit.
Savin Juniper	4	.....	Attractive low evergreen.
Shrubby Cinquefoil	4½	yellow	Blooms all summer.
Tatarian Honeysuckle	6	white to red	A popular favourite.
Woody Caragana	8	yellow	Fine twigs and dark leaves.

HEDGES

Choosing a hedge for use on the home grounds is best accomplished by examining, preferably during each season of the year, different specimens being grown in the immediate vicinity. For the convenience of persons living in west central Saskatchewan, twenty-three sample hedges are under test at the Scott Station. These constitute a focal point of attraction for persons interested in horticulture. This fairly representative group for prairie conditions offers enough variation for a choice to be made on a basis of height, colour, density, bloom, special uses and autumn tints.

Four of these are evergreens consisting of balsam fir, white spruce, Norway spruce and lodgepole pine. Seven of these may be regarded as suitable for low hedges and include pigmy caragana, Pekin cotoneaster, silverberry, Dahurian cinquefoil, shrubby cinquefoil, russet buffaloberry and Oriental spiraea. The nine of medium height are Ginnalian maple, White birch, woody caragana, Manchurian honeysuckle, Tatarian honeysuckle, native plum, silver buffaloberry, Amur lilac and Hungarian lilac. Those which may be used for tall hedges are Manitoba maple, common caragana and green ash, although the evergreens mentioned above fall in this last-listed group.

For persons who do not have the opportunity to see these hedges and who desire further information concerning them some notes are added for each specimen.

Balsam Fir (Abies balsamae).—Planted 1914—height 8 feet 2 inches, width 5 feet 7 inches. Although a native of all eastern seaboard, it has made a creditable showing under prairie conditions. It stands pruning quite well but is not so dense as the spruce specimens but better than the lodgepole pine in this respect. The needles are pale green and the bark grayish in colour. The gummy nature of this specimen is objectionable, particularly where children are playing.

Box Elder or Manitoba Maple (Acer negundo).—This specimen was planted in 1914 but its present height is quite low because it has been cut back several times in the spring. It is quite a rapid grower and becomes too tall for use around the average home. This is well known as a tree on the Canadian Prairies.

Ginnalian Maple (Acer tatarica ginnalia).—Planted 1914, height 8 feet 6 inches, width six feet 4 inches. Too open at the bottom to be an attractive hedge. Bark damaged by sunscald. The red maple tints on the leaves for a short time in the fall are a colourful feature. Actually it is not quite hardy enough for a dry location in a cold climate.

Canoe, Paper or White Birch (Betula papyrifera).—Planted in 1927, height 6 feet, width 5 feet. To date this has made an attractive showing with an abundance of leaves. The bark on the trunk is white and reddish brown on the young growth providing contrast in the dormant season. An outbreak of birch borer might quickly ruin this hedge after being well established.

Common Caragana or Siberian Peashrub (Caragana arborescens).—Planted 1914 but has been cut back several times. This is the most commonly-grown hedge on the prairies but soon becomes too vigourous to permit good growth of vegetables or flowers within ten or even twenty feet as it becomes older. It can be cut back in spring to any desired height or even in fall or winter without damage. Stands a lot of rough usage.

Woody Caragana or Russian Peashrub (Caragana frutiscens).—Planted 1914, 5 feet 6 inches high and 5 feet wide. For home use this is a much better hedge than the common caragana. The leaves appear slightly earlier in the spring, are retained later in the fall and are darker green in colour than *Caragana arborescens*. The growth is also much finer with a mass of twigs and only reaches a height of seven feet if not trimmed. It has a tendency to sucker which is a disadvantage.

Pigmy Peashrub (Caragana pygmaea).—Planted 1926 and both its height and width are now 2 feet 6 inches. This is an excellent low compact hedge except in locations where a prickly hedge is undesirable.

Cotoneaster Acutifolia (Peking Cotoneaster).—Planted 1928, height 2 feet, width 2 feet 3 inches. A neat small hedge with dark glossy green leaves in summer and black berries in fall. This is a particularly attractive hedge in the autumn as the leaves assume variegated colours intermingled with shades of red.

Silverberry (Elaeagnus argentea).—Planted 1927, 3 feet 10 inches high and 3 feet 4 inches wide. Distinctive because of its silvery leaves which are on short stalks which do not flutter much in a light breeze. Quite a neat small hedge.

Green Ash (Fraxinus pennsylvanica lanceolata).—Planted 1914, height 9 feet and width 5 feet 4 inches. Much too open and ragged at the bottom to make an attractive hedge for landscaping. Better adapted as a shelterbelt in the prairies because of its almost unexcelled ability to withstand drought.

Manchurian Honeysuckle (Lonicera ruprechtiana).—Planted 1931, height 2 feet 7 inches, width 2 feet 11 inches. The main objection to this hedge is that it is not hardy enough at Scott. There are numerous dead twigs throughout the hedge and portions which are dead.

Norway Spruce (Picea abies).—Planted 1915, height 6 feet 6 inches, width 6 feet 5 inches. This is the outstanding evergreen hedge at Scott because of its dense and smooth base with a dark green colour. The small birds choose this as their favourite nesting place. It appears to have remarkable drought resistance.

White Spruce (Picea glauca).—Planted 1914, height 8 feet, width 7 feet 3 inches. This hedge still has a good appearance although it indicates a thinning near the base on close examination. The appearance of this specimen near the road has influenced many persons to plant a spruce hedge.

Lodgepole Pine (Pinus contorta latifolia).—Planted 1914, height 9 feet, width 7 feet. As this hedge grew older it became more open at the base and a few branches have died, although it still looks good from a distance it is easily excelled by the two spruce hedges listed above.

Dahurian Cinquefoil (Potentilla dahurica).—Planted 1943, height 2 feet, width 1 foot. The value of this specimen for a hedge has not been determined. It bears white flowers (not in abundance) from mid-June until frost.

Shrubby Cinquefoil (Potentila fruticosa).—Planted 1933, height 2 feet 9 inches, width 3 feet 4 inches. An attractive low hedge because of the profusion of yellow blossoms during the summer except when the weather is abnormally dry.

Canada (Native) Plum (Prunus nigra).—Planted 1914, height 5 feet 6 inches, width 3 feet 7 inches. Rather ragged in appearance with most of the growth on top. As a hedge, it has survived longer than individual specimens of native plum in the fruit plantation.

Silver Buffaloberry (Shepherdia argentea).—Planted 1914, height 4 feet, width 5 feet 4 inches. Practically all leaves are on top leaving ragged open sides so that it is not well adapted for hedge purposes. Its silvery leaves lend distinction but not sufficient to make up for its deficiencies as a hedge.

Russet Buffaloberry (Shepherdia canadensis).—Planted 1932, height and width are both 2 feet 6 inches. Quite an attractive low hedge with its rounded leaves distinctly dark green on top and silvery beneath with brown spots. This native is quite rare in comparison with the common taller silver buffaloberry.

Oriental Spiraea (Spiraea oblongifolia).—Planted 1927, height 3 feet, width 2 feet 10 inches. One of the few spiraeas which is completely hardy at Scott. It does not flower freely every year in a hedge and its leaves drop quite early in the autumn.

Amur Lilac (Syringa amurensis).—Planted 1914, height 6 feet, width 4 feet 6 inches. Not very well adapted for a hedge as it gradually becomes more open on the lower half and lacks the even uniformity desired in a hedge. The white blossoms which appear in early July are quite fragrant.

Hungarian Lilac (Syringa josikaea).—Planted 1914, height 6 feet, width 4 feet 4 inches. This specimen made a good showing until 1943 when the previous severe winter caused considerable winter injury. New growth promises to fill the dead gaps. If trimmed sparingly its lilac shade of blossoms appear each year in the latter part of June.

Tatarian Honeysuckle—Large Flowered (Lonicera tatarica grandiflora).—Planted 1914, height 7 feet 6 inches, width 6 feet 9 inches. This seems to become worse for a hedge with age in that it becomes more open and ragged on the sides with its rough grey branches not conducive to beauty. Its pink and white flowers with red berries in the fall have contributed to its rather popular use for hedge purposes.

TABLE 19.—FLOWERS FOR OUTDOOR BLOOM

Annual Flowers Sown Outside

Name	Variety	Colour of bloom	Approximate height
Asperula	azurea setosa	pale blue	1 ft.
Alyssum	Little Dorrit	white	4 inches
Arctotis	hybrida	mixed	1 ft.
Bartonia	aurea	yellow	1-1½ ft.
Brachycome	Swan River Daisy	bright blue	6 inches
Calendula	Sensation	orange	1 ft. 3 in.
Candytuft	Hyacinth Flowered	white	9 inches
Centaura	cyanus	mixed	1 ft. 2 in.
Clarkia	Salmon Queen	salmon	2 ft.
Cosmos	Mammoth	crimson	3 ft.
Coreopsis	Crimson King	reddish maroon	1 ft.
Dimorphotheca	African Daisy	mixed	1 ft.
Godetia	Azalea Flowered	mixed	1 ft.
Gypsophila	elegans	white	1 ft. 3 in.
Larkspur	Rosy Scarlet	rosy scarlet	2 ft.
Lavatera	Loveliness	rosy pink	2 ft. 6 in.
Linaria	hybrids	mixed	1 ft.
Malope	mixed	mixed	2 ft.
Mathiola	bicornis	mixed	1 ft. 3 in.
Mignonette	Giant Red	reddish buff	9 inches
Nasturtium	Golden Gleam	yellow	1 ft.
Nigella	Miss Jekyll	blue	1 ft. 3 in.
Phacelia	Campanularia	blue	6 inches
Portulaca	Bedding	mixed	4 to 6 in.
Rhodanthe	Manglesii	pink and white	10 inches
Statice	mixed	mixed	30 to 36 in.
Sweet Pea	Early Spencer	mixed	36 to 60 in.
Virginian Stock	mixed	mixed	9 in.
Zinnia	Giant Dahlia flowered	mixed	12 to 18 in.

TABLE 20.—ANNUAL FLOWERS SOWN INSIDE

Name	Variety	Colour of bloom	Approximate height
Ageratum	Blue Ball Improved	blue	4 to 8 in.
Ageratum	White Ball	white	8 to 12 in.
Antirrhinum	bedding	mixed	1 ft. 6 in.
Aster	Ostrich Plume	mixed	1 ft. 6 in.
Anagallis	grandiflora	mixed	6 in.
Anthemis	tictoria	gold	2 ft.
Carnation	marguerite	mixed	2 ft.
Cleome	Spider Plant	pink	48 to 60 in.
Coreopsis	Gold Chest	golden yellow	24 to 30 in.
Daisy	double English	mixed	6 inches
Didiscus	Blue Lace Flower	pale blue	24 to 30 in.
Gallardia	double	mixed	1 ft. 6 in.
Heliotrope	Regale	blue	1 ft. 6 in.
Lobelia	tenuir	cobalt blue	7 in.
Malva	moschata	rose pink	2 ft.
Marigold	African	orange	2 ft.
Nemesia	grandiflora	mixed	1 ft.
Nicotiana	Crimson Bedder	deep crimson	1 ft. 3 in.
Phlox Drummondii	mixed	mixed	1 ft.
Petunia	Giant Fringed	mixed	1 ft. 3 in.
Salvia	St. John's Fire	scarlet	10 to 12 in.
Scabiosa	Scabious	mixed	24 to 30 in.
Schizanthus	hybridus	mixed	1 ft. 3 in.
Salpiglossis	Orchid Flowered	mixed	2 ft.
Stock	Ten weeks	mixed	1 ft. 3 in.
Verbena	Giant Hybrids	mixed	1 ft.

TABLE 21.—PERENNIALS FROM SEED SOWN OUTSIDE

Name	Variety	Colour of bloom	Approximate height
Aquilegia	long spurred	mixed	2 ft. 6 in.
Aconitum	Wilsoni	pale blue	4 ft.
Anchusa	italica	blue	4 ft.
Aubrietia	purpurea	purple	6 inches
Agrostemma	coronaria	mixed	1 ft.
Arabis	alpina	white	6 inches
Campanula	bedding	mixed	1 ft. 6 in.
Cephalaria	alpina	yellow	3 ft.
Cerastium	tomentosum	white	5 inches
Delphinium	Pacific Giant hybrid	mixed	48 to 60 in.
Dianthus	barbatus	mixed	10 inches
Delphinium	Wrexham	Oxford blue	5 ft.
Helenium	Riverton Gem	lemon yellow	2 ft. 6 in.
Heuchera	sanguinea	coral crimson	1 ft.
Liatris	Blazing Star	purple	3 ft.
Lupin	Russel strain	mixed	18 to 36 in.
Lychnis	Arkwrightii	scarlet	2 ft.
Linaria	Maroccana Excelsior	yellow	2 ft. 6 in.
Myosotis	Royal Blue	blue	5 inches
Polemonium	coeruleum	purple blue	2 ft.
Poppy	oriental	scarlet	3 ft. 6 in.
Pyrethrum	mixed colours	mixed	24 inches
Scabiosa	caucasica	blue	2 ft. 6 in.
Sedum	kamtschaticum	yellow	9 inches
Veronica	prostrata	blue	4 inches

Apiculture

Honey production on the open prairie, like grain production, is quite uncertain. Extreme heat and drought at the critical season, even for a short period, may seriously reduce yields of honey and in some cases summer feeding is necessary to avoid a total loss of bees.

During the last eleven years a demonstrational apiary has been maintained, including six to ten colonies, to provide information and assistance for beekeepers. Beekeeping has been carried on at the Dominion Experimental Station at Scott, Sask., since 1923 with considerable experimental work during the first thirteen years.

For the eleven-year period ended in 1947 the wintering has been done each year in the common wintering cases in the apiary with very little loss. Package bees have been purchased as necessary for strengthening in special cases but after developing a very desirable strain of bees the wintering was necessary to maintain the strain. The inexperienced beekeeper seldom realizes the differences in strains of bees but some are much easier to handle and are superior in colour and banding.

TABLE 22.—COMPARATIVE YIELDS OF EXTRACTED HONEY

Year	Over wintered bees	Packaged bees
	lb.	lb.
1941	86	71
1940	212	164
1939	189	129
1934	57	40
1931	92	67
Totals	636	471
Average	127	94

Tests have shown considerably greater production from overwintered colonies than from packages. The average production of extracted honey per colony per season over a five-year period was 127 pounds per overwintered colony and 94 pounds per package colony, an average difference of 33 pounds per year per colony. The most unfavourable season at the Station so far was 1947 when an average of only twenty-two pounds of honey was obtained.

The beekeeper living on the open prairie should provide a small area of sweet clover to ensure some bee pasture every season. The sweet clover should be left for seed so that the bees may get the full value of the blossom, or it may be grown on waste land or on roadsides where it will reseed itself and may not require any attention for an indefinite period.

In the park belt or bush areas, there is usually sufficient fireweed and other volunteer growth of flowers that no special provision need be made for pasture.

A record of time spent in actual care of the small apiary shows an average of fifty-three hours per season for the period of eleven years with from six to ten colonies on hand per season.

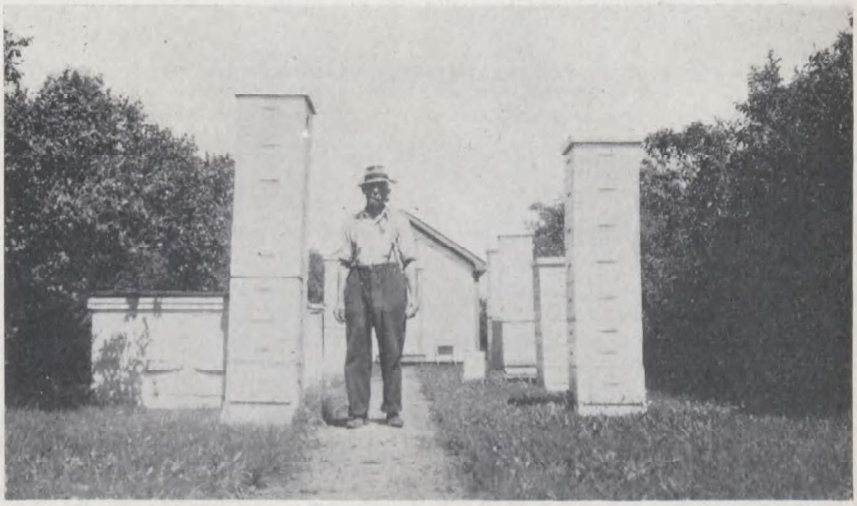

FIG. 29.—Strong colonies provided with ample storage room when nectar was abundant.

Illustration Stations[6]

In the period 1937-1947, there have been numerous changes in the Scott district of supervision. In 1937, there were nineteen Illustration Stations and eight substations supervised from Scott. In 1941, these were split into two districts, the eastern stations being supervised from Melfort. In that year, thirteen stations were supervised from Scott. From 1941-1945, there was a steady decline in the number of stations operating. In 1945, only five stations remained in operation. Three Stations have been added to the present number so that there are at this time of writing four Illustration Stations and four Substations.

With the exception of 1937 when most of the Stations experienced total crop failures or near failures, the period covered by this report has been one of relative prosperity. The chief contributing factor to this more prosperous period was more favourable climatic conditions, combined with higher prices for agricultural commodities, and the more economical means of producing crops which have been developed continually.

[6] Prepared by C. H. Keys, Supervisor, Illustration Stations.

Climatic Conditions

Of the sixteen stations that have been in operation during the eleven-year period, only four stations carried on without interruption. Most of the stations dropped out during the war period when the help shortage was acute and absence of a supervisor further complicated matters in that there are gaps in the records. Table 23 is an indication of the average annual precipitation and the average precipitation during the growing season, which embraces four months, April to July inclusive, during the eleven years in question. Insofar as annual precipitation is concerned there were five years in which the precipitation was over average and six years under, whereas there were only four years in which the average seasonal precipitation was exceeded.

Yields depend, to a great extent, on the precipitation that is obtained in the four months indicated. Table 23 supports this statement very well in that the four years in which above average seasonal precipitation was received a better-than-average crop was obtained and also, below average seasonal precipitation resulted in below-average yields. The yields were taken from wheat on summerfallow. The annual precipitation did not appear to bear a direct relation to crop yields.

Table 23.—AVERAGE ANNUAL PRECIPITATION, SEASONAL PRECIPITATION AND AVERAGE YIELD OF WHEAT ON SUMMERFALLOW

	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1947 Total	Average
Annual precipitation.....	11·64	15·04	12·86	12·93	11·78	15·46	14·50	13·51	11·23	15·31	12·84	147·10	13·27
Seasonal precipitation April 1—July 31..	5·95	6·27	7·95	7·11	5·54	9·46	6·41	8·00	4·61	6·41	4·41	72·12	6·56
Average yields of wheat after fallow	4·9	14·2	23·9	23·9	11·5	29·3	12·3	21·8	7·9	14·7	12·2	176·6	16·1

Rotations

Numerous rotations have been tried on the various Illustration Stations and Substations.

It has generally been found that where moisture is such a limiting factor in crop production and where wheat is the main crop produced, short rotations are the most popular and give bigger cash returns. On the heavier land to the south where, in the past, soil drifting has been a menace, a two-year rotation of summerfallow and wheat has proved quite satisfactory and has fitted in readily with the strip farming program that has been practised at most of these stations. The two-year rotation also fits in well with the control programs for grasshoppers, wheat stem sawfly and wireworms. Three-year rotations on the heavy land have not been satisfactory except in occasional years where moisture during the growing season was more abundant. As a rule the yield of the second crop after fallow is greatly reduced due to lack of moisture and increased weed populations. At Kindersley, the average yield of wheat after fallow was 16·5 bushels per acre and for wheat following wheat it was 11·8 bushels per acre. This was for a thirteen-year period.

In the north where loss of fertility is a problem, longer rotations which include a legume hay crop have been giving increased yields over the ordinary grain and summerfallow rotations. At North Makwa a six-year rotation of fallow, wheat, oats, fallow and seed, hay, hay has been compared with a three-year rotation of fallow, wheat, oats. The six-year cycle was complete in 1946

while the three-year rotation had completed its second cycle. In 1946, wheat on the fallow after hay (six-year rotation) averaged 30·68 bushels per acre while the wheat after fallow (three-year rotation) averaged 20·72 bushels per acre. In the same year, the oats in the six-year rotation averaged 46·16 bushels per acre while the oats in the three-year rotation were cut for feed due to the dominance of wild oats.

Similar results were obtained in 1947 as well.

Four-year rotations that include a legume hay have also given good results where fertility has been a problem.

FIG. 30.—The above picture shows the comparison between the three-year rotation (left) and the six-year rotation (right). The six-year rotation has increased yields and reduced the wild oat population at North Makwa, Sask.

CULTURAL TREATMENTS

This study is chiefly concerned with methods of summerfallowing. In the regions where moisture is limited, summerfallow has two prime purposes: conserving moisture for the following crop, and controlling weeds. Two-year rotations have been used for the summerfallow cultural treatments and where stubble treatments were studied—three-year rotations were used.

SUMMERFALLOW METHODS

At Juniata the six-year average of ploughed fallow versus surface-worked fallow resulted in a 0·9 bushel increase in favour of ploughed fallow. The increased cost per acre of the ploughed fallow treatment averaged thirty-three cents per acre.

At Rosetown the five-year average of four summerfallow treatments were compared and again the ploughed fallow gave the highest yields and highest cost per acre. The following table gives the comparisons at Rosetown:

TABLE 24.—YIELD OF WHEAT AND COST PER ACRE OF SUMMERFALLOW TREATMENTS

Rosetown 1943-47

Treatment	Average Yield bushels acre	Average Cost per acre
One-way and cultivate	20·8	3·99
Single disk and cultivate	22·2	3·84
Cultivate only	20·3	4·05
Plough and cultivate	24·2	4·42

At Rosetown various methods of seeding fallow were tried for a few years.

TABLE 25.—YIELD OF WHEAT AND COST PER ACRE OF COMMON SEEDING METHODS

Rosetown 1938-1942

Treatment	4-Yr. average yield	4-Yr. average cost per acre
One-way, seed and pack	20·5	$10.16
One-way seed	23·3	10.12
Cultivate and double-disk drill	23·9	10.43

From these figures the cultivating and drilling would seem the best. However, in some cases the extra time it takes for the two operations is not offset by the increase in yield. In many cases, time is a valuable item in spring.

With the increased use of the two-year summerfallow—wheat rotation there has been less emphasis on stubble treatments. At Juniata, these stubble treatments were carried out for several years with wheat, oats and barley.

Table 26 gives the four-year average results obtained.

TABLE 26.—YIELD AND COST OF GROWING CEREALS ON STUBBLE

At Juniata 1937-1940

Treatment	Wheat			Oats			Barley		
	Yield bu.	Cost Acre	Cost bu.	Yield bu.	Cost Acre	Cost bu.	Yield bu.	Cost Acre	Cost bu.
Ploughed	10·8	6·97	·31	28·6	7·03	·15	16·3	7·76	·24
One-wayed	8·7	6·58	·33	24·1	6·58	·17	13·2	6·34	·24
Cultivated	7·6	6·12	·39	19·6	6·00	·19	9·5	5·73	·40
Average	9·0	6·56	·34	24·1	6·54	·17	13·0	6·61	·29

From the above, it can be seen that spring ploughing was ahead in every case in that it produced the best yields and consequently the lowest cost per unit. However, this test was conducted on light land (Asquith fine sandy loam) and spring ploughing is not a usual practice in the heavier type of soil.

SUMMERFALLOW SUBSTITUTES

Corn has been grown for a number of years as a summerfallow substitute at Loverna and Juniata.

Except in 1946 and 1947 at Loverna it has provided a further supply of fodder and the yields of wheat after the corn have not been impaired. However, in 1946 and 1947 cutworms wiped out the corn crop completely.

TABLE 27—COMPARISON OF YIELDS OF WHEAT AFTER CORN AND AFTER FALLOW AT LOVERNA

Yield of Wheat	1938	1939	1940	1941	1942	1944	1945	Av.
After corn	8·0	14·3	30·0	8·0	40·0	7	5	16·0
After fallow	10·8	11·8	24·8	8·0	40·0	7	4·5	15·3

NOTE.—The years 1937, 1943, 1946 and 1947 were failures due to drought, hail and cutworms.

The increased yield from the use of corn would not justify its use, but its value as a fodder crop and its value in control of soil drifting have made this rotation possible on a limited scale.

CHEMICAL FERTILIZERS ON CEREALS

Ammonium phosphate fertilizers have been used at various stations since 1942 but there are several gaps in the results in the past eleven years.

Ammonium phosphate, 11-48-0, has been used at the Substations to the south whereas ammonium phosphate, 16-20-0, is used chiefly at the northern Illustration Stations.

It has been found that fertilizers stimulate early crop growth and, when moisture is available during the filling period, fertilizers increase yields substantially. However, in years when drought sets in at the heading stage or a little later the fertilized crops may suffer more than unfertilized crops, mainly because of the heavier growth. Table 28 indicates how fertilizer affects yields at the stations in this supervisory district.

TABLE 28.—THE EFFECT OF CHEMICAL FERTILIZERS ON WHEAT

STATION	Number Years Tested	Fertilized Bu.-Acre	Check Bu.-Acre	Increase Bu.-Acre
Juniata	7	16·8	13·9	2·9
Kindersley	9	21·3	19·5	1·8
Rosetown	6	24·2	20·4	3·8
Loverna	8	6·4	5·5	·9
Glenbush	6	21·9	18·0	3·9*
Meota	8	22·5	19·2	3·2*
Average		18·86	16·1	2·75

* Ammonium phosphate, 16-20-0, used instead of ammonium phosphate, 11-48-0. Rates were based on 25 pounds per acre of ammonium phosphate, 11-48-0.

CEREAL CROP STUDIES

CEREAL VARIETY TESTING

In order to determine the varieties of cereals best suited to local conditions, several varieties of wheat, barley, oats and flax are sown each year at all the stations in the supervisory district. This cereal variety test is conducted in co-operation with Assistant in Cereals at the Scott Experimental Station. New varieties are thoroughly tested and compared with the standard variety, Thatcher. Some of the more promising unnamed varieties are tested as well. These variety tests are sown in randomized, replicated rod-row plots. Each plot consists of four rod-rows and there are four replications.

To give some indication as to the extent of these variety tests, in 1947 seventeen varieties of wheat, nine varieties of oats, nine varieties of barley and eight varieties of flax were tested. However, all varieties were not tested at all stations.

INTRODUCING SUITABLE VARIETIES OF CEREALS

In addition to testing the varieties of cereals, operators are encouraged to increase some of the newer varieties that are well suited to their conditions.

During the past two years, Rescue wheat has been increased at three of the Substations. In two years, 14,333 bushels were grown and all except what was required for their own use was distributed to farmers who required sawfly resistant wheat.

Other newer varieties now being grown on the stations include Montcalm and Titan barley, Exeter and Ajax oats. Very little flax is grown on the stations at the present time.

Forage Crop Studies

Due to the differences in climatic conditions between the Substations in the south and the Illustration Stations in the north, two distinct sets of forage plots are used.

Crested wheat grass has been the most important grass on the Substations during the eleven years under review. Its importance is attributable to its ability to withstand extended periods of drought and its extensive root system is important in controlling soil drifting. It also has the ability to make quick growth when moisture is available. Brome is a very hardy grass as well and is preferred to crested wheat grass for feed by numerous stockmen. The addition of alfalfa to either of the above grasses improves the quality of the forage tremendously and results indicate that mixtures of grass and legume increase the yield well above the yield of the grass or legume separately.

In the northern districts where the Illustration Stations are located, a wider range of forage crops can be grown successfully. Legume crops are of particular importance in that they not only furnish a good crop of forage but they also restore nitrogen to the soil.

Forage crops in the cropping rotation, whether grasses, legumes or mixtures have been quite effective in controlling such weeds as wild oats and sow thistle.

METHODS OF SEEDING FORAGE CROPS

In the southern portion of the territory, where moisture is often a limiting factor, late fall seedings of forage crops have been quite successful during the past eleven years. To have reasonable success with spring seedings in the prairie areas, an abundance of moisture is necessary in order to get the grass plants past the weak seedling stage before dry weather sets in.

In the north, where moisture conditions are usually quite favourable in May and June, and soil drifting is not a problem, consistant success has been obtained by sowing the grass or legume seed on summerfallow that has been prepared early in the season. The soil should be well packed around the end of May or first part of June. The ideal time to sow the seed is just before or right after a rain in order to be sure the seed is in moisture near the surface of the soil.

Seeding with a nurse crop of oats or barley in the third or fourth year of the rotation or even on fallow usually produces weak plants the first year or two, resulting in lower yields and less effective weed competition.

VARIETIES ADAPTED TO VARIOUS CONDITIONS

Altaswede Red Clover.—Although a good yielder generally, it is not dependable enough for use in northwestern Saskatchewan as it often winter kills.

Manhardy Red Clover.—This is a prolific forage yielder north of township 55 in northwestern Saskatchewan but it has been killing out repeatedly in the Glaslyn-Glenbush areas.

Alsike Clover.—This does well in slough land and muskegs but makes a poor showing in upland tests.

Ladino and White Dutch Clovers.—These rarely grow high enough to be cut; they, too, winter-kill often.

In the alfalfas, Grimm is the most common as it is hardy and a good yielder.

Ladak alfalfa has also been doing quite well in test plots and compares favourably with Grimm.

Siberian Yellow appeared to be very hardy but was less leafy than other varieties. Viking alfalfa kills out readily.

Amongst the grasses, brome seems to be as good as any in yield and palatability to livestock. Timothy does well especially in low land where there is more moisture. Meadow fescue also does well where there is more moisture. Crested wheat grass and slender wheat grass yield well and are hardy, but make a hard, rather unpalatable feed if not cut soon after heading. Red top is a moisture loving grass but kills easily.

For the southern plains area crested wheat grass, brome grass and Grimm alfalfa are the most satisfactory perennial forage crops.

IMPROVING NATIVE HAYLANDS

Since 1937, forage plots have been established in native hay meadows and muskegs or peat meadows. Results from these trial plots indicate that the quality and quantity of hay from these sources could be vastly improved by seeding them down to grasses and legumes that are quite tolerant to spring flooding. For land that is flooded for relatively long periods in the spring, reed canary grass is most suitable, with timothy and red top next in tolerance. Brome and alsike clover can stand between three and four weeks flooding, whereas two weeks flooding is about the limit for alfalfa.

Mixtures of timothy, brome and alsike have proved to be as satisfactory as any.

HORTICULTURE

Operators at each Station are encouraged to establish a small orchard for their own use. In the past eleven years, numerous ones were developed but a small number of the owners have ceased being operators. At present, four orchards are being maintained the average size of these being 34 trees. In addition to the fruit trees, these operators have established small fruit plantings for their own needs.

At Loverna, Assiniboine plums, Rescue apple crabs and Heyer 12 apples appeal to the operators most. Some of the Morden seedling crabs and Manitoba seedling plums are fruiting well. The Cree seedlings are getting old and are soon to be replaced with the better quality varieties.

Rescue apple crabs and Opata cherries seem to be doing well at North Makwa where winter hardiness is essential. Some mouse and rabbit damage has been encountered there.

Dakota strawberries, Trent and Rideau raspberries have been supplying the operator at North Makwa with an abundance of choice quality fruit.

YIELD AND COST OF PRODUCING FARM CROPS

In keeping with farm planning and business studies, cost of production is calculated for the main crops grown on each station. Wheat is grown more extensively at the Substations. At the Illustration Stations where more livestock is kept, oats occupies first place in the cropping plan.

Items such as cost of summerfallow, seed, hail insurance, machinery, use of man and horse labour, harvesting, hauling, use of land and taxes, use of buildings, interest on net cost and general farm expense, go to make up the cost of producing the crop. The charge for machinery used is based on the annual use of the machine, plus charges for power, fuel, oil, grease, repairs, housing and wages of the operator. More recently, a charge for management has been made against the crop, this charge is based on a percentage of the land value.

The cost per acre of operations that are calculated each year vary due to such factors as climatic conditions, soil moisture, texture, condition of crop and other factors. Even on individual farms the costs from year to year cannot be consistant. The cost of individual operations for a period of 4 years are given in Table 29. In addition to the average cost figures, the high and low figures are given, along with the number of records used in arriving at the average.

TABLE 29.—AVERAGE COST OF OPERATIONS PER ACRE 1944-47

Operation	No. Records	Av. cost	Highest Cost	Lowest Cost
		$ cts.	$ cts.	$ cts.
Harrow	17	0 19	0 36	0 09
Plough	13	1 22	2 04	0 86
Disk	14	0 42	0 85	0 22
One-way	17	0 62	1 33[1]	0 30[2]
One-way seed	6	0 63	0 75	0 51
Drill	16	0 39	0 58	0 26
Cultivator	15	0 47	0 67	0 34
Rod weed	4	0 37	0 40	0 29
Binder	10	0 82	1 05	0 67
Mow	6	0 52	0 97	0 24
Swathe	6	0 38	0 53	0 15
Combine	14	1 18	1 49	0 92
Rake	.....	.....	.....	.....

[1] Small one-way, working deep for fallow.
[2] Large one-way, working shallow for seed-bed.

High cost of operation is usually due to infrequent use of the machine, resulting in the depreciation being spread over a small number of acres. The soil type and depth of working one also are important factors in cost of operation.

Low costs can be attributed to well balanced, trouble-free units that work many hours during a season. Condition of the crop or soil will vary the cost of operation considerably. The cost of harvesting a heavy crop will be much higher than harvesting a light crop. Similarly, picking up is slower than straight combining except where wide swaths can be readily handled.

Cost of Summerfallowing

The main object in summerfallowing is to control weeds, conserve moisture and control soil drifting. The cost of fallowing depends largely upon the number of workings and effectiveness of each working. The extra cost required to have good summerfallow is usually offset by increased yields of subsequent crops.

In calculating cost of production, the cost of summerfallowing is charged against succeeding crops. In the case of a two-year rotation, the full cost of the fallow is charged against the crop. In a three-year rotation, two-thirds of the cost of fallowing is charged against the first crop and one-third against the second. In longer rotations, the first two crops still absorb the full cost of fallowing.

From the records kept by the operators, the cost of individual operations are calculated and from this the cost of fallowing operations can be figured each year.

A summary of the various items of summerfallow costs for each substation for the year 1947 and the average cost for the period of years is indicated in Table 30.

TABLE 30.—COST PER ACRE TO SUMMERFALLOW LAND—1947

Station	Use of land and taxes	Use of machinery	Gas, oil and grease	Horse labour	Man labour	General farm expense	Management	Total cost per acre	Number years	Average cost
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.		$ cts.
Conquest	1 08	0 55	0 75	.....	0 63	0 70	1 59	5 30	2	5 50
Kindersley	1 83	0 53	0 38	.....	0 30	1 59	1 20	5 80	4	4 44
Loverna	1 24	0 49	0 39	.....	0 40	0 75	1 00	4 27	4	3 58
Rosetown	1 62	0 75	0 65	.....	0 48	0 67	1 15	5 32	4	5 05
Glaslyn	0 48	0 42	1 04	.....	0 70	0 75	0 50	3 99	2	3 79
Glenbush	0 87	1 58	1 08	.....	1 39	0 27	0 54	5 73	2	5 49
North Makwa	0 74	0 72	.....	3 00	3 75	0 28	0 38	8 87	2	8 64

From Table 30, it can be seen that the choice of power and implements has a definite bearing on the costs of fallowing.

At North Makwa, where horse power is used entirely, costs are highest. Ploughed fallow at Conquest and Glenbush are higher in cost than fallows that are one-wayed. At Rosetown, where more frequent applications are necessary to control weeds, costs are increased.

Summerfallow, field operations and material costs form the basis for determining the total cost per acre of producing a crop.

The yield and cost per acre of producing a crop on fallow in 1947 is set forth in Table 31.

A study of Table 31 will show that certain costs involved in producing a crop are relatively fixed and must be incurred up to and including the seeding of the crop. Such fixed costs include the cost of fallowing, seed, preparation of land, seeding, use of general equipment, use of land, buildings, taxes and general expense constitute from 75 to 80 per cent of the total cost of producing a crop. From the foregoing figures and statements it can be seen what effect a medium, light or poor crop will have on the grower.

Over a varying period of years data from the stations have been maintained. A summary of the yield per acre, cost per bushel and cost per acre of producing a crop is given in Table 32.

In nearly all cases, the cost per acre of producing crops in 1947 was higher than average. Increased costs of fuel, labour, machinery and machinery repairs are reflected in these increases. High bushel costs have, in the main, been due to decreased yields on stubble crops or insect damage to crops necessitating extra work in harvesting.

Cost of producing oats at Glaslyn and Glenbush in 1947 was greatly increased due to the drouth and low yields. As a result of the high cost in 1947, the average cost is considerably higher than would be expected if a longer period of years could have been used.

At Loverna, the long-time average yield of wheat after fallow was 11·1 bushels per acre whereas during the past two years of the period under review, wheat after wheat averaged 6·6 bushels. In view of the varied period of years in which the averages were taken, they would appear to be somewhat misleading. Similarly, the average yield of wheat after wheat at Rosetown is relatively low, due to the fact that yields in this rotation were not recorded in some of the recent years when heavy crops were harvested.

TABLE 31—COST OF PRODUCING WHEAT ON FALLOW—1947

Station	Use of land, buildings taxes	Cost of fallow and interest	Seed	Hail insurance	Machinery Use				Hauling	Miscellaneous labour man or horse	Miscellaneous Costs			Total cost per acre.
					Preparation and seeding	Combine harvesting	Binder and thresher harvesting	General equipment			Interest on net cost	General farm expense	Management	
	$ cts.	$ cts.	$ cts.		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Conquest	1 44	3 40	1 65	Incl. in taxes	0 83	0 96	.....	0 40	0 18	.....	0 06	0 70	1 59	11 21
Kindersley	2 13	4 70	2 50	"	0 76	0 93	.....	0 15	0 08	.....	0 06	1 59	1 20	14 10
Loverna	1 42	3 80	1 65	"	0 70	1 11	.....	0 13	0 06	.....	0 11	0 75	1 00	10 73
Rosetown	2 17	5 26	2 50	"	0 93	1 34	.....	0 10	0 10	.....	0 08	0 67	1 15	14 30
Glaslyn	0 64	4 02	1 10	"	1 37	.....	1 39	0 44	0 06	.....	0 12	0 75	0 50	9 99
Glenbush	1 21	5 82	1 10	"	1 28	.....	1 76	0 27	0 26	.....	0 13	0 27	0 54	12 34
North Makwa	0 94	9 07	1 65	Nil	1 58	.....	2 75	0 12	0 13	0 20	0 49	0 29	0 38	17 56

TABLE 32—SUMMARY OF FIELDS AND COST OF PRODUCTION—1947

Station	Kind of Crop	Rotation project number	Number years grown	Yield per acre		Cost per Bushel		Cost per acre	
				1947	Average	1947	Average	1947	Average
Conquest	Wheat after fallow	IS-W1-86	2	11·6	11·55	·87	·88	10·06	10·06
	Wheat after wheat	IS-W1-86	2	10·4	11·2	·95	·88	9·94	9·79
	Barley-3rd crop after fallow	IS-W1-86	2	24·3	19·9	·40	·50	9·70	9·44
	Barley-4th crop after fallow	IS-W1-86	2	14·5	14·25	·64	·59	9·30	8·37
	Barley after fallow	IS-W1-86	1	31·0	31·0	·32	·32	9·83	9·83
Kindersley	Wheat after fallow	IS-W1-21	14	13·0	16·5	1·07	·64	13·83	10·38
	Wheat after wheat	IS-W1-32	13	8·5	11·8	1·41	·98	11·79	8·58
	Oats after fallow	IS-W1-22	4	23·5	28·8	·62	·46	14·55	12·34
Loverna	Wheat after fallow	IS-W1-21	18	12·0	11·1	1·10	·68	13·22	7·18
	Wheat after wheat	IS-W1-32	2	10·0	6·6	·82	1·83	8·19	7·55
Rosetown	Wheat after fallow	IS-W1-21	11	15·0	20·8	·90	·61	13·49	11·45
	Wheat after wheat	IS-W1-32	2	10·5	11·6	1·54	1·22	15·27	13·76
Glaslyn	Oats after fallow	IS-W1-42	2	12·0	26·0	·70	·52	7·45	10·31
	Oats after oats	IS-W1-42	2	10·0	11·5	·90	·85	9·05	8·91
Glenbush	Oats after fallow	IS-W1-66	2	15·8	34·4	·75	·51	11·92	13·04
	Wheat after fallow	IS-W1-31	2	19·2	27·1	·91	·69	17·50	16·88

Rescue wheat, grown on stubble for the first time in 1947, shows promise of improving yields on stubble due to its resistance to sawfly. Normally, stubble crops of wheat could not be grown in sawfly-infested districts.

Wheat after wheat at Kindersley for the past thirteen years has averaged 11·8 bushels per acre which is only 4·7 bushels less than the average yield of wheat on fallow at that station. The average cost per acre of the second crop was $8.58 or $1.80 less than the cost per acre of the summerfallow crop. Thus, at present day prices, the returns from a stubble crop are not so high as those from a fallow crop. There is insufficient data on the cost of production of oats and other crops to present in this report.

Study of The Farm Business

The financial effectiveness of the farm business is dependant largely upon such factors as crop rotations, soil management and the choice of secondary enterprises. In order to determine the relative productivity of the various farm enterprises in terms of money income, operators are required to report their revenue and expenditures each week, and at the end of the year an inventory of each Station is taken in which such information as kind, acreage and yield of crops grown, capital invested in land, buildings, livestock, machinery and equipment, feeds and supplies, accounts receivable and liabilities are recorded. From the weekly revenue and expenditure reports, a summary of "Source of Revenue" is obtained as well as the actual cash income of the farm business. Increases or decreases in inventory give some indication as to the non-cash revenue or expenditures and this plus the cash receipts and expenditures gives a good indication of the farm business trends for the year.

Land Utilization and the Farm Business

On the Illustration Stations and substations in the Scott district of supervision, farming falls into two main classes: grain farming and mixed farming. Generally speaking, the Substations, which lie in the southern portions of the district and in the open plains area, are grain farms. The Illustration Stations, on the other hand, that lie in the northern part of the district in the park belt, carry on a more diversified type of farming.

The Substations, which average 1072 acres in size are, for the most part, located on the better soil types of this district. In view of the fact that the percentage of arable land (78·6) is relatively high, and water for livestock is not readily available, grain farming has been the interprise.

Wheat is the main crop grown on the Substations and takes up 42·8 per cent of the cultivated land. Oats require 3·6 per cent and barley 9·5 per cent. Other crops such as crested wheat grass, brome grass, rye and flax take up 22·7 per cent, and 21·4 per cent of the land is fallowed. The reason for the relatively large percentage of grasses and fall rye is that these crops have been grown on the lighter land as an aid in soil drifting control. The waste land (21·4 per cent of total area) is utilized as pasture for the few head of livestock.

The average size of the Illustration Stations is 622 acres, of which 173 acres or 27·8 per cent is under cultivation. The remaining 72·2 per cent is mainly pasture land and bush. Of the land under cultivation, only 6·4 per cent is in wheat, 50·2 per cent in oats, 6·4 per cent in barley 21·4 per cent in other crops, such as alfalfa, grass legume mixtures and flax, and 15·6 per cent is summerfallowed. Most of the grain is kept on the farm for feeding livestock (cattle and hogs) while some of the wheat is sold. The alfalfa and grasses are usually cut for hay, although in some years, the alfalfa is kept for seed. The bush and waste land which occupies 72·2 per cent of the total acreage is, in the main, used for pasture for cattle and hay. The bush on the farm is a source of fuel for the operator.

Farm Capital

Inventory records from the Substations and Illustration Stations show that 69·9 per cent of the average farm capital is invested in land and buildings, 7·3 per cent in livestock and 22·8 per cent in machinery. The average investment per acre of cropland is $51.78. This figure is high for wheat-growing areas and low for the mixed-farming area where there is a relatively high investment in livestock and the number of cultivated acres is small. Although there are not enough stations to represent all the soil types common in northwestern Saskatchewan, the figures indicate that the percentage of capital invested in land on those stations on the heavier types of soil is much higher than the stations on the poorer soil and the percentage investment in machinery is lower. When considering gross receipts per acre of cropland, the operators on the heavier soil types have a considerably larger income per acre than the operator on poorer soil in the open plains area. Further north, where a more diversified type of farming is carried on, the receipts per acre of cropland are considerably higher than the average of $11.45. This helps to keep the income of a mixed farmer on a level with that of a grain farmer. A summary of average investment, acres of cropland and gross revenue per acre of cropland for this area is summarized in Table 33.

Sources of Revenue

One phase of the farm business study is that of computing the relative contribution of each farm enterprise to the total revenue. The following chart shows the average contribution of each farm enterprise for the District Experiment Substations and Illustration Stations in northwestern Saskatchewan for the past five years of the period under review.

PERCENTAGE CONTRIBUTION OF VARIOUS FARM ENTERPRISES

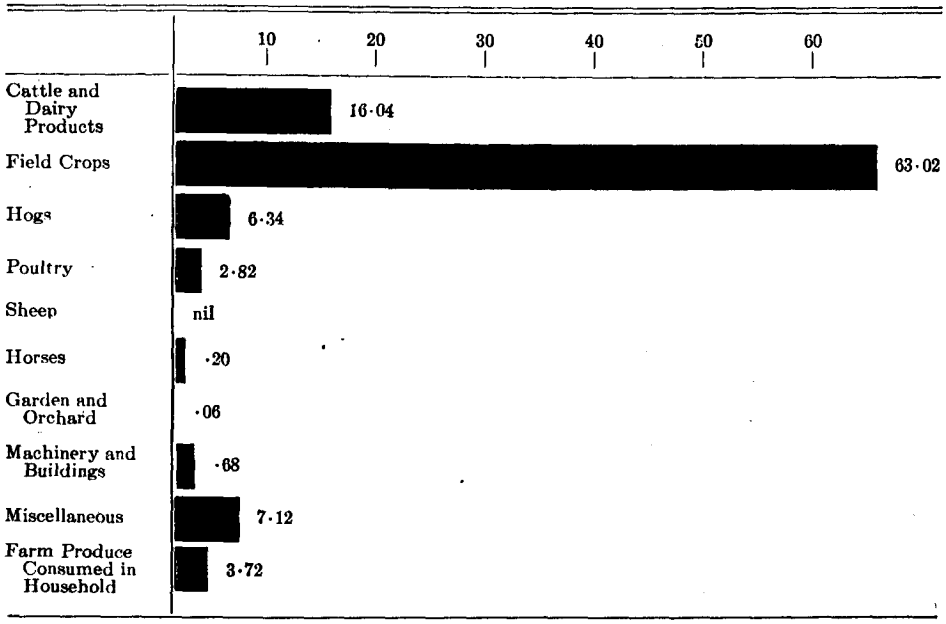

TABLE 33—CAPITAL INVESTMENT, ACRES OF CROPLAND AND GROSS REVENUE PER ACRE OF CROPLAND

Station	Land and buildings		Livestock		Machinery and equipment		Total capital	Investment per acre of cropland	Gross receipts per acre of cropland
	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total			
	$ cts.		$ cts.		$ cts.		$ cts.	$ cts.	$ cts.
Conquest	30,788 00	74·4	1,290 00	3·1	9,317 82	22·5	41,395 82	29 00	2 04
Kindersley	19,755 37	78·2	461 62	1·8	5,055 83	20·0	25,272 82	60 75	10 34
Loverna	9,141 70	55·5	1,840 50	11·2	5,500 32	33·3	16,482 52	18 17	4 98
Rosetown	21,762 50	80·1	312 50	1·1	5,102 10	18·8	27,177 10	43 83	9 43
Glaslyn	3,569 25	43·8	1,953 50	24·0	2,627 41	32·2	8,150 16	69 66	19 73
Glenbush	9,806 00	61·6	3,829 40	24·1	2,271 76	14·3	15,907 16	69·77	13 76
North Makwa	4,569 50	58·0	743 35	9·4	2,572 17	32·6	7,885 02	69 17	19 35
Total	99,392 32	.....	10,430 87	.....	32,447 41	.....	142,270 60	360 35	80 13
Average	14,198 91	69·9	1,490 12	7·3	4,635 34	22·8	20,324 37	51 78	11 45

Sales of field crop products constituted nearly two-thirds of the average total revenue (63.02 per cent). Cattle and dairy products constituted the second most important farm enterprise. Prior to 1945, hogs constituted a relatively important enterprise on several of the stations but due to the increased grain prices since that time, the operators have gone out of hogs and consequently there has been a corresponding increase in the revenue from field crops. The revenue from poultry is low but quite consistant through the years. The farm produce consumed in the household is considered, in the study, as revenue and accounts for 3·72 per cent of the average total revenue.

When looking at the average figures for all stations in the area, it would appear that field crops were by far the most important enterprise. This is not an entirely true picture due to the fact that revenues from the smaller, more diversified farms in the north are overshadowed by the larger more specialized grain farms to the south. To illustrate this point, the 1947 figures showed that at Rosetown 91·71 per cent of the total revenue was from field crops, whereas at Glaslyn, 21·33 per cent was from cattle and dairy products, 34·98 per cent from hogs, 18·36 per cent miscellaneous and only 12·52 per cent from field crops.

Field Days

Each year field days are held at the various Illustration Stations and Substations. Speakers from outside sources are brought in to speak at these meetings on topics of vital interest to the farmers and the Supervisor leads field expeditions and discusses the work being conducted at each of the Stations. A lady speaker is always in attendance to speak to the women on womens topics.

During the past eleven years under review, ninety-five field days have been held in all, with a total attendance of 13,210, which is an average of 139 in attendance at each field day.

LIST OF ACTIVE PROJECTS

Dominion Experimental Station, Scott, Sask.

1937-1947

FIELD HUSBANDRY

F. 105 Rotation B	Two-year rotation of wheat and fallow.
F. 107 Rotation C	Three-year rotation of wheat, wheat, fallow.
F. 114 Rotation D	Four-year rotation of fallow, wheat, oats, oats seeded down to sweet clover.
F. 122 Rotation J	Six-year rotation of wheat, wheat, oats seeded down to grass, hay, hay, fallow
F. 144	Parts 1 and 2 summerfallow treatments.
F. 146	Stubble treatments for seeding wheat and oats.
F. 243	Straw mulch for wheat.
F. 548	Cover-crop experiment.
F. 508-509	Manure for sunflowers.
F. 501	Rates of applying manure for wheat.
F. 535	Fresh vs. rotted manure for grain crops.
F. 142	Sequence of crops.
F. 537	Methods of seeding grasses and clovers.
F. 511	Rates of applying fertilizer with wheat.
F. 161	Rates of seeding wheat with constant fertilizer rate.
F. 155	Dates of seeding wheat with constant fertilizer rates.
F. 510	Part 1. Drilling vs. broadcast phosphate fertilizer for wheat.
F. 513	Part. 2 Fertilizer placement for wheat, barnyard manure alone vs. barnyard manure and phosphate fertilizer for wheat.
F. 194	Using phosphate fertilizer in a rotation of summerfallow, wheat, oats (seeded down to sweet clover).
F. 521	Phosphate fertilizer screened to different sizes for wheat.
F. 522	Place in rotation of applying commercial fertilizer for grain.
F. 511	Part 5. Response of different varieties of wheat to phosphate fertilizer.
F. 512	Part 1. Commercial fertilizers for field crops.
F. 512	Part 2. Phosphate fertilizer using different percentages of nitrogen and phosphoric acid in ammonium phosphate for wheat.
F. 568	Comparing response of wheat to brands of phosphate fertilizers.
F. 280	Part 1. Cultural methods of controlling lamb's quarters. Part 2. Effect of seeding grain at different rates on the control of lamb's quarters. Part 3. Effect of seeding wheat on different dates on the control of lamb's quarters. Part 4. Effect of weeds on crop yields. Part 5. Viability of seeds of lamb's quarters buried in the soil for varying periods of time. Part 8. Depths of seeding from which lamb's quarters will emerge.
F. 255	Methods of regrassing abandoned land or depleted native pastures using crested wheat grass.
F. 627	Light tillage of wheat after seeding for weed control.
F. 388	Chemical control of annual and perennial weeds.
F. 628	Losses in ensiling various crops.
F. 269	Studies initiated under P.F.R.A. to determine methods of controlling soil drifting. Part 1. Strip-farming study. 2. Summerfallow treatments. 3. Stubble treatment. 4. Soil-screening studies. 5. Pre-seeding tillage and delayed-seeding study of fallow. 6. Continuous row cropping. 7. Weed eradication studies. 8. Utilization of grasses. 9. Spaced vs. solid seeding of forage crops. 10. Rejuvenation of old brome grass stands. 12. Snow conservation. 13. Untilled or Indian fallow. 14. Wild oat control studies.
F. 228	Meteorological records.
F. 298	Cost of producing hay crops.
F. 297	Cost of producing grain crops.
F. 196	To ascertain the cost of operating tractor for drawbar and belt work.
F. 570	Manure and commercial fertilizer combination for silage crops.

CEREAL PROJECTS

Ce. 1	Sub-project 1	Test of varieties of spring wheats.
	" 4	Test of varieties of winter wheats.
	" 5	Tests of varieties of oats.
	" 6	Tests of varieties of barley.
	" 8	Field beans. Evaluation of different kinds and varieties.
	" 9	Test of varieties of flax.
	" 11	Test of varieties of winter rye.
Ce. 13	" 50	Production of registered grains.
Ce. 13	" 136	Production of elite stock.
Ce. 14	" 62	Determination of varietal composition of farmer's grain samples.
Ce. 73		Co-operative activities.
		Co-operative work with farmers in the evaluation of different cereal varieties.
Ce. 146		Effect of frost on wheat varieties

FORAGE CROP PROJECTS

Ag. 1	Indian corn. Variety tests for ensilage.
Ag. 2	Corn (Extra Early Flint). Variety tests.
Ag. 76	Sunflowers. Variety tests for yield and purity.
Ag. 92	Triticum × Agropyron hybridization.
Ag. 126	Alfalfa. Variety tests for hardiness, yield and suitability.
Ag. 161	Sweet clover. Variety tests.
Ag. 221	Western rye grass. Variety tests for yield and purity.
Ag. 246	Annual hay crops.
Ag. 253	Brome grass. Variety tests.
Ag. 255	Forage crop nursery.
Ag. 264	Perennial and biennial grasses and legumes for hay.
Ag. 267	Perennial and biennial grasses and legumes for pasture.
Ag. 267B	Tests of grasses and legumes alone and in combination primarily for pasture.

POULTRY

P 15	Incubation costs.
P 56	Pedigree breeding for egg production (a) Influence of sire.
P 62	Costs of egg production.
P 65	Ventilation in temperature of poultry houses.
P 102	Growing turkeys under partial confinement.
P 114	Breeding for egg size.
P 166	Substitutes for fresh green feed.
P 191	Control of pullorum in poultry.
P 209	Best source of animal protein for laying pullets.
P 259	Relative merits of Barred Rocks and New Hampshires and their hybrids.

HORTICULTURE

H 168	Potatoes, growing certified seed.
H 261	Annual flowers, variety experiment.
H 274	Herbaceous perennials, variety experiment.
H 298	Hedges, variety experiment.
H 307	Trees and shrubs, ornamental and shelter—variety experiment.
H 415	Vegetables, comparison of irrigated and dry land—production of
H 684	Phosphate in relation to vegetable crops.
H 793	Bush fruits, variety experiment.
H 806	Salonaceous vegetables—variety experiment.
H 815	Tree fruits, variety experiment.
H 927	Repellants for rodents in orchards.

ANIMAL HUSBANDRY

Horses

A 336	Cost of maintaining brood mares.
A 340	Control of joint ill in foals.
A 531	Breeding Percheron horses.
A 882	Control of equine encephalomyelitis.

Cattle

A 58	Record of performance (Shorthorns).
A 93	Control of tuberculosis in cattle.
A 256	Cost of raising female calves.
A 520	Breeding Shorthorn cattle.
A 660	Serum test for contagious abortion.
A 813	Feed cost of milk and butter-fat production.
A 825	Sunflower vs. pigweed silages for cattle.

Sheep

A 672	Breeding Rambouillet sheep.

Swine

A 113	Mineral and protein supplements for pigs.
A 120	Self-feeder vs. trough-feeding of swine.
A 513	Breeding Yorkshire swine.
A 679	Advanced Registry for purebred swine.
A 826	Lamb's quarters seeds for growing pigs.
A 858	Fecundity and nursing capacity in swine.
A 897	Vitamin supplements in winter swine feeding.

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1949

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