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This volume includes progress reports of the following Experimental Farms, Laboratories and Forest Nursery Stations of the Canada Department of Agriculture:

EXPERIMENTAL FARM

INDIAN HEAD, SASKATCHEWAN

PROGRESS REPORT

1947 - 1956

EXPERIMENTAL FARMS SERVICE
CANADA DEPARTMENT OF AGRICULTURE
OTTAWA, ONTARIO

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STAFF

(1956)

Experimental Farm, Indian Head, Sask.

J. Roe Foster, B.S.A.	Superintendent
E. V. McCurdy, B.S.A.	Field Husbandry
W. W. Cram, B.S.A.	Animal Husbandry
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J. J. Quinn	Plotman
Mrs. L. E. Kirchner	Clerk
Miss S. Hilderman	Stenographer

* April 1952 to April 1956
** October 1956

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Staff Changes

Mr. W. H. Gibson, who had been Superintendent for many years, retired early in 1949. He was succeeded by Mr. J. G. Davidson, B.S.A., M.S.A. Mr. Davidson had been in charge of cereal and forage work at the Indian Head Farm since 1928. He retired in February, 1953, and was succeeded by Mr. J. Roe Foster, B.S.A., who had previously been Superintendent of the Experimental Substation at Regina.

Mr. A. P. Piloski, B.S.A., was appointed to head the Poultry Section in the fall of 1949. In the spring of 1950, Mr. W. A. Russell, B.S.A., was appointed to head the Horticultural Section. Mr. Hugh McKenzie, B.S.A., M.Sc., was appointed to head the Cereal Section about the same time. He transferred to the Cereal Laboratory at Lethbridge in August, 1951, and was succeeded by Mr. A. L. D. Martin, B.S.A., M.Sc., in April, 1952. Mr. Martin transferred to the Cereal Breeding Laboratory, Winnipeg, Man., in April, 1956, and Dr. R. I. H. McKenzie was appointed to head the Cereal Section in October, 1956.

EXPERIMENTAL FARM
Indian Head, Sask.

Progress Report 1947-1956

INTRODUCTION

This report covers the 10-year period 1947-56 inclusive. The previous published report for this Farm was for the years 1937-46.

The Experimental Farm at Indian Head, Sask., is one of the five original experimental farms established by the Canada Department of Agriculture in 1887. In its early years the Indian Head Farm served a wide area but more recently the interests of the farmers in the southeastern portion of Saskatchewan have been its primary concern. This part of the province contains large areas of brown, dark brown, and black soils made up of various soil types and textures. The Farm is situated near the boundary between the Black and Dark Soil zones, on what is described as Indian Head clay and heavy clay.

The type of farming practised within this region is either straight grain production, or the production of grain and livestock. The Experimental Farm directs its efforts towards problems concerned with both grain and livestock farming. It has given considerable attention to crop rotations and cultural practices; cereal breeding and variety testing; problems relating to beef cattle and swine; the search for better forage crops; cultural and chemical control of weeds; the effect of chemicals on crops; the breeding and testing of horticultural crops for home gardens and commercial purposes; and improved methods of poultry husbandry.

Thirteen Illustration Stations and one Horticultural Substation served to provide additional information on various soil types in the area.

In the period covered by this report there has been a considerable trend towards mechanization. In most districts the horse as a source of farm power has been entirely replaced by tractors. On the Experimental Farm itself, which was until recently an active Clydesdale breeding institution, the horse has become of relatively minor importance. "Muirton Masterpiece", the last imported stallion to be stationed here for the benefit of Clydesdale breeders at large, had to be transferred to the Central Experimental Farm, Ottawa, in 1950, because there was no demand from farmers for his services.

ANIMAL HUSBANDRY

W. W. Cram

Horses

The continuing decline in the number and importance of draft horses has led to a cessation of experimental work with this class of livestock. An average of 16 horses (all classes) were kept at the Farm over the 10-year period. A

Clydesdale stallion was maintained at the Farm for 6 of the 10 years covered by this report and was available to farmers at a nominal service fee. A total of 43 Experimental Farm mares were bred during the period resulting in 19 foals. Forty-four farmers' mares were bred during the same period.

Beef Cattle

Performance Testing of Beef Cattle at Indian Head from 1949 to 1955

Performance testing of beef cattle was initiated at Indian Head in 1949 in co-operation with four other western Experimental Farms. The main purpose of the earlier tests was to determine the best techniques for conducting the experiment and recording the data. The first calves tested were steers but work with this class of calves was discontinued in 1953. The testing of bulls and heifers was started in 1950. In the 1949 to 1953 tests, calves were weaned at six months and started on test two weeks later. Grain and hay were fed separately while different grain mixtures and ratios of grain to hay

TABLE 1—SUMMARY OF PERFORMANCE TESTS WITH SHORTHORN CALVES[1] BORN 1949 TO 1955

Identification of Sire[2]	No. and Sex of Progeny[3]	Average Daily Gain (lb.)			Average No. of lb. of Feed per 100 lb. Gain	
		Individuals		Group Average		
		Highest	Lowest		Grain	Hay
YY-43X	4B	2·3	2·1	2·2	447	382
	8S	2·1	1·8	1·9	514	415
	3H	1·7	1·3	1·5	521	446
YY-46X	15B	2·5	1·7	2·1	531	309
	10S	2·2	1·6	1·9	635	308
	21H	1·9	1·4	1·7	619	412
LES-17F	9B	2·8	2·1	2·4	631[4]	
	6H	2·0	1·7	1·8	805	
ESS-64H	6B	2·3	1·8	2·1	634	
	4H	1·7	1·4	1·5	783	
ESS-67H	3B	2·1	1·9	2·0	648	
	4H	1·8	1·3	1·6	764	
NWV-E3	1B	—	—	1·9	698	
	1H	—	—	1·3	838	
ESS-40G	5B	2·5	1·9	2·2	596	
IHF-13C	5B	2·2	2·0	2·1	634	
LES-16G	4B	2·1	1·7	1·9	687	
K. Conq. 31	3B	2·3	2·0	2·1	658	
K. Cyr. 8	2B	2·6	2·0	2·3	574	
ESS-37G	4B	2·2	2·0	2·1	622	
ESS-65H	2B	2·2	1·9	2·0	651	
H No. 1	5B	2·2	1·9	2·0	587	

(1) The sire group by H No. 1 was of Highland breeding.
(2) The first 6 sire groups were from Indian Head, the last 8 from Brandon, Lacombe, Scott, and Manyberries farms.
(3) B = Bulls; S = Steers; H = Heifers.
(4) Complete ration in pelleted form.

were used for the starting and finishing periods. In conjunction with the six months weaning age, bulls were fed to 900 pounds and heifers to 800 pounds at finish.

Beginning in 1954, all calves were weaned at 140 days and started on test at 154 days of age. Starting also with 1954 calves, a standard ration consisting of mixed ground grains, protein supplements, minerals and cut hay was combined in the ratio of two parts of concentrate to one part of roughage by weight, pelleted, and fed throughout the test period. With the change in weaning age from six months to 140 days, the finished weight for bulls was reduced to 800 pounds and that for heifers to 700 pounds.

Table 1 shows average daily gains and feed requirement for the different sire and sex groups, and average daily gains for high and low individuals in each group.

As indicated in Table 1, bull calves showed considerably higher average daily gains and higher feed efficiency than heifers both within and between sire groups. In the two sire groups in which steers were tested the steers were in an intermediate position for daily gains and feed efficiency in relation to bulls and heifers.

The New Performance Testing Barn

A new test barn of loose-housing type with overall dimensions of 134 by 36 feet was completed in the fall of 1955 in time to accommodate the calves born the same year. This building has individual feeding stalls for 50 calves and provides 50 square feet of lounging or bedded area per calf.

Swine

Self- Versus Hand-Feeding of Market Pigs

Yorkshire pigs born in the spring and fall of 1949 and in the spring of 1950, respectively, were used to test the relative merits of hand- versus self-feeding and, also, to compare a standard finishing ration versus the same ration diluted with 20 per cent bran.

In each test, four groups of four pigs, two hand-fed and two self-fed, were carried from an average weight of 50 pounds per pig to market weight. To one hand-fed and one self-fed lot of each replicate the regular Advanced Registry feeds were supplied throughout the test. The other hand-fed and self-fed lots received the regular Advanced Registry feed to 120 pounds. From this stage to finish, 20 per cent of the grains were replaced by bran.

Results of these tests show that when balanced feeds are used for the growing and finishing of market pigs, self-feeding may be expected to produce daily gains equal to hand-feeding, with no loss of carcass quality. The self-fed pigs, however, required about 15 per cent more feed per 100 pounds gain as compared with the hand-fed. Labor costs were higher for the hand-fed group and feed costs higher for the self-fed group. The bran-diluted ration was satisfactory but the pigs required about 9 per cent more feed than those on the standard finishing ration.

Comparison of Lacombe Swine with Yorkshires at Indian Head

In 1954 ten yearling sows and boars of the Lacombe breed were transferred to Indian Head from the Lacombe Farm. The sows were in pig. An experiment was designed to compare the performance of the sows and their progeny with that of a similar group of Yorkshires, and also to compare performance between Farms. At Indian Head during the 3-year period (1954-56),

Yorkshires showed a slight advantage in the number of pigs born and weaned per litter. The Lacombe pigs showed some superiority in birth and weaning weights and rate of gain. Pigs of both breeds were similar in carcass quality and feed requirements.

FIELD HUSBANDRY

E. V. McCurdy

Meteorological Records

Longtime meteorological records are an invaluable aid in appraising the crop potential of any district. Sunshine records have been kept continuously on the Experimental Farm for 65 years, precipitation records for 60 years, temperature records for 50 years, and evaporation records for the past 21 years. Data on yearly rainfall and the occurrence of spring and fall frosts are included in detail since they are of considerable interest to farmers. The 10 years covered by this report were favorable for crop production. Precipitation during the growing season, April to July, inclusive, has averaged 9.19 inches, which is slightly above the 60-year average of 8.64 inches.

A few extremes have been recorded during the period 1947 to 1956. The mean temperature for January, 1950, was −20.6°, the mean minimum −28.8°, both all-time lows for Indian Head. In the same year an early fall frost on August 17 caused considerable damage to many crops in this part of the province, but fortunately missed most of the Indian Head district. A second frost on August 23, more severe than the first, damaged all crops that had not reached maturity. In this district nearly 60 per cent of the crop graded 4 northern, and the remaining 40 per cent graded 5, 6, and feed. In 1951, leaf and stem rust, the latter identified as race 15b, were noticeable on Thatcher and Redman wheat, but the rust occurred somewhat late in the season. By 1953 and 1954 losses from rust were very heavy, particularly on late crops.

Complete meteorological data are given in Tables 2 to 4 inclusive.

Rotations

Crop rotation experiments have been carried out continuously on the Indian Head Experimental Farm since 1911 and as some of these rotations have remained unchanged for many years considerable data have been accumulated. The two-year rotation in which summerfallow is alternated with wheat is gaining in importance in this part of the province, largely because of weeds and the difficulty of preparing a seedbed for the second crop when the field is covered with a heavy combine stubble. With good cultural practices and the use of fertilizer, about equal quantities of grain can be produced from the two- and three-year rotations. With the latter there is always the danger of a partial crop failure in the stubble year, and the reduced amount of stubble makes it difficult to avoid some soil erosion during the summerfallow year.

The 3-year rotation was compared with a 9-year rotation for 45 years. The 3-year rotation consists of: summerfallow, wheat, wheat; the 9-year: summerfallow, wheat, oats (seeded down), hay, hay, hay (broken immediately after the first cut in the third year), corn, wheat, oats. Twelve tons of manure are applied to the hay field before it is broken, then the field is plowed and worked as fallow throughout the remainder of the season. The 3-year rotation is on Indian Head clay whereas the 9-year rotation is on a more productive soil, classed as a heavy clay. Unfortunately the land in the 3-year rotation is slightly undulating and some topsoil has been lost as a result of wind and water erosion, but in the 9-year rotation, erosion has not been a problem. The average yields of the two rotations are given in Table 5.

TABLE 2—PRECIPITATION RECORDS

Monthly and Annual Precipitation Records (inches) 1947 to 1956, inclusive, with 60-year averages and monthly extremes for the same period.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Annual Snowfall	Total Annual Rainfall	Total Annual Precipitation
1947	1·66	1·50	0·62	0·38	0·84	7·56	0·95	1·95	1·94	0·15	2·41	1·30	7·74	13·52	21·26
1948	1·32	0·52	0·83	1·46	1·41	2·79	1·24	2·64	0·37	0·15	1·58	1·99	6·44	9·86	16·30
1949	0·20	0·51	0·82	0·27	2·68	1·25	3·00	1·16	0·65	0·68	0·67	1·03	3·33	9·59	12·92
1950	0·87	0·90	0·93	1·03	1·40	3·29	2·66	1·26	0·63	0·66	0·96	1·07	5·99	9·67	15·66
1951	0·68	1·60	1·28	0·64	0·42	3·58	0·74	2·77	2·62	2·20	0·45	0·97	6·43	11·52	17·95
1952	1·00	0·20	0·43	0·36	0·48	3·77	2·63	4·93	1·45	0·25	0·40	0·18	2·56	13·52	16·08
1953	0·75	0·81	2·12	0·61	2·88	6·34	3·04	0·81	1·63	1·71	0·54	0·55	5·00	16·79	21·79
1954	0·97	0·62	0·31	1·41	2·27	4·90	5·06	3·15	4·21	0·27	0·37	0·17	3·44	20·27	23·71
1955	1·12	0·35	1·52	1·95	3·32	3·51	3·06	2·24	1·20	0·94	1·47	1·07	6·22	15·53	21·75
1956	1·27	1·08	1·78	0·67	2·51	3·59	2·01	0·73	0·33	1·48	0·72	1·39	8·68	8·88	17·56
60-year Av.	0·81	0·71	1·05	0·89	1·89	3·54	2·32	2·04	1·68	1·05	0·91	0·76	5·12	12·53	17·65

EXTREMES 1897-1956 (60 YEARS)

Low year	0·00 1902	0·07 1934	0·08 1915	0·00 1931	0·23 1931	0·65 1900	0·40 1899	0·00 1901	0·14 1909	0·00 1902	0·00 1901	0·00 1943
High year	2·98 1911	2·25 1904	3·30 1904	3·13 1901	4·72 1910	11·20 1897	7·25 1923	4·93 1952	7·40 1901	6·47 1913	2·65 1932	1·99 1948

Snow is converted to rain by the formula: 10 inches of snow equals 1 inch of rain.

NOTE: The 1897 records are not included in the "low" figures.

TABLE 3.—METEOROLOGICAL RECORD—1956.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

Month	Temperature – °F.						Sunshine		Tank Evaporation	
	Mean		Maximum		Minimum					
	1956	Average 50 Years	High	Mean	Low	Mean	1956	Average 65 Years	1956	Average 21 Years
	°	°	°	°	°	°	hr.	hr.	in.	in.
January	−0·1	0·31	34·0	8·3	−30·5	−8·5	105·2	76·8		
February	2·2	5·53	36·0	12·3	−33·0	−7·9	117·2	104·0		
March	14·3	17·7	45·0	23·6	−30·0	5·0	148·3	136·8		
April	30·3	37·0	64·0	40·2	4·0	20·5	210·7	175·3		
May	50·4	50·2	84·0	62·7	26·8	38·2	193·8	214·6	3·590	3·700
June	63·4	59·2	96·5	75·6	38·0	51·2	229·7	212·7	4·931	3·900
July	61·5	65·0	84·9	72·8	39·8	50·3	236·8	274·7	4·140	4·817
August	62·1	62·4	84·0	74·9	34·0	49·3	241·1	241·4	4·069	4·317
September	50·5	52·0	87·0	63·8	25·5	37·2	175·4	164·6	3·225	2·855
October	40·6	40·0	78·5	52·3	10·0	29·0	150·2	134·8		
November	23·1	22·2	45·5	30·4	−8·0	15·9	82·0	73·9		
December	8·4	8·3	42·5	17·4	−34·0	−0·5	69·6	62·3		
Total	—	—	—	—	—	—	1960·0	1871.9	19·955	19·589

TABLE 4—FROST RECORDS

FROST: 32°F. OR LOWER. KILLING FROST: 28°F. OR LOWER. A FROST ON OR AFTER JULY 16 IS A FALL FROST.

Year	Last Frost in Spring		First Frost in Fall		No. of Frost-Free Days	Last Killing Frost in Spring		First Killing Frost in Fall		No. of Crop Days (above 28°F.)
	Date	Temp. °F.	Date	Temp. °F.		Date	Temp. °F.	Date	Temp. °F.	
1947	May 29	20·5	Sept. 15	31·0	108	May 29	20·5	Sept. 22	24·2	115
1948	May 28	28·5	Sept. 9	28·5	103	May 11	27·5	Sept. 30	27·0	141
1949	May 27	31·5	Sept. 14	23·0	109	May 23	20·5	Sept. 14	23·0	113
1950	May 16	31·5	Aug. 23	28·0	98	May 8	25·0	Aug. 23	28·0	106
1951	June 3	26·5	Sept. 21	32·0	109	June 3	26·5	Sept. 24	22·0	112
1952	May 31	28·8	Sept. 19	31·5	110	May 28	28·0	Oct. 3	25·0	127
1953	May 21	29·0	Sept. 21	25·0	122	May 30	26·5	Sept. 21	25·0	123
1954	June 3	30·5	Sept. 21	27·0	110	May 16	27·0	Sept. 21	27·0	128
1955	May 8	32·0	Sept. 10	29·0	124	Apr. 26	26·0	Sept. 11	25·0	138
1956	May 12	32·0	Sept. 6	25·5	117	May 3	26·8	Sept. 6	25·5	126
50-Year Average	May 30	—	Sept. 9	—	102·2	May 19	—	Sept. 19	—	123·0
Shortest Crop Season	June 5 1918	28·0	July 24 1918	31·0	48	June 20 1917	28·0	Sept. 2 1917	28·0	73
Longest Crop Season	Apr. 26 1922	30·0	Sept. 10 1922	28·0	136	May 9 1938	25·0	Oct. 15 1938	26·0	158

Earliest and Latest Frost Dates (32°F. or lower) 1907-1956 inclusive.

Latest spring frost.....June 25, 1929—32.0°
Earliest last spring frost.....May 8, 1955—32.0°
Earliest fall frost.....July 24, 1918—31.0°
Latest first fall frost.....Sept. 30, 1938—29.0°

Earliest and Latest Killing Frost Dates (28°F. or lower) 1907-1956 inclusive.

Latest spring killing frost.....June 20, 1917—28.0°
Earliest last killing frost of spring.....April 26, 1955—26.0°
Earliest fall killing frost.....Aug. 23, 1950—28.0°
Latest first killing frost of fall.....Oct. 15, 1938—26.0°

Frost-free period (1907 to 1956 incl.).....102.2 days.
Killing frost-free period (1907 to 1956 incl.).....123.0 days.

TABLE 5—YIELDS PER ACRE IN THE 3- AND 9-YEAR ROTATION EXPERIMENTS

3-year grain	Average Yield 1912-1956	Average Yield 1947-1956
Summerfallow	—	—
Wheat on fallow	26.6 bu.	28.4 bu.
Wheat after wheat	16.7 bu.	14.7 bu.
9-year mixed farming		
Summerfallow	—	—
Wheat	36.1 bu.	46.8 bu.
Oats seeded down	47.0 bu.	64.5 bu.
Hay	1.15 tons	1.44 tons
Hay	1.30* tons	1.44 tons
Hay and break	1.07* tons	1.24 tons
Corn	7.01 tons	9.29 tons
Wheat	29.2 bu.	39.3 bu.
Oats	51.5 bu.	70.3 bu.

* 37 years only

Wheat after summerfallow in the 9-year rotation in the past 45 years averaged 36.1 bushels to the acre, and in the 3-year rotation 26.6 bushels. For the first ten years of the experiment, 1912 to 1921, wheat on summerfallow averaged 36.1 bushels compared with 28.7 bushels for the 3-year rotation. During the past 10-year period the figures were 46.8 compared with 28.4 bushels. These figures indicate that the productivity of the soil in the rotation where the grass-legume mixture and barnyard manure were included is just as high now as when the project was started. Large differences are evident with the second crops after summerfallow. During the past 10-year period in the grain rotation, wheat after wheat averaged 14.7 bushels or 887 pounds of grain. In the 9-year rotation oats after wheat yielded 64.5 bushels or 2,193 pounds. In the rotation where grass was left down for three years wild oats have not increased, but they have become a serious problem in the 3-year rotation, even when the practice of delayed seeding has been followed. Owing to the desirability of keeping the hay down for more than 3 years, the 9-year rotation has certain disadvantages in this area. A 5-year combination rotation started 22 years ago is a more practical one. The sequence of crops is: summerfallow, wheat undersown with sweet clover, clover, and oats. A fifth field is sown to alfalfa and left down for four years, then broken and fallowed for a complete year and worked back into the regular sequence. In the year the old stand of alfalfa is broken the oat field is seeded down and then this field is left in alfalfa for four years. The yields of this rotation are given in Table 6.

TABLE 6—YIELDS PER ACRE IN A 5-YEAR COMBINATION ROTATION

	Long-term Average Yield bu./tons	No. years	Average Yield 1947-1956 bu./tons
Summerfallow	—	—	—
Wheat on fallow (seeded down)	35.9	23	43.5
Clover after wheat	1.39	14	1.38 (8 yr.)
Oats after clover	57.4	22	68.7
Alfalfa	0.83	19	0.85

Fertility Studies

Experimental work with commercial fertilizers has been carried out on this Farm since 1900. In 1944 all the projects dealing with fertilizers and manure were reorganized and transferred to a uniform field classified as Indian Head heavy clay.

In a 3-year wheat rotation manure was applied at 6, 9, and 12 tons to the acre early in the summerfallow year. In all cases wheat on summerfallow and wheat on stubble outyielded the checks by approximately 2 bushels to the acre. In another project ammonium phosphate (11-48-0) was tested at rates ranging from 20 to 100 pounds per acre on wheat after summerfallow, and fertilizers were also applied to two replicated stubble plots. The other stubble plots were not fertilized in order to determine the residual effect, if any, from the fertilizer treatments of the previous year, particularly at the heavier rates. The results are given in Table 7.

TABLE 7—THE EFFECT OF FERTILIZERS ON WHEAT YIELDS

Treatment	Wheat on Summerfallow 12-Year Average	Wheat after Wheat 11-Year Average No Fertilizer
	bu.	bu.
20 lb. 11-48-0	39.8	21.4
30 " 11-48-0	41.6	21.0
40 " 11-48-0	42.5	21.5
60 " 11-48-0	42.0	20.5
80 " 11-48-0	42.4	21.0
100 " 11-48-0	43.9	21.5
Check	37.9	20.8
No fertilizer	38.8	22.8*
40 lb. 11-48-0	41.4	22.7*

*These plots received 40 lb. 11-48-0 in the stubble year

Table 7 shows that even with 100 pounds of 11-48-0 applied in the summerfallow year, there was no residual effect in the succeeding crop. When 40 pounds of 11-48-0 were applied on wheat stubble (cut with the binder), the increase in yield in most years was not large enough to pay for the fertilizer. In a project with oats and barley sown on a heavy combine wheat stubble, 100 pounds of 16-20-0 resulted in satisfactory increased yields. Anhydrous ammonia at 40 pounds of nitrogen to the acre was applied to wheat and oat stubble fields for the first time in 1955 and the project was expanded in 1956. This was also compared with spring applications of ammonium nitrate applied at comparable rates of nitrogen. Both sources of nitrogen resulted in very large yield increases. When 40 pounds of 11-48-0 were applied with the wheat at seeding time the yields were increased further.

Commercial fertilizers were applied in the fall and early spring to a well-established brome-alfalfa mixture. During the past 4-year period fertilizers containing nitrogen and phosphorus have resulted in increases, whereas those with nitrogen alone have not been satisfactory. Data are presented in Table 8.

TABLE 8.—YIELD INCREASES FROM FERTILIZER TREATMENTS ON A BROME-ALFALFA MIXTURE OVER THOSE FROM NON-FERTILIZED PLOTS

Treatment	4-year av. increase tons dry weight
100 lb. 11-48-0	0.58
100 " 16-20-0	0.35
200 " 16-20-0	0.86
300 " 16-20-0	0.96
100 " 33.5-0-0	0.28
150 " 33.5-0-0	0.14

Sweet clover, fall rye, and oats were used as green manures and were either plowed under or disked into the surface of the soil. The crops following the green manures were compared with those following an early summerfallow. In most years wheat after summerfallow without the green manure outyielded the crops following any of the green manure treatments. The lowest yields were in dry years when the crop had to depend largely on the reserve moisture. Under such conditions the lower yield has been noted, not only in the first year after summerfallow but also in the second year.

Cultural Practices

Although soil erosion by wind has not been so serious during the period covered by this report as it was in the 1930's, erosion control methods on summerfallow have been continued and were expanded in 1956. Tillage in the fall preceding the summerfallow year has not increased yields on relatively weed-free fields. Stubble holds snow and the maintenance of a good stubble cover is the first step in soil conservation. A combination of the blade and the duckfoot cultivator appears promising from the standpoint of both wind erosion control and increased yields. When the plow, cultivator, disk, and blade were compared, yield differences were not apparent so long as all work was done early and weeds were well controlled.

A number of methods of preparing a summerfallow field for crop have been compared. The use of harrows only, before seeding, resulted in poor weed control and reduced yields. Stinkweed was difficult to kill with the narrow shovels on the cultivator, and with the wider shovels an operation with the harrows was necessary to prepare a uniform seedbed. The disk-type implements controlled weeds, but with a light trash cover they leave the surface of the soil subject to erosion by wind and water. The choice of the best implement therefore will depend upon the general condition of the fields in the spring. The preparation of a field covered with a heavy combine stubble is a serious problem to many farmers. Ten methods have been tested for the past 12 years. These include plowing, one-waying, blading, disking, and burning. Yields following the use of the one-way have been a little higher than those after the plow. In dry springs the plowed fields were rough at the time of seeding, resulting in a crop lacking uniformity. The crop following burning has been the most uniform of the group and has consistently yielded well. The crop after blading has also been very satisfactory. When the stubble was either removed by burning or left on the surface with the blade-weeder, the trash was not mixed with the topsoil to compete with the growing crop for nitrogen.

Although projects dealing with the date of seeding have been under test since the inception of the Experimental Farm, varieties and methods have changed so greatly that it has been necessary to continue this project. At

present wheat is sown on one series of plots as soon as equipment can be used on the fields and then at three 10-day intervals. Forty pounds of 11-48-0 are applied to half the plots at each seeding. Irrespective of early or late springs, the earliest sown crop has given the highest yields. However yields are not seriously depressed until seeding is delayed past the middle of May, after which they decrease more rapidly. Although the increases from the use of fertilizer were not so large in this experiment as in most of the others, the fertilized crops were more uniform at maturity and yield increases varied little with the different dates of seeding. More complete information is given in Table 9.

TABLE 9—EFFECT OF DATE OF SEEDING ON WHEAT YIELDS
(12-year average 1945-1956 inclusive)

Relative Seeding Time	Yield per Acre	
	No fertilizer	40 lb. 11-48-0
Early as possible	34.3	36.2
10 days after first seeding	33.6	35.9
20 days after first seeding	33.1	36.6
30 days after first seeding	29.0	31.4

Methods of Seeding Forage Crops

In a short rotation it is essential to obtain uniform stands of forage crops rapidly. This means that the grass or legume seed must be placed at a shallow, uniform depth in a firm seedbed. If the forage is sown without a companion crop, higher yields can be expected in the second year and stronger plants will develop after summerfallow than after stubble. On the other hand there is less danger of injury to the small seedlings when they have the protection of the stubble, particularly when surface drifting occurs in the spring.

If a cereal crop is sown with the grass seed, lower yields of forage can be expected the following year but little difference will be noted in the second-year hay crop. The increased yield of forage does not compensate for the loss of revenue from the companion crop. This applies particularly to sowing a forage crop alone on summerfallow. In a project in which the different methods are being tested, the average yield of wheat used as a companion crop on summerfallow was 36.8 bushels and when sown on stubble 20.3 bushels. The loss of yield in the first crop of hay has been approximately one-half ton to the acre. Under less favorable conditions the difference in favor of the companion crop would not have been quite so marked.

Methods of seeding sweet clover have also been tested. The clover is sown with wheat on summerfallow, with wheat on stubble, and alone on stubble. The yield of clover has averaged 1.52 tons per acre when sown alone and 1 ton when sown with wheat on summerfallow or on stubble. In the summerfallow—wheat—clover rotation, wheat after wheat yielded an average of 14.2 bushels. When sweet clover is seeded alone on stubble the loss of revenue from stubble wheat has to be balanced against a ½-ton increase in the hay crop the following year. This indicates that sowing sweet clover alone is not an economic method in eastern Saskatchewan. In all the above rotations the clover is cut in the early bloom stage and the field is worked for the balance of the season as a partial summerfallow.

Weed Control

Experimental work with 2,4-D, consisting of the study of formulations, rates, and effect on cereals and weeds has been carried out on this farm since 1946. In one project three different herbicides were tested annually in a 3-year rotation, namely, in the summerfallow year, on summerfallow wheat and on stubble wheat. After ten years a noticeable reduction has occurred in annual weed populations. The use of 2,4-D in the summerfallow year was of little value since the volunteer grain had to be controlled, which required as many cultural operations on the treated plots as on the checks.

Throughout the period under review extensive experiments dealing with rates, dates, and formulations of 2,4-D and MCP products have been conducted on cereals and flax, particularly oats and flax. Oats and flax have proved to be quite sensitive to 2,4-D but dosages of from one to two ounces less than those usually used for wheat or barley have been applied without excessive injury, and MCP has proved to be a safer product to use than 2,4-D.

Varietal tolerance to 2,4-D was given a good deal of study but practically no differences were found between any of the varieties of wheat or barley tested. Five varieties of oats were tested, namely Ajax, Vanguard, Fortune, Exeter, and Clinton. Over a period of several years little consistent difference was found in their tolerance to 2,4-D. Five varieties of flax, namely, Royal, Redwing, Dakota, Victory, and Rocket were treated with applications of 4 ounces of 2,4-D at several stages of growth. On the basis of yield, Dakota was the most resistant when treated at the early stages, followed by Victory and then Redwing.

Off-types occurred frequently in wheat, oats, and flax treated with 2,4-D in the early stages of growth. These off-types appeared as distorted heads or abnormal plants. Flax showed distorted and twisted plants, large roots, and faulty bolls. Many of the off-types were grown for three generations and all the progeny were normal, indicating that the distorted effect is not inherited, which is of importance to seed growers. Attention was given to the possible effect 2,4-D treatment might have on the quality of both wheat and flax. A substantial number of samples of wheat from crops that had been treated with 2,4-D from 2 ounces up to 2 pounds, were subjected to milling and baking tests. It was found that the treatments with 2,4-D had not adversely affected the milling and baking quality of the wheat. The oil content and quality of the linseed flax likewise were not affected by 2,4-D treatments on the growing crop.

The effect of 2,4-D on some perennial weeds has been studied. The top growth on patches of perennial sow thistle was completely destroyed and seed-setting prevented by treatment with 2,4-D. This resulted in an almost complete elimination of this weed by good summerfallow the following year. Numerous formulations of 2,4-D and other chemicals have been tested on bladder campion and Russian knapweed, with but little success. However, compounds containing a chlorate or a borate-chlorate mixture at 2 to 3 pounds per 100 square feet, proved to be very satisfactory herbicides for these weeds.

The work on the control of wild oats was greatly expanded in 1953. Light cultivation in the fall, delayed seeding, the use of heavier rates of sowing, the use of phosphate fertilizers, and the choice of a competitive crop such as barley have all aided in reducing the stand of wild oats in the fields. In the past two years numerous chemicals have been tested. Some of these were applied on summerfallow and those that proved to be effective either caused injury to the succeeding crop or were prohibitive in cost. Numerous pre-planting chemicals were disked into the surface soil before the crops were sown in 1956. In all

cases where rates of the chemicals were high enough to kill the wild oats, crop injury was so extensive that none of the chemicals tested can be considered satisfactory.

CEREALS

A. L. D. Martin

The search for improved varieties of cereals is a continuous program at this Farm. Improvements in disease resistance are important because new races of disease organisms may cause heavy losses in the older varieties which should be replaced by varieties possessing more resistance to diseases. In spring wheat, the spread of a new race of stem rust, 15b, gave new impetus to this program. For combine harvesting it is necessary to have varieties of grain that are relatively free from lodging and shattering. Where it is necessary to swath grain it is desirable to have varieties that are resistant to after-harvest sprouting.

Southeastern Saskatchewan is characterized by a fairly plentiful supply of moisture with a good portion of it occurring during the growing season. This generally results in high yields but it also favors the development of plant diseases such as the rusts. It is therefore important that any new variety being developed for this area should have resistance to both leaf and stem rust combined with high yield. Earliness is a factor to be considered although it is not so important as in the more northerly areas.

To combine the many desirable characteristics of several varieties into a single variety, breeding projects involving crossing and selection are necessary. This necessitates co-operative work with other plant breeders as well as a considerable amount of testing at different locations in the area served by the Farm.

Spring Wheat

Selection work with the early generation hybrids of spring wheat at Indian Head is conducted co-operatively with the Laboratory of Cereal Breeding at Winnipeg. In addition, test plots are grown for the Cereal Breeding Laboratory, Lethbridge. The material developed at these plant breeding centers is evaluated under conditions pertaining in this district. In addition to a full-scale testing program a certain amount of breeding work is also done.

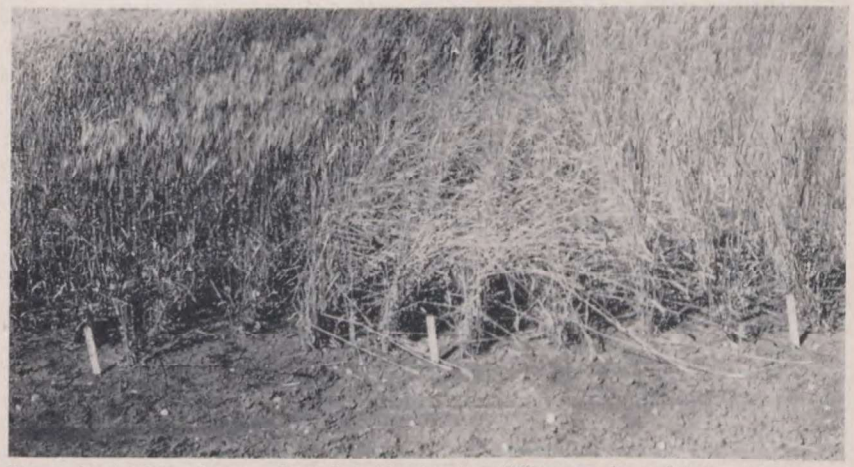

Fig. 1: Test plots of new wheat hybrids showing differences in resistance to lodging.

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Variety Testing

One of the first varieties released in Canada during the period under review was Saunders, licensed in 1947. This variety, which originated at Ottawa, is considered to be earlier than Thatcher. However, tests in the Indian Head area show that it matures no earlier than Thatcher and has been lower in yields. Saunders appears to have no special merit so far as this area is concerned, and therefore it is not recommended.

In the spring of 1947 the variety Redman was released and recommended specifically for eastern Saskatchewan and western Manitoba because of its superiority to Thatcher in leaf-rust resistance. In tests at this Farm and in the surrounding area Redman was slightly lower in yield than Thatcher.

Chinook is a new variety of sawfly-resistant wheat licensed in 1952, and has replaced Rescue in the Assiniboia area largely because of its superior milling and baking qualities. Its high resistance to wheat stem sawfly attack, its drought resistance, and its good milling and baking quality make Chinook a suitable variety in the drier areas where sawflies are a problem.

Lee was licensed in 1950 mainly because of its superior leaf-rust resistance and this characteristic has made it a fairly high yielder in the Indian Head district. It does not outyield Thatcher in areas where leaf rust is not a serious problem.

Selkirk was the first variety of wheat developed with resistance to race 15b of stem rust and was licensed in 1953. Seed was first made available to farmers in 1954. Selkirk outyields Thatcher in most areas of southeastern Saskatchewan due mainly to its superior leaf-rust resistance and resistance to race 15b of stem rust.

Lake was released in 1954 and is now recommended for the drier parts of the province. It is not resistant to race 15b of stem rust and therefore is not recommended for southeastern Saskatchewan.

TABLE 10—YIELDS OF WHEAT VARIETIES GROWN AT EXPERIMENTAL FARM, INDIAN HEAD, 1947-1956.

Bushels per Acre

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Average
Saunders	20·0	37·3	26·7	45·3	32·9	29·8	25·1	13·6			28·8*
Redman	33·6	31·6	28·3	41·0	33·7	20·5	27·1	13·1			28·6*
Thatcher	32·8	41·4	26·6	39·5	36·5	31·4	28·7	19·4	36·9	52·0	34·5
Rescue	34·7	42·4	25·5	45·1	35·2	25·2	27·1	16·1	37·9	48·2	33·7
Lee				45·8	39·9	31·1	26·7	33·4	37·5	49·5	37·7**
Chinook						27·1	29·2	17·0	32·4	48·6	30·9***
Selkirk							30·3	34·9	40·3	53·5	39·8****
Lake							30·2	20·7	36·0	44·4	32·8****

* 8-year average
** 7-year average
*** 5-year average
**** 4-year average.

Durum Wheat

Durum wheat has been grown only to a limited extent in this part of the province in recent years, mainly due to the lack of stem-rust-resistant varieties. The high quality amber durum variety, Stewart, and Pelissier, an inferior variety for macaroni quality, have been tested extensively. Ramsey, the new stem-rust-resistant durum wheat, with good macaroni quality, was released recently and will be of interest in this area.

Winter Wheat

No varieties of winter wheat have yet been developed that are suitable for this area. Several new strains, which have shown promise at Lethbridge, are being tested in co-operation with that Farm.

Oats

A good oat variety should give high yields, and should have disease resistance and strong straw. Earliness in a variety is desirable but is often associated with low yield. Many of the lines tested up to 1955 had to be discarded on account of susceptibility to crown rust. New lines have been obtained from Ottawa and are being evaluated.

Fig. 2: New experimental oat strains showing differences in resistance to lodging.

A testing program with oats, very similar to that for wheat, is also conducted in co-operation with the Cereal Breeding Laboratory at Winnipeg. Many strains in both early and advanced stages of development are evaluated each year. In recent years varieties of oats resistant to such diseases as smut and stem and crown rusts, have gradually replaced the more susceptible older varieties such as Victory and Banner.

The variety Garry, originally distributed in 1947, was resistant to all known races of stem rust and practically all races of crown rust as well as smut. The original strain, however, was susceptible to *Helminthosporium victoriae*, a crown rotting organism, and therefore has not been widely grown. A new strain of Garry with resistance to this organism was developed and a new foundation stock was released in 1953.

Fortune oats, licensed in 1948, is slightly earlier, taller, and more resistant to lodging than the older variety Exeter. In addition Fortune has smut resistance, which is a definite advantage, but does not yield so well as Exeter. Both Exeter and Fortune are susceptible to the new races of rust now prevalent in the southeastern part of the province.

Ajax, Valor, and Larain are early maturing varieties that are grown to a limited extent in this area largely as a cover crop or where delayed seeding is necessary for wild oat control. Larain, the newest variety of the three, is generally grown in the more northern regions of the province. Valor, a very low yielder, is seldom grown. Ajax, a high yielder, is often grown as a main crop.

Rodney, the latest variety of oats to be developed, was licensed in 1953. It is characterized by a large, short, plump kernel and is becoming widely grown. In yield, strength of straw, kernel size, bushel weight, and disease resistance it is superior to Exeter and Victory and matures at about the same time. Rodney is resistant to all races of stem rust except race 7a, which is not yet prevalent, and to about 75 per cent of the prevailing races of crown rust.

TABLE 11—YIELD OF OAT VARIETIES GROWN AT EXPERIMENTAL FARM, INDIAN HEAD, 1947-1956.

Bushels per Acre

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Average
Exeter	75·5	80·8	49·9	98·0	76·5	85·8	89·9	63·0	73·0	109·8	80·2
Ajax	66·4	56·4	50·2	70·4	56·4	89·0	69·3	76·9	80·8	109·9	72·6
Fortune		60·9	52·0	104·3	73·2	105·6	61·3	53·8	70·5	106·3	76·4*
Garry							92·9	85·2	93·3	99·7	92·8**
Rodney							82·6	86·7	99·9	109·8	94·8**

* 9-year average.
** 4-year average.

Barley

Breeding work with barley is concerned with the development of new varieties of feed barley that have high yields, strong straw, and disease resistance. Part of the breeding program is conducted in co-operation with the Experimental Farm at Brandon. Those lines rated as superior at that Farm are tested in the southeastern Saskatchewan area. In addition selection work with bulk populations of hybrid material received from Brandon is conducted at Indian Head.

If the barley is to be harvested with a combine, a variety that is resistant to lodging and to "head-breaking" should be grown.

The malting variety, Montcalm, is grown in southeastern Saskatchewan but is not too popular because of its low yields and weak straw. Montcalm is susceptible to race 15b of stem rust and is subject to severe damage from this disease. Parkland, a new malting variety, has resistance to rust, and yields more than Montcalm.

The varieties Titan and Plush are being grown to some extent in southeastern Saskatchewan. Titan is favored because of its early maturity, strong straw, and resistance to the more common races of loose and covered smut. Plush is a high yielder but is weak in the straw and tends to "head-break".

Vantage was licensed for sale in 1947 and quickly became very popular as a feed barley. Because of its high yielding ability, stem-rust resistance, and strong straw it has almost completely replaced Plush. Velvon II was licensed for sale in Canada in 1950. It yields well, has resistance to covered smut, and is grown to a limited extent in southeastern and central Saskatchewan. It is considered satisfactory for combine harvesting although a little weak in the straw.

Husky barley was licensed in 1953. It is a high yielding variety that has resistance to rust but it is slightly inferior to Vantage in strength of straw and has a tendency to shatter when overripe. Both Husky and Vantage have performed well in the southeastern part of Saskatchewan and are the leading feed varieties grown.

Vantmore, licensed in 1954, is considered more resistant to root rot and some of the leaf spotting diseases than is Vantage. Its yield in southeastern Saskatchewan has been below Vantage for the three years under test.

TABLE 12—YIELD OF BARLEY VARIETIES GROWN AT EXPERIMENTAL FARM, INDIAN HEAD, 1947-1956.

Bushels per Acre

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Average
Plush	56·7	55·0	47·1	72·1	69·5	55·4	56·6				58·9*
Titan	59·1	44·7	36·9	57·4	74·8	61·5	41·1	48·2	52·1	58·9	53·5
Montcalm	45·8	36·9	32·9	60·3	73·7	37·4	38·4	57·0	55·4	59·3	49·7
Velvon II	50·2	52·1	42·9	62·9	83·5	44·9	44·8	53·5	61·7		55·2**
Vantage	56·1	46·0	44·3	67·9	86·4	72·0	57·4	60·9	63·2	61·0	61·5
Husky						56·7	49·8	60·8	55·2	68·6	58·2***
Vantmore								52·2	64·8	64·7	60·6****

* 7-year average.
** 9-year average.
*** 5-year average.
**** 3-year average.

Flax

Flax has received considerable attention from farmers and plant breeders during the period under review. Processors of linseed oil require varieties with a high yield of good quality oil. Many of the older varieties lack one of these characteristics.

Disease resistance, particularly resistance to wilt, is of the utmost importance. Before the advent of wilt-resistant varieties it was hazardous to attempt to grow flax on land that had previously grown this crop. For combine harvesting uniform maturity is also important.

An active flax breeding program is in progress at Indian Head. This includes selecting suitable lines from bulk progenies of crosses made at the Central Experimental Farm, Ottawa. A series of crosses numbered 4221 to 4226 have yielded some very promising selections that are being tested further for yield, oil quality, oil quantity, height, and earliness. The hybrid populations of these crosses were selected for rust resistance at Ottawa, and for wilt resistance at Indian Head by planting in a wilt-infested nursery. This wilt testing nursery was established in 1946 by infesting the soil with the organism causing wilt. The area was then sown with a wilt-susceptible variety for three consecutive years to permit the organism to increase in the soil. In 1949 the first lines were tested for wilt resistance in the nursery.

Fig. 3: Test plots of new experimental flax strains. Those in flower are late maturing strains.

The pasmo disease of flax occurs in the Indian Head area but has not yet reached serious proportions. None of the varieties presently grown possesses complete resistance to the disease although the newer varieties Redwood and Marine show some tolerance. The variety Viking is very susceptible. In an attempt to find resistant plants, hybrid populations were sprayed with pasmo inoculum at flowering time and those plants that resisted artificial infection were retained for further testing.

Royal, a selection from Crown, is one of the older wilt-resistant varieties and is still grown to a limited extent. It is being replaced by newer varieties that are more resistant to prevailing races of rust and are more uniform in maturity.

Rocket was licensed and distributed in 1947 and is grown extensively in the flax area of southeastern Saskatchewan. It is characterized by high yields of good quality oil and seed, and ripens uniformly. Rocket is considerably later in maturity than Redwing but similar to Royal.

Dakota was also licensed in 1947. It is earlier and ripens more uniformly than Royal or Rocket. It is not resistant to all races of rust now prevalent and is therefore grown to a very limited extent in this area.

Victory was licensed before 1947 but is grown over a large area of southeastern Saskatchewan because of its high yield and large seed. Norland, a selection of this variety licensed in 1955, is more uniform.

Redwood, licensed in 1951, is a late maturing, high yielding variety, and is resistant to wilt and to all the known races of rust. It has performed well in southeastern Saskatchewan and is a popular variety.

An early maturing variety called Marine was licensed in 1952. It is resistant to all the known races of rust and has some tolerance to pasmo. It is gaining in popularity.

Raja is the newest variety developed to date and was licensed in 1953. It is a few days earlier in maturity than Marine and possesses equal rust resistance.

TABLE 13—YIELD OF FLAX VARIETIES GROWN AT EXPERIMENTAL FARM, INDIAN HEAD, 1947-1956.

Bushels per Acre

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Average
Royal	13·0	19·6	11·0	19·4	13·0	24·0					16·7*
Dakota	12·5	17·9	10·7	19·7	13·1	21·0					15·8*
Rocket	12·4	15·8	11·9	21·5	8·7	23·1	16·6	21·8	14·2	13·6	16·0
Victory	12·9	17·6	14·3	22·8	12·3	24·3	10·5	23·6	12·6	11·6	16·3
Redwood				23·0	11·9	25·3	12·6	23·6	13·3	14·2	17·7**
Marine						16·5	8·5	18·2	11·5	14·1	13·8***
Raja						21·0	12·2	17·0	11·5	17·9	15·9***

* 6-year average.
** 7-year average.
*** 5-year average.

Field Peas and Beans

Only a limited amount of experimental work and testing is carried on with field peas and beans because they are of minor importance in this area. The pea variety Early Blue is a consistently high yielder. Chancellor, superior in quality, is a small pea, useful in the split pea trade and commands a limited market. Early fall frosts make beans a hazardous crop. Test plots include the standard varieties Great Northern, Norwhite, and Norwegian. Great Northern is a late variety and often damaged by frost. Norwhite, a white seeded selection from Norwegian, is early but has not yielded so well as Norwegian.

Seed Improvement

During the ten years, this Farm has been responsible for producing a considerable amount of high quality pure seed of the leading varieties of wheat, oats, barley, and flax.

Foundation stock of Thatcher wheat is produced and distributed to Elite seed growers. A total of 489 bushels of Foundation Thatcher was produced during the period 1947 to 1956, inclusive. In 1953 a program of improving the Foundation stock of Thatcher was initiated. As a result a new Foundation stock was distributed to Elite growers in the spring of 1956.

Elite stocks of Redman wheat, Exeter oats, and Montcalm barley were grown. During the period 1947 to 1953 a total of 223 bushels of Redman, 550 of Exeter, and 332 of Montcalm were produced. In 1955 and 1956 a total of 69 bushels of Elite Selkirk, 99 of Elite Husky, and 145 of Elite Garry were produced.

All available seed of Raja, the new flax variety, was grown at Indian Head in 1953, and a total of 99 bushels was produced. This was further increased in 1954 and 1,300 bushels were produced, most of which was distributed to farmers in Saskatchewan and Manitoba for seeding in 1955. Raja was increased again in 1955 and a second distribution of 900 bushels was made to farmers in the winter of 1955-56 for the 1956 seeding.

In addition to producing high quality seed the Experimental Farm at Indian Head assisted the Canadian Seed Growers' Association in the verification of the purity of seed produced by its members.

As a service to farmers in the area this Farm also assists in the "Crop Testing Plan" sponsored by the Searle Grain Company. Under this plan small samples of farmers' seed are collected and sent to the Experimental Farm where they are planted in rod rows. At maturity these rows are critically examined for impurities and the results reported to the farmer. The farmer is then in a better position to determine whether or not he should change his seed.

FORAGE CROPS

E. Buglass

Since native hay and pasture are becoming more limited each year, the need for cultivated perennial grasses and legumes to maintain livestock production becomes more urgent. Soil erosion, particularly by water, is increasing. There is evidence that soil fertility, particularly in the older settled areas of the Black Soil zone, is decreasing. On some of the district Illustration stations, rotations, on summerfallow, that include a grass and legume mixture are producing higher yields of grain than the straight grain-growing rotations. Serious thought should be given, particularly in the Black Soil zone, to the use of grass and legumes in the rotation, to maintain crop production, to conserve soil resources, and to provide adequate supplies of hay and pasture for a permanent, balanced type of agriculture. Land is the largest item in the farmers' capital investment. Repairs to, and maintenance of, a productive soil are just as important as repairs to modern, high-priced machinery.

Much of the forage crop program at this Farm is devoted to obtaining information on the suitability of varieties and species of grasses and legumes for hay and pasture for this area. The value of grain crops, in comparison with other annuals, as a source of supplementary hay and pasture receives attention. A large introductory nursery is maintained to evaluate the usefulness of introductions, and new species and varieties for the area. Varietal differences in forage crops are as important as in cereal crops but usually less attention is paid in selecting the best yielding varieties of the former than the latter. Some selection work is being done with wheat $\times$ perennial grass hybrids in an attempt to obtain suitable grasses with larger seeds than the presently adapted types. Grass seed production problems receive consideration. Information on the effect of fertilizers on seed and forage production is being obtained.

Perennial Grasses

Only four perennial grasses can be recommended as suitable for this area as a hay crop for general use. These are brome, crested wheat grass, slender wheat grass, and intermediate wheat grass. Seed of intermediate wheat grass is still scarce, but is likely to become more plentiful in the future. Slender wheat grass is inclined to be short-lived.

Brome Grass

Brome grass has been the popular and most suitable grass for hay and pasture in the Black Soil zone for many years. For yield, leafiness, and quality, no grass now grown is quite its equal. The yields of brome are good for three or four years after established, then become progressively smaller. Its creeping roots cause the stand to thicken to the point where production of hay and pasture is greatly reduced.

There are two main types of brome grass—northern and southern. Variety tests laid down in 1945 and 1948 indicate that the southern type of United States origin, is not as productive as the northern commercial type. Martin, a northern type developed in the United States, has been the highest yielder during the period 1949-56. Table 14 shows a comparison of varieties of brome for the period under review. Lincoln, Fischer, Nebraska B-9, Northeastern Nebraska, and Kansas are southern types. The southern types while hardy, cannot be recommended over the northern commercial types.

TABLE 14—BROME GRASS VARIETIES, YIELD IN TONS PER ACRE

Variety	1953		Average 1946-53	
	Green Weight	Dry Matter	Green Weight	Dry Matter
Test No. 1				
Commercial	0·91	0·38	3·40	1·46
Lincoln	0·61	0·28	3·10	1·36
S-23-12-1-3-1-1	0·76	0·31	3·05	1·32
Parkland	0·88	0·34	3·07	1·27
S-23-7-1-2-3	0·69	0·27	2·90	1·26
Fischer	0·36	0·15	2·81	1·21
Nebraska B-9	0·26	0·10	2·64	1·17
Northeastern Nebraska	0·33	0·14	2·59	1·13
Kansas	0·63	0·28	2·48	1·13
	1956		Average 1949-56	
Test No. 2				
Martin	1·41	·50	1·82	·82
Commercial	1·21	·42	1·62	·71

Crested Wheat Grass

Since crested wheat grass can maintain its stand and produce some growth even under extreme drought conditions, it is particularly useful in the dry prairie area. It is useful in the Black Soil zone to provide early spring and late fall pasture. It is ready to graze about two weeks earlier than any other grass. While producing well at Indian Head, yield of hay has been lower than from brome for the first two or three years. Under favorable moisture conditions both brome and intermediate wheat grass outyielded crested wheat grass. It is the first grass to start growth in the spring, and makes a good growth in the fall, providing early spring and late fall pasture. Summit, a new variety of crested wheat grass produced by the Forage Crops Laboratory, Saskatoon, has averaged about 10 per cent higher in hay yield than the Fairway strain. It is a taller, coarser growing type than Fairway. Seed production is satisfactory.

Slender Wheat Grass

Slender wheat grass (western rye grass) is a short-lived perennial, with fibrous roots. It produces well in the first two years then soon becomes non-productive and dies out. It is one of the most alkali-tolerant of our hardy grasses. Primar, a new variety produced in the United States has been the best variety at Indian Head. Mecca is the second choice.

Intermediate Wheat Grass

This is a relatively new grass that has been under test at Indian Head only since 1949. It is a creeping rooted, hardy, long-lived perennial that is very promising for hay and pasture. During the period 1949-56 it outyielded

brome. The yield for the first year was particularly high, decreased rapidly after the third year, but it continues to outyield brome. The present indications are that it will become root-bound similarly to brome, but it does not appear to be as aggressive. It is a tall-growing grass, is fairly leafy and should be valuable for both hay and pasture. Present indications are that this grass is worthy of more extensive use, at least on a trial basis for hay and pasture. It will likely prove to be best adapted to the Park Belt. It is suitable for use in mixture with alfalfa and other grasses.

TABLE 15—YIELDS OF GRASS SPECIES FOR HAY

Tons Dry Matter per Acre

Species	Test No. 1 Sown 1948			Test No. 2 Sown 1952		
	1949	1953	Average (5 Yrs.) 1949-53	1955	1953-55	Average both tests
Intermediate Wheat						
Ree	2·11	1·02	1·15	1·78	2·93	2·04
Crested Wheat						
Summit	1·50	1·17	1·13	1·83	2·82	1·98
Fairway	1·61	0·72	0·98	1·55	2·40	1·69
Brome						
Commercial	1·42	0·67	0·66	1·27	2·09	1·38
Tall Wheat	1·37	1·10	0·98	2·18	2·71	1·84
Russian Wild Rye	0·88	0·81	0·79	0·90	1·75	1·27
Virginia Wild Rye	1·37	1·02	0·95	0·95	1·84	1·40
Canada Wild Rye	1·89	1·11	1·08	1·68	2·28	1·68
Slender Wheat						
Primar				1·92	2·61	
Mecca				1·45	2·56	

Russian Wild Rye

This is a hardy, long-lived perennial grass that may have some use for pasture in drier areas. It is a bunch-type grass with many basal leaves and few stems. The herbage is mostly made up of the leaves. It has been tested since 1948 at Indian Head for hay, and has proved to be much lower in yield than brome. More information is required before definite recommendations can be made.

Miscellaneous Grasses

Creeping red fescue has been under test for some years. It is not a productive grass in this district and has yielded considerably less hay than such grasses as brome grass, intermediate, slender, and crested wheat grass. This grass cannot be recommended in this area for use in general farm practice.

Virginia and Canadian wild rye grasses have been tested for hay. They do not yield as well as brome, and are inclined to be coarse and stemmy.

Reed canary grass is a valuable grass in flooded areas that are alkali free. It can stand about two months flooding. The quality of hay is good.

Grass and Alfalfa Mixtures

All perennial grasses sown alone produce well for the first three or four years, then the yield drops quickly. The value of including a small amount of alfalfa with grass as a mixture for hay and pasture has been demonstrated

frequently. There is little difference in yield between alfalfa alone and a mixture of brome and alfalfa. Both have maintained productivity well for long periods.

Table 16 gives yield comparisons of alfalfa, brome sown alone, and a brome and alfalfa mixture. The data show the value of a brome-alfalfa mixture for hay, and the necessity of breaking up brome when sown alone after being down for about four years. The mixture containing 3 pounds of alfalfa per acre resulted in adequate alfalfa in the hay, during the first few years. Alfalfa formed about 75 per cent of the hay in later years. When a second cutting was obtained, the hay was practically all alfalfa.

TABLE 16—HAY YIELDS OF BROME, ALFALFA, AND MIXTURES - 1941-51

Tons per Acre

Mixture and Rate of Sowing	Average			
	1941-44	1945-47	1948-51	1941-51
Per Acre:				
Alfalfa, 10 lb.	2·30	1·91	1·86	2·03
Alfalfa, 3 lb. and brome 9 lb.	2·28	1·72	1·83	1·96
Alfalfa, 6 lb. and brome 6 lb.	2·38	1·97	1·66	2·00
Brome (Comm.) 15 lb	1·96	0·87	0·39	1·00

Mixtures containing crested wheat grass, slender wheat grass, and intermediate wheat grass with alfalfa have shown the same trend as brome and alfalfa. Crested wheat grass is not as well adapted as brome in mixture with alfalfa, it matures earlier than alfalfa and is usually past the best stage to cut for hay when the alfalfa is ready.

Comparative tests have shown that alfalfa should always be included when seeding grass for hay. The inclusion of about 2 pounds of alfalfa per acre results in a higher yield over a longer period of time, and in addition produces a hay with a greater feeding value. A mixture of 2 pounds of alfalfa and 8 pounds of brome per acre is an excellent mixture for hay. A good sod is also produced with this mixture.

Alfalfa

Alfalfa is frequently called the "Queen" of the forage crops. It is one of the most important sources of high quality forage. Hardy, adapted varieties are productive under our conditions, and provide a roughage high in protein, minerals, and carotene. The acreage devoted to alfalfa, and mixtures of alfalfa and grasses could well be increased many times.

Comparative variety tests to obtain information on suitable varieties, lines, and plant breeders' material for this area are stressed. New varieties under test include Rhizoma, Canauto, Ranger, Buffalo, Ferax, Vernal, Rambler, and Atlantic as well as plant breeders' lines that are being assessed for hardiness, yield, creeping habit, and general suitability for this area.

Ladak has been the highest yielder at Indian Head. It is a hardy drought-resistant variety that excels in its ability to produce a high yield the first cut. The second cut frequently produces less than the second cut of Grimm. However, frequently only one cutting is obtained in this area. Vernal, a new American variety, is showing up well.

TABLE 17—ALFALFA VARIETIES 1946-1956

Average Yield Dry Matter per Acre in Tons

Variety	Test 1		Test 2	Test 3
	1953	1946-53	1954-56	1955-56
Ladak	2·60	1·87	2·90	·84
Rhizoma	2·31	1·72	2·75	·74
Viking	2·50	1·72	—	—
Grimm	2·29	1·60	2·63	·86
Canauto	2·00	1·54	—	—
Ranger	2·01	1·54	2·12	·62
Ferax	2·13	1·48	—	—
Buffalo	1·91	1·39	—	—
Atlantic	—	—	2·35	—
Vernal	—	—	2·83	·85
Rambler	—	—	—	1·17

While Rhizoma has yielded well at Indian Head, it is not completely winter hardy, and tends to thin out somewhat. This variety is reported to spread by underground stems where moisture conditions are favorable. It has failed to indicate any creeping habit at Indian Head.

Ranger, an American variety that is highly resistant to bacterial wilt, has been lower yielding than Ladak, which is less resistant, and Grimm, a wilt-susceptible variety. Ranger is not completely winter hardy and its superior wilt-resistance qualities are of little importance at Indian Head at present. Buffalo has been the lowest yielder, and suffers considerable winterkilling.

Tests to compare alfalfa varieties in mixture with brome grass indicate that all varieties thus far tested are able to compete satisfactorily with the grass.

Effect of Stage of Cutting on Feed Value of Hay

In 1954 alfalfa varieties cut at the 10 per cent bloom stage averaged 3 per cent higher in crude protein than when cut at the full bloom stage. On the average when cut at 10 per cent bloom the varieties produced 816 lb. of protein per acre at first cutting and 420 lb. per acre at the second cutting, or a total of 1,236 lb. of protein per acre. When cut at full bloom only 634 lb. of protein per acre were obtained, with only one cutting being possible. The less mature alfalfa crop produced almost twice as much protein.

Pasture

Much of the native pasture, particularly in the Black Soil zone is in a non-productive, run-down condition. Weeds, brush, and the less productive native grasses have increased to the extent that pasture development and improvement is necessary for a healthy, vigorous, balanced type of farming, based on livestock production. Figure 4 shows a typical park belt pasture that could be cleared, broken up, and seeded to cultivated pasture crops, resulting in a much higher carrying capacity and greater and more economical livestock gains.

Limited tests at Indian Head have indicated that brome, intermediate wheat, and crested wheat are the most productive grasses for pasture. Intermediate wheat has been the highest yielder and is a promising pasture grass. Crested wheat provides much early spring and late fall pasture. One pound

Fig. 4: Native parkland pasture. Typical growth in such pastures includes poplar bluffs, willow, wolf willow, western snowberry, and prairie sage.

of alfalfa per acre almost doubles the yield of dry matter, and provides a satisfactory stand. The stand of our present alfalfa varieties is inclined to thin out when used for pasture. Creeping rooted alfalfa, which is relatively new, should maintain pasture at a higher level of production for a longer period. There is some danger of bloat when cattle are pastured on alfalfa or clovers.

Cultural Studies

Effect of Fertilizer on Brome Grass

All perennial grasses become root-bound, with reduced production, after three to four years. In a brome variety test sown in 1948 all varieties had become root-bound by 1952. Ammonium nitrate (33.5 per cent N) was broadcast in the fall at rates of 100 and 200 pounds per acre during the period 1952-54. The average yield of dry matter on unfertilized plots during the period 1953-55 was 0.73 tons per acre, as compared with 2.13 tons for the 200-pound rate, and 1.38 tons for the 100-pound rate. There was no effect from phosphorus. All varieties reacted similarly to the fertilizer.

Crested Wheat Grass Seed Production

A fertilizer test with crested wheat grass was laid down on a local farmer's field that was being used for seed production. The grass had been seeded in 6-inch drills in 1949. The yield of the third seed crop was low. The test included rates, dates, and kinds of fertilizer, the fertilizer being broadcast on the surface. The results are given in Table 18.

When fertilizer was applied in the fall the yields were significantly higher than when fertilizer was applied in the spring, regardless of the kind used. Phosphorus had no effect on yield of seed. Relatively high rates of nitrogen were required to obtain satisfactory yields. Yields were in direct proportion to the pounds of nitrogen applied. It is recommended that fertilizer to supply 50 to 65 pounds of nitrogen per acre should be applied in the fall to crested wheat grass for seed production, particularly when seeded in 6-inch drills.

TABLE 18—CRESTED WHEAT GRASS
EFFECT OF FERTILIZER ON SEED PRODUCTION

Yield in Pounds of Seed per Acre

Fertilizer	Date Applied	Rate of Fertilizer Lb.	Lb. Nitrate Per Acre	Yield of Seed 1954-55	Seed Increase Over Check	Lb. Seed per lb. Nitrogen 1954-55	Yield of Seed 1954-56
Ammonium Nitrate (33.5% N)	Late Fall	264	88·4	472	428	4·84	441
" "	"	160	53·6	342	298	5·56	297
" "	"	112	37·5	279	235	6·27	238
Ammonium Nitrate	"	60	35·8	282	238	6·65	—
Ammonium Phosphate 11-48	"	144					
Ammonium Phosphate 16-20	"	144	23·0	210	166	7·22	—
Ammonium Phosphate 16-20	Early Spring	144	23·0	52	52	·35	—
Ammonium Nitrate	"	160	53·6	119	75	1·40	100
Check	—	—	—	44	—	—	47

Annual Forage Crops

Perennial hay and pasture crops are the basis for economical livestock production. Periodically lack of moisture causes a below-average yield of hay and pasture of perennial species. During these periods a supplementary source of hay and pasture becomes necessary to maintain the growth and finish of cattle and sheep. The farmer must turn to the cereal crops for supplementary feed.

Cereals

While any of the cereals can be used for hay and pasture, oats have proved to be the best from the standpoint of yield and quality. The mid-late varieties of oats, such as Exeter and Fortune, have outyielded early maturing varieties such as Ajax and Valor. During the period 1947-53, on summerfallow Exeter yielded 3.22 tons of hay per acre compared with 2.68 tons for Valor. Garry and Rodney outyielded Exeter during the last few rust-prevalent years. In a test of dates of sowing the earliest date gave consistently higher yields than oats sown two weeks later. Oats should be cut at the early dough stage to produce the highest tonnage of good quality feed. For silage they should be cut shortly after heading.

Oats have proved to be very useful as a source of supplementary pasture. In a pasture test on summerfallow where four or five clippings were obtained, the average yield was over one ton of dry matter per acre. Mid-late varieties such as Exeter produce a higher yield than the early variety Ajax. Garry and Rodney outyielded Exeter during the last few years. The earliest dates of sowing were more productive. A rotational system of grazing is advisable when using cereals for pasture. Plants should not be grazed before they have reached the three-leaf stage, or about 8 inches in height. After the growth has been grazed down the livestock should be removed to permit regrowth.

Millets

Varieties of millets have been tested for many years at Indian Head. During the period 1932-51 Siberian, a foxtail type, was the highest yielder at 2.29 tons of hay per acre. During the same period Banner oats yielded 2.82 tons of hay per acre. Millets yielded relatively high, compared with oats, during the hot dry years, whereas oats outyielded millet by a considerable amount during periods of adequate rainfall and cooler temperatures. During

the period 1942-51 Banner oats yielded 3.42 tons of hay per acre, compared with 2.11 tons for Siberian millet. Millet cannot be recommended for general use as a source of supplementary feed in this area.

Miscellaneous Crops

Tests on corn and soybeans have failed to show that these crops are dependable or economical in comparison with cereal crops, for this area, either for grain or hay.

Oil seed rape can be grown in this area under relatively weed-free conditions. Polish rape has averaged higher in yield than Black Argentine rape during the period 1947-53. Polish rape matures about a month earlier than the Argentine type and thus has been able to escape damage from frosts, which explains its higher yield. The yield of Black Argentine has varied from a high of 1,200 pounds in 1945 to 140 pounds in 1951.

Triticum × Agropyron Hybrids

Since the seeds of perennial forage crops are small they must be sown shallow to permit emergence of the plants. Suitable forage crops with large seed would permit deeper sowing, resulting in greater success in obtaining a satisfactory stand.

Fig. 5: A tall plant selection of wheat X wheat grass cross.

In 1935 the Forage Crops Division at Ottawa, and the Dominion Forage Crops Laboratory, Saskatoon, commenced a hybridization program with wheat and perennial grasses, in an attempt to produce grasses with large seeds. Lines

from this material have been tested at Indian Head but all lack necessary hardiness and forage suitability. Selection within available material is being made to isolate suitable material combining hardiness with desirable agronomic characters.

Plant Introductions

A new nursery was established in 1951, comprising 135 species and varieties. Included in this group are strains of standard sorts, and introductions from foreign sources. Since most of our adapted economic forage crops have been introduced, the importance of maintaining a large nursery cannot be over-emphasized.

HORTICULTURE

W. A. Russell

Most of the people in the area grow gardens for home use. A few market gardeners supplying the cities of Regina and Moose Jaw and a few potato growers in the Qu'Appelle Valley make up most of the commercial gardeners. Although only a small part of the garden produce is marketed, gardening is very important to the people. Rural home gardens supply most of the family needs for vegetables and a part of their needs for small and tree fruits.

Projects Under Way in the Horticultural Division

Research work with vegetables includes variety testing, cultural trials, and vegetable breeding. Varieties are tested for suitability to the growing conditions of this area and for their acceptability as home and market garden vegetables. Experiments are under way to determine the best cultural treatments for the growing of warm season vegetables. Breeding work is undertaken with tomatoes with the object of obtaining early maturing, large size, good quality fruit.

Varieties of apples, crabapples, plums, sandcherry $\times$ plum hybrids, gooseberries, currants, raspberries, and strawberries, are tested for quality and suitability to climatic conditions. Investigations are under way to determine methods of controlling lime-induced chlorosis and many seedlings are being examined to locate resistant materials.

Vegetables

Variety trials with vegetables, including the vegetables usually grown in home gardens, are conducted to obtain comparative data on yields and quality. A list of vegetable varieties recommended on the basis of these comparative trials can be obtained on request.

During the past seven years greatly improved varieties of some of the vegetables have become available. Topcrop and Rival green beans are far superior to the older varieties. Hybrid onions have outyielded the standard varieties and are well worth the extra cost of seed. The determinate varieties of tomatoes have been so improved that the staking varieties are no longer recommended. They yield more, and are earlier, of equal quality, and more economical.

Peas

Replicated pea variety trials were carried out during the years 1952, 1953, and 1955. The results are given in Table 19.

TABLE 19—COMPARATIVE YIELDS OF PODDED AND SHELLED PEA VARIETIES FROM 30-FOOT ROWS—1952, 1953, AND 1955*

	Treatment	Varieties					
		Director	Lincoln	Selkirk	Ottawa P.E.I.	Little Marvel	Thomas Laxton
1952	Podded	24·8	23·5	22·3	16·1	21·6	16·2
	Shelled	10·5	9·2	10·2	7·9	9·3	6·3
1953	Podded	21·3	20·2	15·3	18·9	13·7	11·4
	Shelled	9·8	8·8	7·8	9·1	5·7	4·8
1955	Podded	16·3	21·7	15·9	17·2	15·3	14·2
	Shelled	7·8	9·9	8·7	8·9	7·4	6·7
Average	Podded	20·8	21·8	17·8	17·4	16·9	13·9
	Shelled	9·4	9·3	8·9	8·6	7·5	5·9

* Note—In 1954 the replicated pea variety trials were flooded out.

Tomato Variety Trials

Nine tomato varieties are tested annually in co-operation with other stations, and are replicated in 20 single-plant plots to obtain information on early maturity and size. The experiment has been conducted over the 4-year period, 1953-56, inclusive. The object is to discover varieties that are suitable for breeding purposes from the standpoint of early maturity and fruit size. The variety Earlinorth has the best fruit size in the early maturing group, and B.B.3 has the largest fruit size although in the late maturing group. These two varieties are being used in a breeding program to produce early maturing plants with large fruit. From 500 back-cross progeny ($F_1 \times$ B.B.3.) 12 selections have been made for further breeding work.

National Potato Trials

Approximately 30 varieties and strains have been tested annually in adaptation tests of the National Potato Trials for the past six years, 1951 to 1956, inclusive. These are rated for plant and tuber type, disease resistance, and keeping and culinary qualities. The data are submitted for assembly in the Report of the National Potato Trials. No strains tested at Indian Head have been equal in performance to the standard varieties.

Cultural Trials with Sweet Peppers

In an attempt to find the best cultural method for growing warm season vegetables, pepper seed was sown at three different dates, and plants from each sowing were transplanted to the garden at each of three dates. One-half of the plants were covered with hotcaps at the time of planting. Results of this trial over a 3-year period are given in Table 20 on the basis of declining yields. It may be noted that increases in yield can be expected from early sowing, early transplanting and covering. The heaviest average yield was obtained from plants sown April 20, transplanted May 28 and covered with hotcaps.

TABLE 20—AVERAGE YIELDS OF RIPE FRUIT PER PLOT OF TEN PEPPER PLANTS ACCORDING TO DATES OF SOWING AND TRANSPLANTING AND USE OF HOTCAPS—1953-55

Sown	Planted	Covered or Uncovered	3-Year Average
			lb.
April 20	May 28	Covered	8·35
April 10	May 28	Covered	7·62
April 10	June 5	Covered	7·02
April 20	June 5	Covered	6·14
April 30	June 5	Covered	6·07
April 30	May 28	Covered	5·77
April 20	May 28	Uncovered	5·40
April 10	May 28	Uncovered	5·23
April 20	June 5	Uncovered	4·48
April 10	June 15	Covered	4·40
April 10	June 5	Uncovered	4·38
April 20	June 15	Covered	4·14
April 30	June 15	Covered	3·81
April 30	June 5	Uncovered	3·64
April 30	May 28	Uncovered	3·63
April 30	June 15	Uncovered	2·57
April 10	June 15	Uncovered	2·17
April 20	June 15	Uncovered	1·55

Fruits

Over the past 65 years tests with fruit varieties in eastern Saskatchewan have clearly demonstrated that fruit trees, especially the crabapples and the native plums, are well adapted when provided with good cultural conditions and shelter. A list of recommended varieties of both tree and small fruits can be obtained from the Experimental Farm.

Breeding for Resistance to Lime-induced Chlorosis

Lime-induced chlorosis, a nutritional disease that attacks apple and plum species and many ornamental plants, has seriously impaired Indian Head Experimental Farm orchards. There are no practical control methods. Of over 3,000 Malus seedlings planted in 1954, involving 4 specific crosses and seedlings from 25 open pollinated varieties, only 51 seedlings have shown resistance to the disease.

Ornamentals

Trees, shrubs, hedges, lawn grasses, and perennial and annual flowers are used for landscaping the grounds and for demonstration purposes. New varieties are continuously being introduced and compared. Lists of suitable varieties of each may be obtained from the Experimental Farm.

POULTRY

A. P. Piloski

Poultry work during the period under review was concerned with several phases of egg production. The only poultry kept on the Farm from 1933 to 1950 was a general-purpose flock of Barred Plymouth Rocks. In 1950 the entire strain of Barred Rocks developed at the Experimental Farm, Harrow, was transferred to Indian Head. This strain was used exclusively to study the effect of strain and environment on egg production.

In 1953 samples of the two major strains of Single Comb White Leghorns from the Central Experimental Farm, Ottawa, were brought to Indian Head for a study in population genetics. This particular project deals with the effect of relaxed selection on egg production and mortality.

Strain—Environment Project

This experiment was part of a co-operative project designed to test the performance of the Harrow strain of Barred Rocks in different environments. The Harrow strain consistently had the highest average egg production of this breed in the Experimental Farm system. The experiment was designed to determine the causes of their superiority in egg production—the genetic make-up of the strain, the Harrow environment, or an interaction of both.

Hatching eggs were produced at Harrow from mass-mated pens and random lots were distributed to the co-operating Farms at Scott and Indian Head and one lot retained at Harrow. The chicks were produced in two hatches, two weeks apart, reared in the customary manner at each Farm, and were housed when 160 days of age. Table 21 shows the laying house performance of each hatch at the three Farms based upon a 5-day trap week and calculated to a 7-day week.

TABLE 21—MEAN PERFORMANCE DATA OF THE HARROW STRAIN AT THREE DIFFERENT LOCATIONS. DATA TAKEN FROM HOUSING AT 160 DAYS OF AGE IN THE FALL OF 1950, TO SEPT. 4, 1951

Farm	Hatch	Females No.	Survivor Production	Hens Housed Production	Mortality %	March Body Weight	March Egg Weight	Days to First Egg
Harrow	1	177	145	117	31	5·7	58	172
	2	213	147	119	26	5·6	57	197
Indian Head	1	160	137	124	16	5·8	58	182
	2	200	129	115	16	6·0	59	197
Scott	1	148	133	126	8	6·1	56	193
	2	149	122	111	13	6·0	56	218

It will be noted that production of survivors at Harrow was significantly higher than at the other two Farms. However, the mortality was much higher at Harrow which resulted in little difference in the production of the hen-housed birds between Farms.

The difference in body weights in March was not significant but there was a significant interaction between Farm and hatch. This is shown in the body weights of the second hatch at Harrow and Scott, which were lighter than the first-hatched birds while at Indian Head the reverse was true. The difference in the mean number of days to sexual maturity between hatches at Indian Head was 15 days while at the other two stations it was 25 days.

The Effect of the Discontinuance of Selection in White Leghorns

Two major strains of Leghorns that are being continuously selected for high production by the use of trap nests were secured from the Central Experimental Farm. These two strains differ in that one is newly formed and is showing marked response to continuous selection while the other is an old strain in which improvement is slow.

At Indian Head work was started in the spring of 1953, with the arrival of hatching eggs of both strains from Ottawa, to determine what effect the discontinuance of selection would have on the laying house performance of White Leghorns. Data on the performance of this original stock and two generations of their relaxed selection progeny are given in Table 22.

TABLE 22—LAYING HOUSE PERFORMANCE OF TWO STRAINS OF WHITE LEGHORNS. DATA FROM THE SELECTED GENERATION AND TWO GENERATIONS OF RELAXED SELECTION PROGENY

Strain	Year	Generation	Housed No.	Days to First Egg	Body Weights (gm.)		March egg weight	Mortality %	Egg Production	
					Housing	March			Hen Housed	Survivor
Ottawa.....	1954	0	117	175	1600	2410	57	16.2	199	218
	1955	1	135	169	1750	2190	57	30.0	151	186
	1956	2	133	181	1620	2230	57	15.0	175	200
New.....	1954	0	160	178	1590	2300	58	13.8	206	221
	1955	1	154	182	1670	2200	58	22.0	148	178
	1956	2	173	191	1580	2220	59	12.1	174	188

The Effect of Roosts on Pullet Performance

Four pens of pullets totalling 368 birds were used in this study. Pens with roosts were separated by wire partitions from pens without roosts and the methods of handling the litter were similar. Samples of litter were taken at 2-week intervals and were air-dried to determine moisture content. The pens without roosts had an average moisture content 4 per cent greater than the pens with roosts. The average mortality in pens without roosts was 37 per cent compared with 31 per cent in pens with roosts. The highest mortality (43 per cent) was experienced in the dampest pen where the litter showed a moisture content of 32 per cent. It appears that moisture in the litter may influence the mortality rate.

Other economic factors such as survivor egg production, egg weight, and body weight were not influenced by the absence of roosts. It is concluded from this study that under conditions where moisture is not a problem pullets may be raised and housed successfully without roosting accommodation.

ILLUSTRATION STATIONS

R. N. McIver

There are 13 Illustration Stations, including one special station for horticultural projects, in the Indian Head supervisory district. The work on each station is generally on specific problems peculiar to that particular district. Throughout this report reference is made to certain districts and when this is done it relates to work being developed in co-operation with the farmers who own and operate the Illustration Stations in the districts concerned. The location of each of the stations, the names of the operators, and the soil types are as follows:

Location	*Operator*	*Soil Type*
Alameda	Young Bros.	Estevan clay loam
Arcola	C. Marsh	Alluvial clay loam
Avonlea	J. Dombowsky	Alluvial clay loam
Aylesbury	C. McMillan	Elstow clay loam and loam

Fleming	G. Osborne	Naicam and Ryerson clay loam and loam
Kelliher	R. L. Church	Oxbow loam
Lisieux	O. Prefontaine	Wood Mountain sandy clay loam and alluvial clay loam
Radville	Levee Bros.	Trossachs clay loam
Strasbourg	A. Coles	Weyburn loam
Strasbourg	J. G. Hooper	Weyburn loam
Viceroy	L. L. Gyman	Haverhill clay loam
Wawota	W. H. Pryce	Ryerson loam
Yorkton	Jas. Harris	Canora silty clay loam and Yorkton clay loam

Crop rotations

Rotational studies are carried out on 2-acre plots at each station in this district. In the western section where drier conditions prevail, short rotations are being studied while in the eastern portion, where soil fertility and weed infestations are a problem, attention is given to the longer rotations which include a grass and legume mixture.

Two-year Rotation: Summerfallow, Coarse Grain

This rotation was carried out at the Alameda, Lisieux, and Radville stations. A comparison of the yield of oats and barley in this rotation as well as wheat in a similar rotation is shown in Table 23.

TABLE 23—COMPARATIVE YIELDS OF WHEAT, OATS, AND BARLEY IN A 2-YEAR ROTATION OF SUMMERFALLOW, GRAIN. 16-YEAR AVERAGE, 1938-1953 INCLUSIVE

Station	Wheat		Oats		Barley	
	bu.	lb.	bu.	lb.	bu.	lb.
Alameda	21.8	1,308	53.6	1,822	34.5	1,661
Lisieux	20.9	1,254	39.5	1,343	31.0	1,488
Radville	27.6	1,656	48.3	1,642	38.8*	1,862*

* 15-yr. average—1938-1952 inclusive.

The figures indicate that a higher yield of grain can be produced with oats at Alameda than with wheat or barley. At Lisieux and Radville the yield of barley was higher than the yield of wheat or oats.

Two-year Rotation: Summerfallow, Wheat

A 2-year rotation is quite general on the stations in the western portion of this supervisory district. This rotation provides a good trash cover during the summerfallow year, and weeds are well controlled particularly when 2,4-D is used during the crop year. The average yields are given in Table 24.

Three-year Rotation: Summerfallow, Grain, Grain

A 3-year rotation is carried out on all the stations except at Aylesbury. It is the most common rotation in the eastern portion of this supervisory district. It is quite successful as a straight grain growing proposition, particularly with the use of 2,4-D. However, perennial weeds are not so effectively controlled as in the 2-year rotation (fallow, grain). The yields from this rotation are given in Table 24.

TABLE 24—WHEAT YIELDS PER ACRE IN TWO- AND THREE-YEAR ROTATIONS AVERAGED FOR THE NUMBER OF YEARS SHOWN IN BRACKETS

Station	2-Year Rotation	3-Year Rotation	
	After summerfallow	After summerfallow	After wheat
	bu.	bu.	bu.
Alameda	24.6 (13)	22.4 (13)	16.1 (13)
Arcola	27.9 (3)	23.5 (3)	13.2 (3)
Aylesbury	29.7 (3)	29.4 (3)	25.5 (3)
Fleming	26.0 (8)	25.1 (8)	12.7 (8)
Kelliher	30.0 (4)	30.8 (4)	18.7 (4)
Lisieux	22.8 (10)	22.6 (10)	16.5 (10)
Radville	27.2 (13)	24.0 (13)	12.9 (13)
Strasbourg	26.0 (11)	25.4 (11)	14.4 (11)
Viceroy	27.1 (5)	27.2 (5)	16.7 (5)
Wawota	—	26.8 (13)	—
Yorkton	23.5 (3)	23.0 (3)	15.5 (3)

Rotations that Include a Grass and Legume Mixture

A grass and sweet clover mixture is under test at Alameda, Arcola, Radville, Wawota, and Yorkton. In general, a satisfactory stand was obtained except at Radville where the grass and legume mixture failed to become established in seven of the sixteen years that this study has been conducted. The mixture is left down for two years, broken and seeded to wheat. The yield of grain from this rotation has not been increased as compared with the fallow-grain rotation, except at Yorkton. The 17-year average yield of wheat on fallow in the grass and legume rotation at Yorkton was 27.8 bushels per acre as compared with a 23.1 bushel yield on fallow in a fallow—grain rotation for the same period.

Fertilizer Studies

At the Alameda, Arcola, Kelliher, Radville, Strasbourg, and Viceroy stations, 40 pounds per acre of ammonium phosphate (11-48-0) fertilizer was applied on 2-acre plots of wheat after fallow in a 2-year rotation of summerfallow—wheat. The yields are given in Table 25.

TABLE 25—WHEAT YIELDS PER ACRE AFTER FALLOW WITH 40 LB. PER ACRE OF 11-48-0 AND WITHOUT FERTILIZER. AVERAGED FOR THE NUMBER OF YEARS SHOWN IN BRACKETS

Station	With Fertilizer	Without Fertilizer	Increase		
			Highest	Lowest	Average
	bu.	bu.	bu.	bu.	bu.
Alameda	28.2 (8)	23.6 (8)	6.3	1.4	4.6 (8)
Arcola	22.7 (8)	22.9 (8)	5.6	−4.6	−0.2 (8)
Aylesbury	29.0 (5)	27.0 (5)	6.2	0.0	2.0 (5)
Kelliher	30.1 (4)	29.7 (4)	1.7	−0.4	0.4 (4)
Radville	25.8 (8)	25.5 (8)	3.6	−2.4	0.3 (8)
Strasbourg	31.6 (8)	28.8 (8)	9.9	−1.5	2.8 (8)
Viceroy	32.3 (5)	31.4 (5)	1.7	−1.6	0.9 (5)

The results indicate that there was a good response to fertilizer at Alameda and to a lesser extent at Strasbourg and Viceroy. There was no increase in the yield at Arcola, Kelliher, and Radville.

During the period 1950 to 1955, inclusive, 20-, 40-, and 60-lb. rates of 11-48-0; 48- and 96-lb. rates of 16-20-0; 25- and 50-lb. rates of 0-38-0; and 20-lb. potash alone and in combination with each type of fertilizer were applied to wheat on fallow in rod-row plots at several stations. At Alameda, Arcola, and Yorkton the greatest response was from the higher rates of 11-48-0 and 16-20-0. At Kelliher and Wawota the response was as great from 20 lb. of 11-48-0 as from the higher rates. The application of potash alone or in combination with ammonium phosphate did not increase the yield.

Cereal Varieties and Their Distribution

A series of rod-row tests are sown in co-operation with the Cereal Division on most of the stations to obtain a comparison of the new varieties with those now recommended. The information obtained from these tests is used by the Saskatchewan Advisory Council on Cereal Crops to determine the varieties that should be recommended in the various cereal zones.

In order that each station may function as a source of pure seed of the recommended varieties for the district the station operators grow a seed plot of pure seed stock each year. During the 10-year period, 1947 to 1956, inclusive, the operators sold a total of 29,297 bushels of wheat, 13,759 bushels of oats, 11,819 bushels of barley, and 2,000 bushels of flax to farmers in their respective districts.

Forage Crops

At Alameda, Fleming, and Kelliher, various forage mixtures have been under test during the 3-year period, 1953 to 1956, inclusive. A number of grasses and grass mixtures with and without alfalfa were included in the test. In general, the grasses alone yielded about 0.75 tons of dry matter per acre. The addition of 2 pounds per acre of alfalfa to the grass seed increased the yield to 2.0 tons per acre during this period. At these three stations a mixture of common brome, intermediate wheat grass and alfalfa appeared to be the most suitable mixture.

An alfalfa variety test consisting of six varieties was carried out at Alameda and Fleming during this same period. Ladak was the highest yielding variety.

Farm Management Studies

An annual study is made of the farm business on each station. The operators submit an itemized statement of their revenues and expenditures as well as a detailed record of their field operations. An inventory is taken at the end of each year of the land and buildings, livestock, machinery, equipment, feeds, and supplies on hand.

The sources of revenue indicate the type of farming and organization of the station farm. Grain production is the major enterprise at all the stations except Lisieux and Wawota where cattle and dairy products take priority. The percentage of revenue derived from hogs and poultry has declined slightly since 1947. However the relationship of the percentage of revenue derived from cattle and dairy products and field crops has remained relatively constant throughout the 10-year period 1947 to 1956, inclusive. The sources of farm revenue for this period are given in Table 26.

TABLE 26—SOURCES OF REVENUE BY PERCENTAGE, FOR ALL STATIONS

(10-Year Average 1947-1956 Inclusive)

Enterprise	Average	Highest	Lowest
Cattle and Dairy Products	15.8	21.7 (1951)	13.9 (1953)
Field Crops	76.6	84.1 (1952)	70.6 (1950)
Hogs	3.2	6.2 (1947)	1.1 (1953)
Poultry	1.0	2.6 (1947)	0.7 (1955)
Garden Vegetables	0.3	.6 (1947)	0.1 (1954)
Miscellaneous	3.1	7.6 (1949)	0.4 (1953)

The average capital investment per station farm in land and buildings, livestock, machinery, and equipment is given in Table 27 for the 10-year period 1947-1956, inclusive. The investment in land and buildings and livestock was fairly constant throughout this period. There was a gradual increase in the capital invested in machinery from an average of $7,558 in 1947 to $18,747 in 1953. Since 1953 there has been relatively little change. The fluctuations in the percentages of capital invested in these items are caused by the increase in the investment in machinery and equipment.

TABLE 27—AVERAGE CAPITAL INVESTMENT PER STATION FARM

9-YEAR PERIOD 1947-1955, INCLUSIVE

Year	Land and Buildings		Livestock		Machinery and Equipment		Total Value
	Value	Percentage of Total	Value	Percentage of Total	Value	Percentage of Total	
	$		$		$		$
1947	18,811	61.3	4,331	14.1	7,558	24.6	30,700
1948	19,792	55.6	5,841	16.4	9,981	28.0	35,614
1949	20,045	52.4	5,747	15.0	12,491	32.6	38,283
1950	18,873	48.5	5,917	15.2	14,131	36.3	38,921
1951	19,119	45.8	7,501	18.0	15,111	36.2	41,731
1952	20,211	47.0	6,197	14.4	16,605	38.6	43,013
1953	20,008	45.6	5,104	11.6	18,747	42.8	43,859
1954	19,874	45.6	5,498	12.6	18,327	41.9	43,699
1955	19,729	45.7	5,914	13.7	17,544	40.6	43,187
1956	19,734	46.2	6,164	14.4	16,822	39.4	42,720
Total	196,196	—	58,214	—	147,317	—	401,727
Average	19,620	48.8	5,821	14.5	14,732	36.7	40,173

Cost of production data are calculated for the cereal crops produced on each station. The various factors that contribute to total cost are studied for the purpose of increasing the operating efficiency where possible. All known costs are included such as the use of land and buildings, taxes, labor, machinery use, general farm expense, and a charge for management. The cost of summerfallowing is charged to the succeeding crop with interest at 6 per cent per annum. In a 3-year rotation two-thirds of the summerfallow cost is charged to the first crop and one-third to the second crop. The average cost per acre for summerfallow and the cost of wheat production are shown in Table 28.

Variations in the costs between stations are a result of the differences in soil and climatic conditions, value of the land, and machinery charges. In a 2-year rotation, about 37 per cent of the cost of producing wheat is for the previous year's summerfallow. In the 3-year rotation, about 27 per cent and 17 per cent of the total cost of the first and second crop, respectively, is for the previous year's summerfallow. The low cost of the summerfallow in the second crop is offset by the lower yield per acre.

TABLE 28—AVERAGE COST PER ACRE OF WHEAT PRODUCTION ON SUMMERFALLOW AND ON SECOND CROP

Station	Type of Rotation	Wheat After:	Period	Yield per Acre	Cost of Summer-fallow	Total Cost of Production
				bu.	$	$
Alameda	2-year	Fallow	13-year 1944-56	24.6	6.36	16.32
	3-year	Fallow	13-year 1944-56	22.4	4.24	13.48
	3-year	Wheat	13-year 1944-56	16.1	2.24	11.18
Arcola	2-year	Fallow	13-year 1944-56	24.6	5.51	16.07
	3-year	Fallow	3-year 1954-56	23.5	4.35	15.48
	3-year	Wheat	3-year 1954-56	13.2	2.18	12.53
Aylesbury	2-year	Fallow	13-year 1944-56	19.9	4.81	13.17
	3-year	Fallow	3-year 1954-56	29.4	4.39	14.54
	3-year	Wheat	3-year 1954-56	25.5	2.20	11.80
Fleming	2-year	Fallow	8-year 1949-56	26.0	8.20	19.66
	3-year	Fallow	8-year 1949-56	25.1	5.47	17.02
	3-year	Wheat	8-year 1949-56	12.7	2.89	12.94
Kelliher	2-year	Fallow	7-year 1950-56	30.1	6.89	18.20
	3-year	Fallow	4-year 1953-56	30.8	4.92	17.08
	3-year	Wheat	4-year 1953-56	18.7	2.60	13.89
Lisieux	2-year	Fallow	10-year 1947-56	22.8	3.53	12.39
	3-year	Fallow	10-year 1947-56	22.6	2.36	11.35
	3-year	Wheat	10-year 1947-56	16.5	1.25	9.04
Radville	2-year	Fallow	13-year 1944-56	27.2	6.24	14.84
	3-year	Fallow	13-year 1944-56	24.0	4.16	13.09
	3-year	Wheat	13-year 1944-56	12.9	2.08	10.77
Strasbourg	2-year	Fallow	13-year 1944-56	26.0	5.20	14.22
	3-year	Fallow	11-year 1946-56	25.4	3.42	12.68
	3-year	Wheat	11-year 1946-56	14.4	1.81	10.68
Viceroy	2-year	Fallow	5-year 1952-56	27.1	7.14	18.73
	3-year	Fallow	5-year 1952-56	27.2	4.77	16.42
	3-year	Wheat	5-year 1952-56	16.7	2.53	13.08
Wawota	3-year	Fallow	13-year 1944-56	26.5	6.37	15.37
Yorkton	2-year	Fallow	3-year 1954-56	23.5	9.12	22.04
	3-year	Fallow	13-year 1944-56	24.8	4.82	17.62
	3-year	Wheat	13-year 1944-56	17.0	2.55	14.74

PUBLICITY

Field Days are held on each station as frequently as possible to provide an opportunity for the local farmers to familiarize themselves with the work carried out on the station. The results of the tests on each station are summarized and submitted to the local papers in that particular district each year. In addition, one or two press articles are prepared on some important phase of the work each year.

ACTIVE PROJECT INVESTIGATIONS

Animal Husbandry

Performance testing of beef cattle
Breeding Yorkshire swine
Self- versus hand-feeding of market pigs
Advanced Registry and comparative testing of Yorkshire and Lacombe swine

Field Husbandry

Agricultural meteorology
Rotations and sequence of crops
Fertilizers for cereals and forage crops
Cultural treatments for summerfallow and stubble
Dates and methods of seeding
Cultural and chemical weed control

Cereal Crops

Testing varieties and strains of spring wheat, durum wheat, winter wheat, oats, barley, peas, beans, linseed flax, and winter rye in replicated plots
Breeding superior disease resistant varieties of spring wheat, durum wheat, winter wheat, oats, barley, peas, beans, and linseed flax for general adaptability and specific regions
Production and maintenance of Foundation, Elite, and other seed stocks of wheat, durum wheat, oats, barley, and linseed flax varieties
Verification of purity and varietal composition of samples of spring wheat, oats, barley, and linseed flax
Differential growth rates in flax varieties and their relation to other plant characters
Testing lines of safflower for yield and quality

Forage Crops

Plant introductions
Comparative testing of legumes and grasses for hay and pasture
Comparative testing of annuals for hay and pasture
Seed production research
Perennial grass and wheat hybridization
Co-operative testing of plant breeders material of legumes and grasses
Co-operative testing of sunflowers and rape for oil seed production

Horticulture

Variety testing of tree, bush, and small fruits
Variety testing of ornamental and protective trees and shrubs
Variety testing of greenhouse plants and bulbs, and of annual, biennial, and perennial flowers
Co-operating in the National Potato Trials
Developing cultural techniques for growing difficult vegetables

Poultry

A test of the effect of different environments on the producing ability of Harrow Strain Barred Rocks
The effect of laying houses without roosting accommodation on production, liveability and general performance of pullets
The effect of a discontinuance of selection on production and mortality in two strains of Single Comb White Leghorns

Illustration Stations

Crop rotations
Fertilizers for cereals
Soil moisture studies
Testing cereal and flax varieties
Testing forage mixtures for hay
Cost of production studies

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