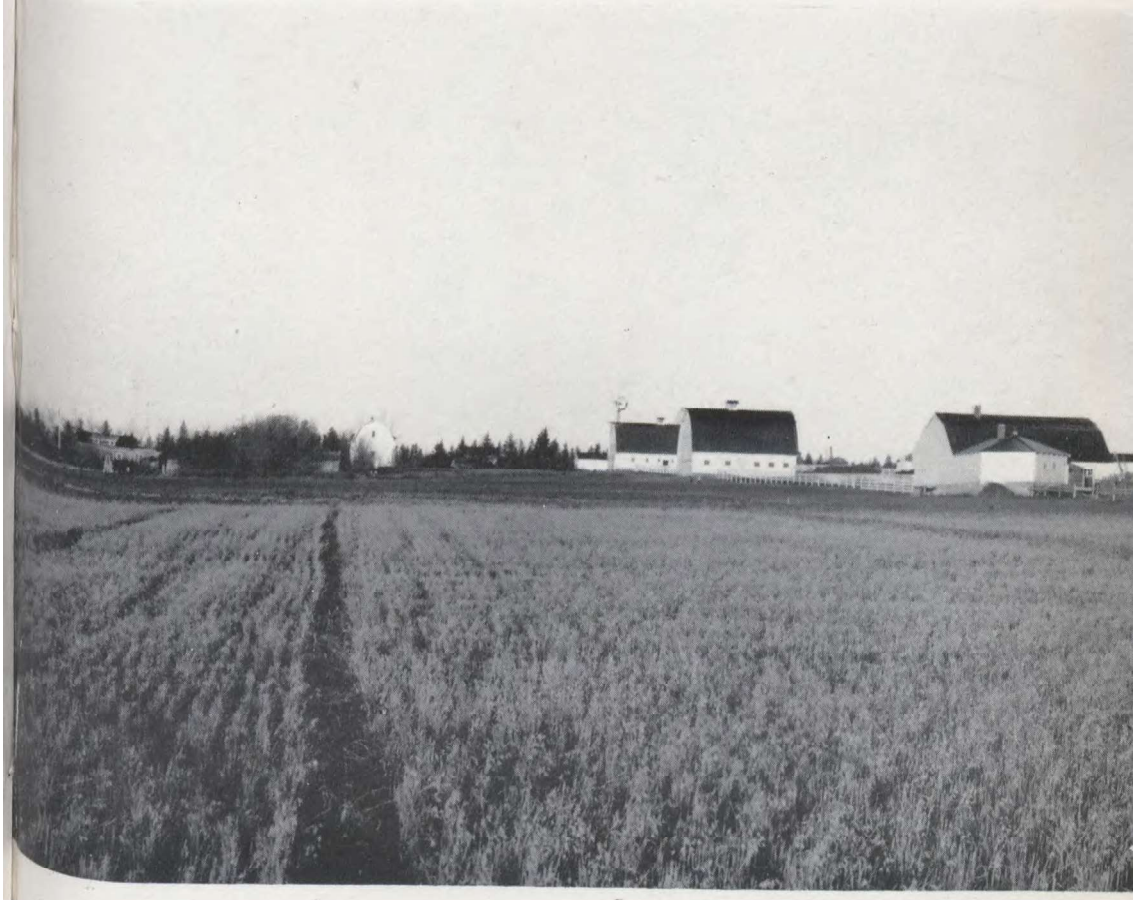
CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS SERVICE

DOMINION EXPERIMENTAL STATION
BEAVERLODGE
ALBERTA

E. C. STACEY, B.A., M.Sc., SUPERINTENDENT

PROGRESS REPORT
1937-1947



VIEW OF BUILDINGS
DOMINION EXPERIMENTAL STATION
BEAVERLODGE, ALBERTA.

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INTRODUCTION

Experimental work was initiated at Beaverlodge in 1915 by the late W. D. Albright who was Superintendent until his retirement in 1945. In 1940 the status of the Substation was changed to that of Station and provision was made for increased staff, buildings and equipment. There have been extensive changes in the Station grounds and additional land has been purchased for field husbandry investigations. The staff now includes several technical assistants. A cattle barn and a piggery have been erected.

Since the last published report of the Beaverlodge Substation appeared in 1936 there have been notable developments in Peace River agriculture. Most important of these is the amount of land brought under cultivation and the greater production of grain and livestock. Grain production in the district has increased from 12,000,000 to 20,000,000 bushels per annum and livestock from about 66,000 head to double that number. Production of forage crops is much greater, while the seed crop in a normal year may well total 15,000,000 pounds.

The region served by the Beaverlodge Station extends from Whitecourt on the Athabasca River, and the east end of Lesser Slave Lake, west to Hudson Hope, and north to Keg River on the Grimshaw-Hay River highway, and Muncho Lake on the Alaska highway. It comprises an estimated 16,500,000 acres of arable soil, of which 13,000,000 acres may be classed as grey wooded soil and 3,500,000 acres as transitional black soil. At present, some 1,500,000 acres are under cultivation. There is a steady influx of population, and, assuming favourable economic conditions, this will probably be intensified.

Most of the region served by the Station lies within north latitudes 55 to 58, which gives it a strong northerly basis, but without the extreme rigours of Sub-Arctic weather. The mean annual temperature at Beaverlodge is 35·93°F., determined over a period of 32 years, 1916-1947 inclusive, which is about that recorded at Lacombe in Alberta, but is higher than the mean annual temperatures recorded at Dominion Experimental Farms and Stations in Manitoba and Sackatchewan with the exception of Morden and Melita in Manitoba and Swift Current in Saskatchewan. At Beaverlodge the annual precipitation during the same 32 years has averaged 17·36 inches. This is a favourable amount considering the small free-water evaporation, from April to October, inclusive, of 18·55 inches. Unfortunately, the distribution of the precipitation is not always favourable, frequently being heavy in September and October rather than in June and July when it would have a more beneficial effect on crop growth. Frosts harmful to crop growth occur, but are experienced much less than would be expected in this latitude.

It has been a function of the Beaverlodge Station to include studies of weather and soil conditions. In the district the brown-black clay loam is readily adaptable to a wide range of cropping but in certain parts it is underlain by a very tough impervious subsoil which impedes moisture absorption. The better grades of grey wooded soil are moderately porous but merge to inferior types characterized by low organic-matter content and a well defined leached layer which has poor physical properties until enriched by crop residues. An outstanding contribution of the Station has been the work with legumes, particularly the effect of the deep-rooted species such as alfalfa and sweet clover, on both black and grey wooded soils. The physical condition of the soil may thus be improved readily, and the subsoil made more absorptive. When these are followed by grass-legume mixtures in rotation with grain crops a balanced form of agriculture is assured and soil erosion reduced to a minimum.

There has been an intensive search for early-maturing varieties of cereals. The Beaverlodge Station is responsible for observing the adaptability of Saunders wheat in the region and for the interest in Olli barley and Beaver oats.

A further contribution has been the testing of horticultural material and the recommendation of horticultural practices suited to the region. The result is a very great appreciation of the farm garden, and of plantings by the settlers, even though many farms have not yet emerged from the development stage. This is another indication of stabilized agriculture in the district.

REVIEW OF THE SEASONS

In 1937 seeding was delayed by snow and rain and was not general until May 8. Wheat seeding was completed May 15-20 except in certain low-lying areas. Drying winds brought a need for a general rain by the end of the month even though there had been an abundant carry-over of moisture. The rains were late in coming and wheat headed short. Late crops responded and the feed situation improved materially. A heavy frost in early August caused widespread damage. Yields and grades were disappointing and dockage heavy. Little fall work was done and the subsoil moisture was in very poor supply.

Seeding commenced early in 1938, with some farmers on the land before the middle of April. A strong wind on May 12 caused widespread soil drifting and otherwise accentuated the dry spring. This was followed by an outbreak of red-backed cutworm which caused rather severe losses in a few localities. August moisture aided filling and revived pastures but yields were low. Autumn weather was ideal for fall work.

The second wettest year on record, according to precipitation tables, was 1939 yet the cropping season was comparatively dry. Seeding was normal but showers were local until mid-July brought a three-day soaking rain. Unfortunately this came too late to do the grain crop much good and it spoiled much of the hay crop. Threshing was repeatedly interrupted and continued into October. Some damp grain heated in the bins before winter set in.

The 1940 season was much more favourable inasmuch as a moderate amount of moisture fell at opportune times to make a heavy crop. There was no moisture carried over, however. The 1941 season opened early and much of the seeding was done in April. July records show rain on fourteen days at Beaverlodge but less at Fairview and Dreau. Beaverlodge also reported rain on fourteen days in August, and in addition, a ruined hay crop. Wet weather persisted into September with rain on all but three days, continuing to October 9. Finally the weather cleared and the crop was salvaged with much less loss than was expected. Wheat averaged about seventeen bushels per acre.

Cropping conditions were almost optimum in the Peace River district in 1942. Seeding and harvest weather was favourable and a dry spell in July did little harm. The hay crop was one of the heaviest on record and was stacked in prime condition. Wheat averaged twenty-two bushels, oats forty-five, barley thirty-two and flax ten bushels per acre.

Seeding was early in 1943 but germination was tardy. Warm weather commenced June 7 but growth was not rapid until June 20. Crops suffered from drought in July but filled well in August. Uncut grain was subjected to severe lashing by wind on September 12.

The 1944, 1945 and 1946 seasons were dry. Yields were light and the crops were harvested without difficulty. Combines were used freely and compensated for the manpower shortage.

TABLE 1.—ANNUAL PRECIPITATION 1937-1947 INCLUSIVE

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1937	1·88	0·25	1·06	0·84	0·73	1·60	2·25	3·85	1·24	1·20	1·45	1·04	17·39
1938	0·75	1·18	0·70	0·43	0·34	1·41	0·49	2·41	2·24	0·70	1·48	1·48	13·61
1939	1·09	2·63	1·29	0·98	1·66	1·61	3·70	1·94	2·02	3·22	1·19	1·34	22·67
1940	1·79	0·71	2·09	1·97	1·03	1·29	2·83	0·37	0·54	0·58	1·52	0·49	15·21
1941	1·10	1·49	0·42	0·68	2·15	2·75	4·56	3·24	4·05	1·16	0·68	1·09	23·37
1942	0·05	0·59	0·68	1·15	2·34	2·92	1·00	2·20	1·32	0·34	2·67	1·06	16·32
1943	0·41	0·74	1·65	0·08	3·44	3·31	2·26	2·71	0·64	0·49	tr.	0·13	15·86
1944	0·33	1·75	0·71	0·88	1·09	2·34	1·42	0·98	2·85	0·46	1·98	0·78	15·57
1945	2·65	0·81	0·48	0·88	1·53	1·94	0·62	0·44	2·27	1·87	1·51	0·57	15·57
1946	1·62	0·90	0·18	0·11	1·37	1·54	1·31	0·89	1·57	0·35	0·99	1·97	12·80
1947	2·55	2·40	0·67	1·18	1·49	1·27	5·57	2·21	1·33	0·91	0·83	1·65	22·06
Average 1937-1947	1·29	1·22	0·90	0·83	1·56	2·00	2·36	1·93	1·82	1·03	1·30	1·05	17·31
Average 1916-1947	1·35	0·96	1·13	0·79	1·55	2·06	2·31	1·78	1·78	1·14	1·30	1·21	17·36

Meteorological records taken in co-operation with the Meteorologica Division of the Department of Transport.

TABLE 2.—METEOROLOGICAL RECORDS 1916-1947 INCLUSIVE

Month	Temperature			Precipitation			*Bright Sun	†Wind Hourly Velocity	‡Evaporation
	Highest	Lowest	Mean	Rain	Snow	Total precipitation			
	°F.	°F.	°F.	in.	in.	in.	hr.	m.p.h.	in.
January	62·0	—53·1	9·40	·03	13·28	1·35	78	7·16	–
February	57·8	—47·5	13·28	·03	9·28	0·96	109	6·83	–
March	61·0	—34·0	22·58	·07	10·55	1·13	157	8·42	–
April	79·1	—14·2	37·78	·31	4·86	0·79	218	9·61	0·77
May	91·0	17·0	49·18	1·46	0·96	1·55	265	10·24	3·51
June	89·0	24·0	55·55	1·99	0·71	2·06	256	9·11	3·65
July	98·1	29·0	60·07	2·31	0	2·31	300	8·55	4·34
August	94·4	27·0	57·85	1·78	0	1·78	257	8·14	3·45
September	89·3	14·0	49·62	1·54	2·44	1·78	177	8·27	1·95
October	82·0	—11·2	39·57	·65	4·87	1·14	138	8·69	0·88
November	65·0	—24·0	23·83	·23	10·65	1·30	79	7·26	–
December	62·0	—45·2	12·40	·06	11·54	1·21	67	6·81	–
Annual	–	–	35·93	10·46	69·14	17·36	2101	8·26	18·55

* 1923-1947 (25 years)
† 1936-1947 (12 years)
‡ 1922-1947 (26 years)

The 1947 crop started well but conditions were generally dry until early July. Late rains brought on a heavy second growth and a mid-August frost caused widespread damage. Most of the grain graded feed and much of it was threshed tough. Legume crops set seed poorly.

TABLE 3.—THE OCCURRENCE OF FROST AND FROST-FREE PERIODS 1937-1947 INCLUSIVE

Year	Date of Last Frost in Spring	Date of First Frost in Fall	Days Frost Free
1937	May 20	September 21	123
1938	June 6	October 6	121
1939	May 10	September 13	125
1940	May 28	October 5	129
1941	May 26	August 30	95
1942	May 15	September 16	123
1943	May 16	September 7	113
1944	May 12	September 29	139
1945	May 9	September 21	134
1946	May 14	September 6	114
1947	May 18	August 19	92
Average 1937-1947	May 19	September 16	119
Average 1916-1947	May 28	September 3	97

ANIMAL HUSBANDRY

The Peace River region is eminently suited to mixed farming, hence livestock will always constitute an important phase of its agriculture. It is not a ranching area, however, because of the relatively long winter feeding period. There is a place for unlimited hog production but for the most part cattle and horse raising should be incidental to the mixed farming enterprise. There is suitable range for small flocks of sheep but coyotes may cause heavy losses in wooded areas.

Cattle

The Station commenced the development of a herd of purebred Shorthorn cattle in 1943 with the transfer of a bull from the Scott Station and two mature females from the Lacombe Station. More recently another sire, Lacombe Monarch 13th, was transferred from the Lacombe Station. The herd is maintained on a supervised basis and all animals have reacted negatively to the T-B test.

By the end of 1947 five young bulls had been sold to local breeders.

A new cattle barn, fully equipped with steel fittings, was erected in 1947.

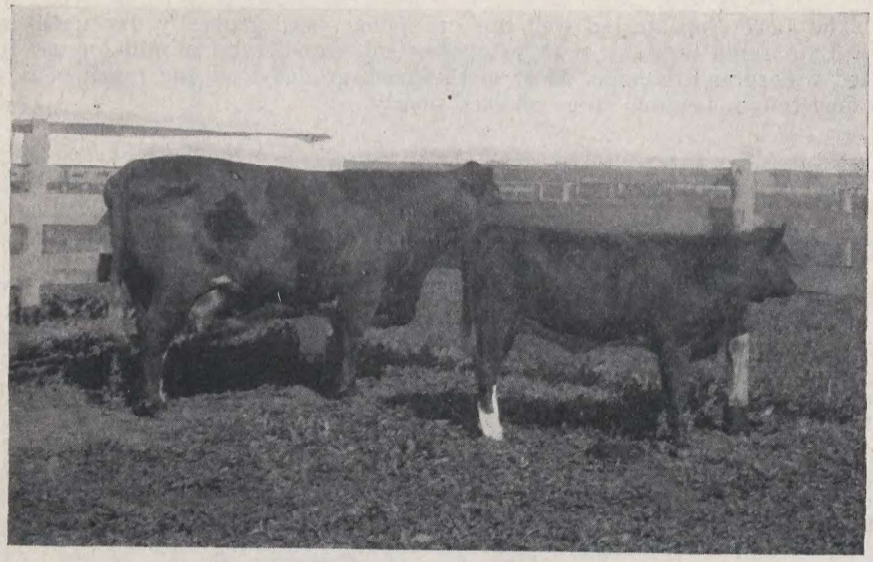

FIG. 1.—Nucleus of Shorthorn herd on Station.

HORSES

For horse power the Station depends on seven head of outstanding Percherons transferred from the Scott Station in 1944 and 1946. One aged stallion, Sir William Laet (14499) 211 593, is held for limited service.

FIG. 2.—Purebred Percheron horses on Station.

Sheep

In keeping with Government policy to encourage sheep raising, the Station established a flock of purebred Hampshires in 1941 and since then has made select breeding stock available for local use. The demand for this stock has, however, been disappointing. This is possibly a reflection of the returns from sheep raising compared with other farming enterprises in this area.

In recent years the Station lost two outstanding mature rams as a result of urinary calculi, a bladder obstruction caused by the deposit of water-borne minerals.

Fig. 3.—Hampshire sheep on Station.

Swine

The Station maintains a top-ranking herd of Yorkshire hogs, mostly of Lacombe breeding, and supplies stock to local breeders. Feeding trials were run for a number of years and some valuable information obtained. However, acute labour shortage and inadequate housing resulted in some serious breaks in project routine. Experimental work was temporarily suspended and emphasis has been placed on the distribution of breeding stock.

Optimum Proportion of Oats for Bacon Hogs. — In the period 1934 to 1940 the Station conducted a comprehensive experiment designed to determine the optimum proportion of oats which could be fed to bacon hogs. There has been serious criticism that prevailing feeding practices resulted in heavy shrinkage on the 400-mile freight haul and most of this was attributed to the feeding of large quantities of oats.

It was concluded that wheat or barley when fed to bacon hogs resulted in a little less shrinkage than occurred when oats was fed but the difference was so slight that it had little commercial significance. Of more importance was the fact that hogs fed a high percentage of wheat went to market in 195 days while those fed entirely on oats required 210 days. The oat ration produced the lowest belly grades and the fat lacked firmness. The carcasses carried a lustreless colour of lean and a greyish colour of fat, while the wheat-fed hogs had a white fat and

a deep red lean. Thus it would appear that the hog ration should carry a substantial proportion of wheat or barley in the advanced stages of feeding.

Vitamin A in Swine Feeding. — At various times fast growing pigs in feeding trials exhibited puzzling symptoms. These varied with individual cases but among the most common were strained facial expression and peculiar position of the ears, giving a wild-boar appearance; nervous derangement; inco-ordination of muscular movement, usually developing quickly into posterior or more general paralysis; inability to feed normally; contortion and miscellaneous ailments such as strangling and a foamy discharge at the nostrils. An occasional pig walked in circles.

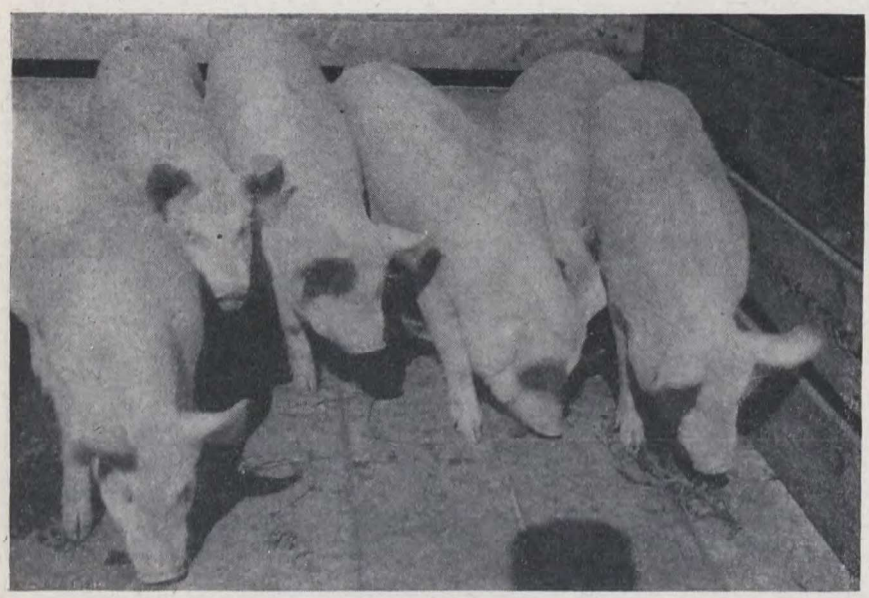

FIG. 4.—Breeding Yorkshire hogs for greater length.

At first a deficiency of vitamin B was suspected but the feeding of cane molasses and nicotinic acid failed to effect a cure. Also, since the pigs were receiving a ration in which there was a fairly substantial percentage of ground wheat, which is supposedly abundantly supplied with vitamin B, it was concluded that there must be some other deficiency. The matter was referred to the Dominion Veterinary Research Station at Lethbridge, Alberta. After eliminating other possibilities, Dr. Gwatkin concluded that the trouble was a deficiency of vitamin A and possibly of D. An experiment was accordingly commenced in the autumn of 1940 and was repeated during the summer of 1941.

Symptoms as already stated were observed in pigs in both the winter and summer trials where neither well cured alfalfa nor pilchardene was fed. Since the symptoms occurred in summer as well as winter among pigs exposed to sunshine in open-air quarters vitamin D was eliminated as a contributing factor. Thus results pointed to vitamin A as the deficient element.

Pilchardene or Green Alfalfa Prevented the Trouble. — Pigs receiving 10 c.c. of pilchardene per day and those receiving green or cured alfalfa did not develop any of the symptoms in question. Ailing pigs were in nearly every case brought completely around and sent to market in normal condition by feeding skim-milk, pilchardene and greens. In other cases alfalfa alone or pilchardene alone effected marked improvement.

Pigs fed on a vitamin-A-deficient ration made normal development for a time then one after another succumbed either gradually or suddenly while pen and litter mates on the same ration escaped and went to market without apparent setback. Excitement from handling and the onset of cold weather seemed at times to precipitate the trouble.

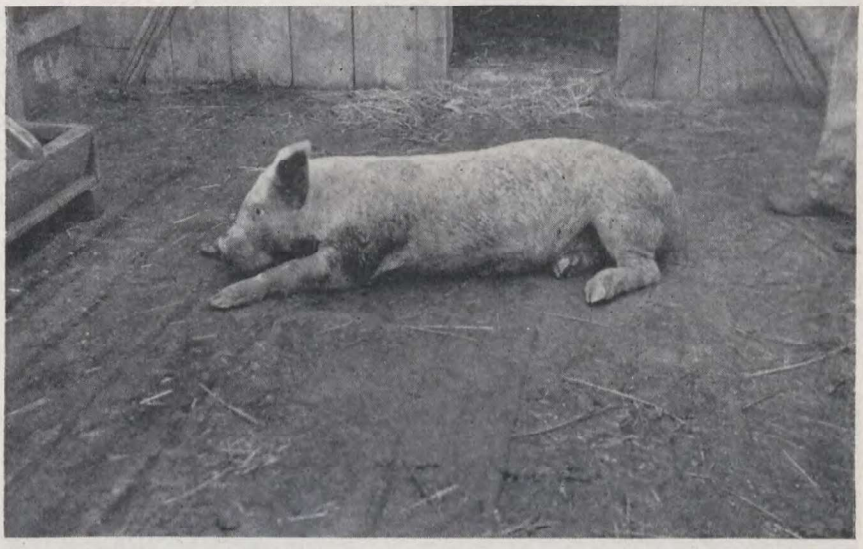

FIG. 5.—Effect of vitamin A deficiency, showing collapse. After twenty days' treatment this pig was practically normal.

Green or well cured alfalfa or alfalfa meal appears to be the most economical source of vitamin A for hogs but any green stuff is satisfactory. Where this or some other source is not available fish oil given in tepid water may be substituted.

Experience with Phenothiazine. — In 1941 phenothiazine was used as a vermifuge for swine to rid the stock of round worms. Shortly afterwards several individuals developed a condition diagnosed as solar eczema, which upon investigation proved to be the first of its kind reported in Canada with swine, although photosensitization had previously been reported in man and in white-faced sheep. Further study of the condition was made in 1942. Dosage caused skin eruption over the back and rump of affected animals, muscular inco-ordination, ears to redden and curl at the edges and general discomfort. In some instances swelling of eyelids obstructed sight. It was observed that these symptoms were more acute when the hogs were exposed to bright sunshine, particularly after the second treatment.

It was concluded the use of phenothiazine could not be condemned provided the pigs were protected from direct sunlight for a period of at least three days following treatment. Also, since the phenothiazine is not efficient in removing immature round worms from pigs, the chemical should not be used on individuals less than seventy days of age.

CEREALS

Cereal breeding programs now recognize the need for the regional adaptation of varieties and it is no longer expected that any one variety will have widespread distribution. The breeding and selection work of the Beaverlodge Station has resulted in a choice of varieties now considered highly suited to Peace River

conditions, regardless of their performance elsewhere. In recent years the testing program has been expanded so that new varieties are proved at strategic points before being released for production. In this the Illustration Stations throughout the area have rendered valuable service.

Hard Red Spring Wheat

Canada's export trade demands superior baking quality not readily attainable under the soil and climatic conditions generally characteristic of northern areas. Every effort must be employed to overcome this natural handicap if this large portion of the nation's wheat-producing area is to enjoy good markets. Choice of varieties is therefore greatly restricted and wheat growing is advocated only where a high quality product is expected. This, in general, relegates most of the grey wooded soil areas to the production of coarse grains, flax or forage crops for seed. Since cropping method modifies the natural effects of soil and climate the responsibility for production is largely on the individual.

The ultimate demands satisfactory milling and baking quality, early maturity, strong straw, resistance to shattering and to disease, especially bunt, easy threshing and satisfactory yield. Unfortunately most varieties are somewhat deficient in one or more of these characteristics.

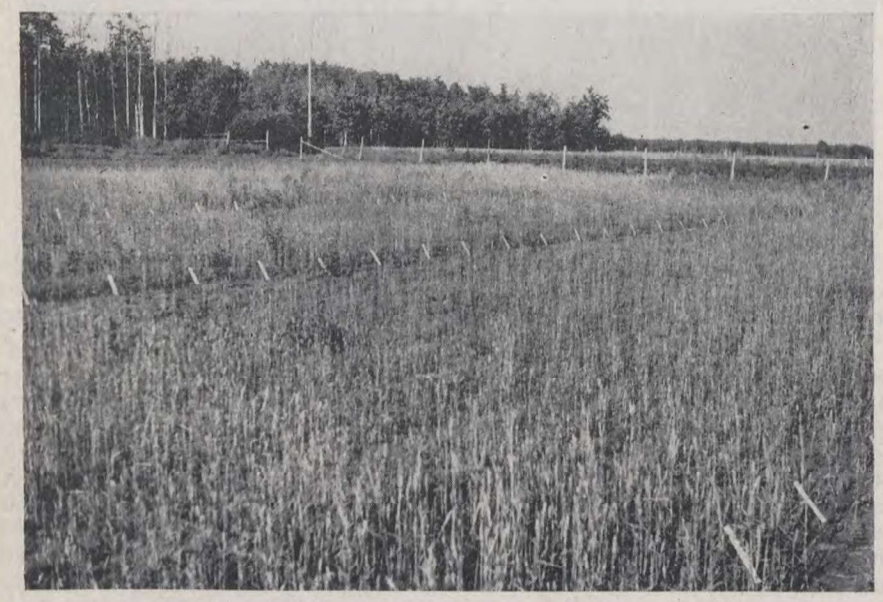

Fig. 6.—Test of wheat varieties on grey wooded soil, McLennan district.

Thatcher. — Thatcher incorporates more desirable qualities than any other variety under quantity production in that it is about equal to Marquis in milling and baking quality, has good straw qualities, yields well and does not shatter. It is, however, difficult to thresh and the sample carries a greyish cast. It is susceptible to bunt infection but fortunately is highly resistant to root-rot which, in effect, makes it appear quite drought tolerant.

Red Bobs. — Red Bobs is popular because of its high yield and free threshing. It shatters readily, is notoriously susceptible to bunt and root-rot and under unfavourable conditions is quite subject to piebalding. The quality is not equal to that of Thatcher.

Garnet. — Although Garnet yields well and admirably meets the most exacting demands of early maturity and sample appearance its milling and baking quality restricts its use and consequently its market value. It shatters readily, lodges under some conditions and is susceptible to bunt.

Saunders. — Saunders was licensed mainly on data originating in the Peace River area, thus it stands to become an important variety locally. It is the product of two rust-resistant parents, Thatcher and a high-yielding, early-maturing hybrid. It is classed as maturing one day later than Garnet and has satisfactory straw qualities. It is free-threshing and non-shattering and is equal to Thatcher in yield and milling and baking quality. It has a bright, attractive kernel and is at least moderately resistant to all important diseases, including bunt and root-rot.

FIG. 7.—Saunders wheat, Grande Prairie district.

At present a limited quantity of certified seed of the variety is in existence but registered seed will not be available for at least two years.

Reward. — Within the period of this report the production of Reward has declined almost to extinction. This is solely attributable to its low yield, which is regrettable as the variety has earliness and outstanding quality.

Regent. — This variety has many good points in its favour, particularly high yield, early maturity and high quality, but has not become popular because of its rough kernel.

Redman. — Redman has many of the qualities of Thatcher and has the added advantage of being resistant to bunt infection. It is doubtful, however, if it will become an important variety in this area as it matures slightly later than Thatcher.

TABLE 4.—HARD RED SPRING WHEAT STATION DATA 1937-1947 INCLUSIVE

Variety	1943-1947				1937-1947			
	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
	dy.	in.		bu/ac	dy.	in.		bu/ac
Red Bobs	125·1	32·0	9·9	26·7	119·3	31·7	9·9	29·9
Thatcher	123·9	30·4	9·9	28·2	119·5	30·4	9·9	30·8
Redman	124·3	29·3	9·9	28·6				
Regent	123·4	31·7	9·7	30·1				
Saunders	122·6	29·3	9·9	29·6				

TABLE 5.—HARD RED SPRING WHEAT LOCAL CROP TEST DATA 1943-1947 INCLUSIVE

Variety	1945 and 1947				1943 and 1947			
	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
	dy.	in.		bu/ac	dy.	in.		bu/ac
Saunders	111·0	29·0	10·0	21·7	109·6	29·0	9·8	22·4
Thatcher	114·2	29·2	9·9	20·6	112·4	29·5	9·9	21·7
Red Bobs	114·2	30·8	10·0	21·7	112·6	30·8	9·8	21·7
Garnet	110·3	31·1	9·9	20·8				

Oats

Much of the land in the area is primarily adapted to the production of coarse grains, particularly oats. It is essential that the varieties produced have earliness of maturity and from the standpoint of the seed producer they should be acceptable on outside markets. The straw should be of moderate length and good strength, the kernel large, plump and of pleasing appearance, as well as having a low percentage hull and high feed value. The combination of these characteristics plus high yield and disease resistance is the ultimate goal.

Victory. — This high yielding, moderately late maturing variety is still popular in many areas of the Peace River. The kernel is attractive and the straw long and of moderate strength. Its only disease resistance is to take-all root-rot. Although embodying many desirable characteristics its late maturity places it at a disadvantage.

Ajax. — Ajax, because of its early maturity, has become very popular during the last five years. It has only moderate yield and under drought conditions, a small, slim, unattractive kernel. The straw is of medium height and strength. It is partially resistant to all important diseases.

Banner. — Because of its production of large quantities of palatable straw, Banner is still grown for use as green feed. It is moderately late maturing, high yielding and produces a long, slim kernel of good quality. Its disease resistance is negligible.

Beaver. — First distributed in 1946, Beaver shows definite promise, indications being that it will be widely grown as soon as seed supplies are established. Its yield is similar to that of Ajax and its maturity slightly later. The straw is of medium length and excellent strength, and the kernel large, well filled and of good quality. The disease resistance is satisfactory.

Garry. — Garry is similar to Beaver except that it is susceptible to a highly destructive root-rot prevalent in Eastern Canada for the first time in 1947.

Larain. — Apart from exceptional earliness of maturity, Larain does not appear well suited to this area. The kernel is attractive but the yield low. The straw tends to be short and occasionally lodges. Its only disease resistance is to common root-rot

Legacy. — Legacy is criticized for having a long, slim and unattractive kernel. Nevertheless, it remains the Station's choice of the early-maturing varieties since it definitely outyields Ajax, Beaver and Garry. Its decline in popularity is attributed to its lack of rust resistance and to the difficulty of processing stocks containing wild oats.

TABLE 6.—OATS STATION DATA 1942-1947 INCLUSIVE

Variety	1945-1947				1942-1947			
	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
	dy.	in.		bu/ac	dy.	in.		bu/ac
Ajax	109·8	28·7	8·4	38·6	106·3	33·7	9·2	60·6
Banner	111·1	30·6	8·8	49·1	110·1	35·9	9·2	69·7
Beaver	109·9	29·2	9·3	40·1	107·3	33·3	9·6	60·7
Legacy	109·9	28·5	8·7	45·1	106·3	32·7	9·3	67·9
Victory	112·7	30·2	8·7	46·7	111·1	35·4	9·3	70·6
Garry	110·3	29·7	8·9	39·5				
Larain	108·9	28·4	7·7	31·2				

TABLE 7.—OATS LOCAL CROP TEST DATA 1945-1947 INCLUSIVE

Variety	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
	dy.	in.		bu/ac
Ajax	105·9	30·9	9·7	42·7
Beaver	106·3	31·1	9·9	42·8
Larain	102·9	30·3	9·5	35·7
Victory	109·1	32·2	9·7	47·2

Barley

Barley, on the whole, is poorly suited to the Peace River area. Some very satisfactory yields are obtained but under poor soil conditions or in dry years crops are short, the heads sometimes remaining in the boot. There is, however, a considerable acreage grown for feed, while a smaller acreage produces malting barley of very satisfactory quality.

Early maturity and high yield combined with good length and strength of straw are essential. Resistance to shattering, ease of threshing and removal of awns are desirable. Smooth-awned varieties are desirable but lose their advantage if the crop is combine harvested. Disease resistance, especially to covered smut, should also be given consideration.

O.A.C. 21. — O.A.C. 21, a six-rowed, rough-awned variety is the standard for malting quality in Canada. It is moderate yielding and late maturing, producing a long straw of only moderate strength. It is partially resistant to common root-rot and covered smut and is subject to shattering.

Montcalm. — Montcalm, first distributed in 1946, is comparable with O.A.C. 21 in malting quality and yield and has the further advantage of being smooth awned and strong strawed. It is moderately susceptible to common root-rot but is highly resistant to covered smut.

Fig. 8.—Swathing Montcalm barley, Grande Prairie district.

Olli. — Olli is a rough-awned, six-rowed variety acceptable as a malting or a feed barley. It is early maturing and moderate yielding, producing a short, strong straw. Generally it is classed as non-shattering but exhibits a tendency to shatter when slightly over-ripe. It is moderately resistant to covered smut. Its exceptional earliness makes it a good crop for weed control purposes.

Newal. — Newal, a six-rowed, smooth-awned variety is an important feed barley. It displays good yield, kernel and straw qualities but is medium-late maturing. It is moderately resistant to covered smut but is moderately susceptible to common root-rot and very susceptible to loose smut.

Titan. — This six-rowed, smooth-awned feed barley has enjoyed only limited production in the region. It is moderately early maturing and high yielding. It has exceptional strength of straw and the heads stand erect. It has the disadvantage that during a wet fall its awns are extremely difficult to remove. It is resistant to covered smut.

Warrior. — This hooded variety is similar to Olli in length and strength of straw, earliness of maturity and yield. Because of its unattractive appearance it has gained little importance. It could, however, be used to advantage by anyone wishing to produce feed barley.

TABLE 8.—BARLEY STATION DATA 1933-1947 INCLUSIVE

Variety	1944-1947				1933-1947			
	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
	dy.	in.		bu/ac	dy.	in.		bu/ac
Newal	102·8	26·7	9·0	33·3	104·1	33·1	8·4	48·7
O.A.C. 21	104·4	28·3	8·9	30·5	104·7	34·6	8·0	42·5
Olli	98·1	24·3	9·4	34·4	97·6	29·1	9·1	46·2
Montcalm	104·8	28·3	9·3	32·4				
Titan	101·9	25·0	9·7	31·6				

TABLE 9.—BARLEY LOCAL CROP TEST DATA 1945-1947 INCLUSIVE

Variety	Period of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
	dy.	in.		bu/ac
Montcalm	111·3	32·6	9·6	29·8
Newal	107·3	30·1	9·1	31·9
O.A.C. 21	110·4	32·2	8·9	25·7
Olli	103·4	25·6	8·9	27·1

Flax

Flax is a specialty crop in that it requires sod or clean fallow for best results and harvesting is difficult in wet weather. Maturity can be hastened by early seeding, about May 6 in the average season, by the use of a light application of ammonium phosphate and by the use of early-maturing varieties. The oil quality of Peace River flax rates exceptionally high.

Redwing. — Redwing is the only variety having sufficient earliness to be recommended for production in the Peace River region. This blue-flowered brown-seeded variety has good yield and the seed produces a satisfactory percentage of high quality oil.

Other varieties. — The recently licensed variety Dakota is slightly later maturing and lower yielding than Redwing. Although it produces slightly less oil than Redwing the product is of superior quality. Bison and Royal are too late maturing for satisfactory production in the Peace River area.

Field Peas

Although small acreages of field peas have been grown for a number of years it is doubtful if their production will ever reach economic importance in the Peace River area, particularly because of difficulties encountered in taking off the crop with standard harvesting equipment.

Fig. 9.—Variety test of field peas on Station.

As with the other crops earliness of maturity, good yield and resistance to shattering are of prime importance. For ease of harvesting good vine length is essential.

TABLE 10.—FLAX STATION DATA 1930-1947 INCLUSIVE

Variety	1945-1947			1930-1947		
	Period of maturity	Length of straw	Yield of grain	Period of maturity	Length of straw	Yield of grain
	dy.	in.	bu/ac	dy.	in.	bu/ac
Redwing	130·8	16·8	6·7	120·7	18·6	14·6
Bison	133·2	15·5	5·4			
Dakota	132·8	15·2	6·3			

Chancellor. — Chancellor is a small, round, yellow pea considered the standard for quality of field pea varieties. It is high yielding, moderately late maturing and has good length of vine.

Early Blue. — Early Blue is a semi-wrinkled, bluish-green pea, slightly larger than Chancellor. It is higher yielding and slightly earlier maturing than Chancellor. Its short vine makes its production on field scale prohibitive.

TABLE 11.—FIELD PEAS STATION DATA 1944-1947 INCLUSIVE

Variety	Period of maturity	Length of vine	Yield of grain
	dy.	in.	bu/ac
Chancellor	116·0	29·1	32·8
Early Blue	115·0	20·4	38·2

Winter Grains

Both winter wheat and fall rye are grown in the Peace River region but production has reached only minor importance. The main advantages of producing winter grain lie in distributing farm labour more evenly throughout the season, protecting land over winter from the ravages of erosion, controlling wild oats and safe cropping on wireworm-infested land. The major disadvantage is the tendency of the crop to winter-kill. This killing is induced by late seeding and by winter exposure or icing.

Winter Wheat. — Kharkov M.C. 22, because of its superior resistance to winter-killing, is the only variety considered suitable for production. It has good yield, maturity, height and straw strength. Its milling and baking quality is acceptable.

TABLE 12.—WINTER WHEAT STATION DATA 1927-1942 INCLUSIVE

Variety	Date of seeding	Date of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
			in.		bu/ac
Kharkov M.C. 22	Aug. 17·0	Aug. 17·3	33·3	8·6	30·5
Red Bobs*		Aug. 25·6	34·3	9·2	35·6

*Red Bobs, a spring wheat variety, is included for comparative purposes.

Fall Rye. — Dakold is considered the variety best suited to this area. Although fall rye is seldom sold under variety name most of the crops grown are of this variety. Dakold is a good yielder and matures early but like most varieties is rather weak in the straw and prone to shattering.

TABLE 13.—FALL RYE STATION DATA 1937-1942 INCLUSIVE

Variety	Date of seeding	Date of maturity	Length of straw	Strength of straw Scale 10 points	Yield of grain
			in.		bu/ac
Dakold	Aug. 26·0	Aug. 5·0	43·0	8·9	33·8
Red Bobs*		Aug. 17·4	31·6	10·0	33·5

*Red Bobs, a spring wheat variety, is included for comparative purposes.

Breeding for Superior Varieties

Wheat. — The major aim of breeding work at the Station has been to develop an early maturing variety embodying the other essential characteristics —good yield and quality, strong straw and ease of threshing combined with resistance to shattering and to disease. During the past eleven years the progeny of a number of crosses have been subjected to selection and testing.

Progeny from crosses received in 1937 from Ottawa were tested and by 1943 all except one selection from Supreme×928QQ2-35 had been discarded because of lack of earliness. This selection, designated as C.D. 3376, was tested at Stations across Canada but was discarded in 1946. The crosses tested were as follows:

482×Reward 22-42
Supreme×Reward 22-42
Supreme×928QQ2-35
(482B×Garnet)×Reward 22-42
Reward×Early Triumph
Reward×(Quality×Reward)
Canus×C-26-59·2H

A selection from a Canus-Reward cross made at the Station in 1933 was tested at Stations across Canada from 1945-1947 under the designation C.D. 3548.

During 1944 and 1945 some 200 promising selections were received from the Central Experimental Farm. The licensing of the early-maturing Saunders necessitated the discarding in 1947, of a number of these selections which had previously appeared promising. There are, however, thirty-one selections being held for advanced testing. The following crosses are involved:

Thatcher×44.7
(44·7×Thatcher)×(Garnet×Reward)
(Thatcher×Red Bobs)×(Thatcher×44·7)

Oats. — The progeny from a number of crosses have been tested in an effort to obtain a variety having earliness of maturity and a large, plump kernel of high feeding value.

Selections received from Ottawa in 1939 were discarded by 1947 as none were outstandingly early or possessed exceptional yield or seed characteristics. The seleetions were from the following crosses:

Legacy×Early Miller
R.L. 911×(Vanguard×Erban)

In 1946 and 1947 the following material was received and is under observation:

3044-91×Eagle	—	9 lines
1856-518×3044-91	—	21 lines
2806-A6×Eagle	—	4 lines
Beaver×Sask. 2140	—	18 lines
Larain×Sask. 2140	—	9 lines
Ajax×Sask. 2140	—	22 lines

FIG. 10.—Head-row plots of barley on Station.

Hulless Oats. — The breeding problem with hulless oats has been similar to that with the hulled types in that earliness, high yield and good kernel and straw characteristics are of major importance. Because of the limited importance of hulless oats in this region the breeding work has been carried on a minor scale.

Eight selections from Markton×Laurel were received from Ottawa in 1937 and by 1939 were discarded as none appeared as early as Liberty.

Twenty-one selections from (Laurel×Markton)×R.L. 915 and five selections from R.L. 1277×(Laurel×Markton) received from Ottawa are still under test.

Barley. — The main objective of the barley breeding program has been to obtain a high-yielding, strong-strawed, dual-purpose barley variety as early maturing as Olli. A number of excellent hybrids have been obtained but they have all lacked the earliness of Olli, thus have been discarded.

Between 1937 and 1944 a number of selections were studied but these lacked the essential earliness and only one selection from Velvet×Olli is being held for further testing. The crosses were as follows:

Newal×Peatland
(Newal×Peatland)×Plush
Nobarb×Manchurian
Nobarb×Olli
Regal×Beaver
Regal×Early Chevalier
Regal×Mensury
Regal×Olli
(Velvet×Mensury)×O.A.C. 21
Velvet×Olli
(Velvet×Olli)×Mensury
(Velvet×Olli)×Montanum
(Velvet×Olli)×O.A.C. 21
(Velvet×Olli)×Peatland

The following bulked families received in 1945 are undergoing selection and testing with some promising material in evidence:

Prospect×Common six-rowed
(Sanalta×Titan)×(Montcalm×Olli)
Velvon×Olli
Byng×Olli

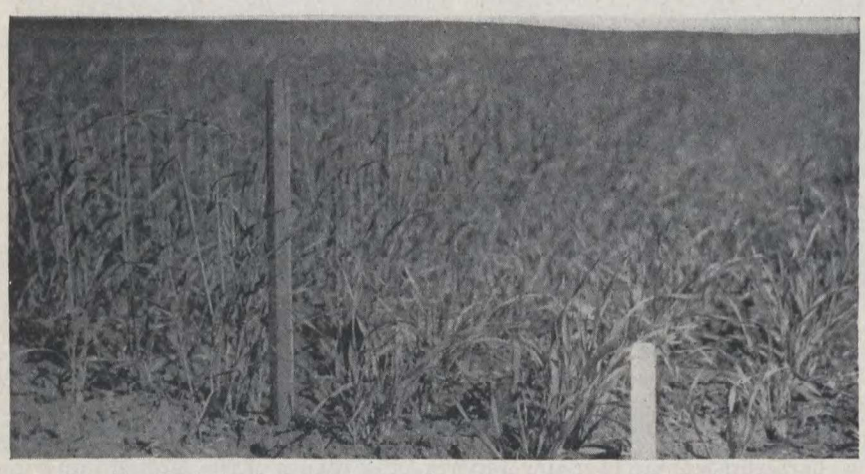

FIG. 11.—Variation in heading of barley under conditions of limited moisture.

Flax. — Only a limited amount of flax breeding work has been done at this Station. The object of the work undertaken has been to produce a large seeded variety of flax embodying the earliness of Redwing and good oil quality.

A number of lines of six crosses involving Slope, Diadem, N.D.R. 114. Linseed White, Walsh, Cyprus and Buda were received in 1938. However, none of these showed outstanding promise.

In 1944 selections from various combinations of the following varieties—Renew, Bison, Ottawa 770B, Buda, Kota, Redwing, B. Golden, Argentine and Walsh were received from Ottawa for observation. All except three selections from Walsh×Redwing have been discarded.

Seed Increase

Varietal Purification. — During the last three years of the period under review, the Beaverlodge Station has been attempting to purify stocks of Brighton oats, the seed of which develops hulled kernels. To date it has not been possible to obtain lines showing no segregation but it is hoped that by continued selection, lines will be established that will breed true. If this is accomplished these lines will then be used as the basis for the production of Foundation stock seed.

Maintenance of Foundation Seed Stock. — The Canadian Seed Growers Association holds the institution, instrumental in originating a new variety or having an introduced variety licensed for production in Canada, responsible for the maintenance of Foundation Stock seed of the variety. It is thus the duty of the Beaverlodge Station to maintain Foundation Stocks of Olli barley. During the past four years Foundation Stock of Thatcher wheat has also been produced from basic stock seed received from the Central Experimental Farm.

Maintenance of Pure Seed of Standard Varieties. — During the period covered by this report it has been the policy of the Station to keep on hand limited quantities of good seed of important varieties. It has not been the intention to meet all seed demands as there are many good seed growers who are equipped for large scale production of pure seed. It is felt, however, that the availability of small quantities of registered seed has contributed somewhat to the purity of crops in the region. Under this system quantities of Thatcher wheat, Olli barley and Redwing flax have been distributed.

Seed Supplies of New Varieties. — A quantity of Beaver oats was produced and distributed in 1946 to meet the demand for an early-maturing variety having a large, well-filled kernel.

In 1947, with the excellent co-operation of six farmers within a forty-mile radius of the Station, 2,400 bushels of Certified seed of the newly-licensed Saunders wheat were produced from 120 bushels of seed. This was distributed at a maximum allotment of six bushels per farmer, giving 400 farmers a start in this promising variety.

Cereal Diseases

It is fortunate that the Peace River area is relatively free from cereal diseases. The farmers of the district have never experienced the ravages of rust and have seldom, if ever, been faced with the necessity of removing ergot from barley. Those who have farmed in areas where disease is a serious hazard will realize that although there is little disease infestation at present it is wise to grow resistant varieties as a safeguard against what the future may bring.

To the seed grower, disease resistance is especially important. If he wishes his product to meet with a favourable reception on outside markets it is essential that the varieties produced have all possible resistance to disease.

Bunt. — Bunt or stinking smut of wheat is the only serious cereal disease present in the Peace River region. Its severity has been accentuated by the large-scale production of the highly susceptible variety, Red Bobs. It is hoped that much of the Red Bobs in the area will be replaced by the new moderately bunt-resistant Saunders, thus alleviating the situation. At present, a considerable portion of the wheat shipped out of the area is graded Smutty, constituting an appreciable loss to the farmer.

Other Diseases. — Two types of root-rot are sometimes present in wheat but normally are of little consequence. These are known as common root-rot and take-all. Take-all is most often found in wheat sown on land broken from grass.

On the Station in 1947 a severe infection of barley scald and a light infection of Helminthosporium stripe were encountered on Olli barley. There was also a moderate infection of Aschochyta blight on some of the pea varieties.

FORAGE CROPS

In the past decade forage crop production has advanced rapidly in importance in Peace River agriculture so that the sale of grass and legume seeds now represents a substantial portion of the farm income. In 1947 forage crops accounted for approximately 100,000 acres or roughly seven per cent of the cultivated land. The bulk of this was sown primarily for seed production. It is unfortunate that the use of forage crops for mixed farming has not increased with the same rapidity.

Hay Crops

Brome, a Superior Meadow Grass. — As land clearing proceeded settlers were soon confronted with the necessity of supplementing their native meadows with seeded forages. From the first, brome gave a good account of itself as a meadow grass. It was found to be winter-hardy and reasonably drought resistant. It established itself quickly, suppressed weeds exceptionally well and produced satisfactorily under a wide range of conditions. Repeated reports have been heard that it is difficult to eradicate but experience has shown that by proper working satisfactory eradication is practicable in normal seasons. Thirty years' experimentation at Beaverlodge has not brought forth a more productive meadow grass, as evidenced in Table 14.

TABLE 14.—YIELDS OF MEADOW GRASSES, AVERAGE OF THE 7 YEARS, 1934-1940 INCLUSIVE

Crop	Yield of cured hay in tons per acre
Brome	2·14
Crested wheat grass	1·70
Timothy	1·66
Western rye grass	1·42
Meadow fescue	1·42
Kentucky blue grass	1·17

Selections of brome grass, notably the Parkland strain, have been tested but none has proved superior to common brome.

Brome-Alfalfa, Good Companions. — The combination of brome and alfalfa is very effective. Not only do brome stands remain productive longer as a result of association with the legume but the forage is more palatable and more nutritious. Moreover, hay yields have been augmented about fifteen per cent. In addition, the inclusion of alfalfa largely overcomes the deleterious effect of brome sod on ensuing grain crops. Brome at eight pounds and alfalfa at six pounds per acre makes an excellent combination.

TABLE 15.—YIELDS OF BROME AND ALFALFA ALONE AND IN MIXTURES FROM TESTS CONDUCTED DURING 1936-1940 INC.

Crop	Yield in tons of cured hay per acre				
	First crop year	Second crop year	Third crop year	Fourth crop year	Total of 4 years
Alfalfa	1·23	1·69	1·56	1·46	5·94
Common brome	1·97	1·64	1·19	0·83	5·63
Parkland brome	1·82	1·68	1·30	0·91	5·71
Common brome and alfalfa	1·71	1·82	1·47	1·40	6·40
Parkland brome and alfalfa	1·67	1·90	1·63	1·47	6·67

Where Three Is Not a Crowd. — Seeding sweet clover with the brome-alfalfa mixture has merit. In most years this biennial legume makes considerable growth in the first hay crop, thus preventing weed intrusion. Moreover, with its dying out it leaves a beneficial residual effect on the soil which is taken advantage of by the brome and alfalfa. A seeding mixture of six pounds each of brome, alfalfa and sweet clover has been found very commendable.

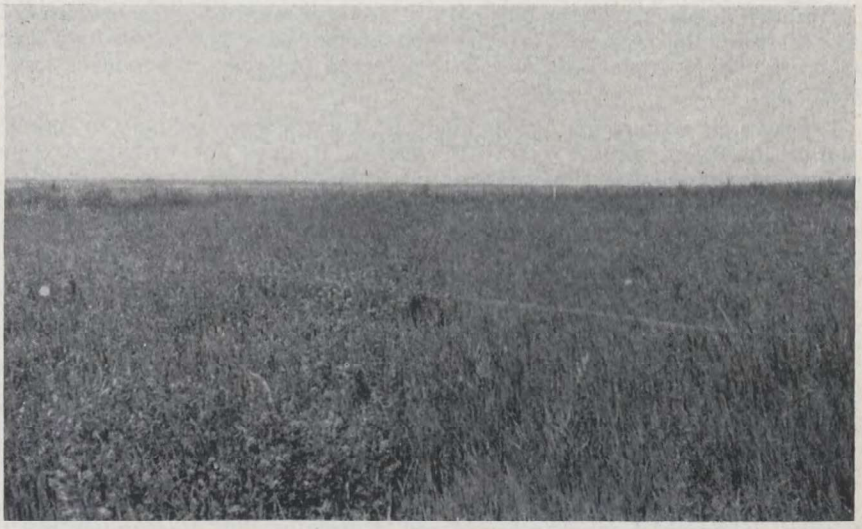

FIG. 12.—Effect of legume in a five-year-old meadow. Brome and alfalfa, left; brome only, right.

Pure Alfalfa Difficult To Cure. — Pure alfalfa stands for hay have never been popular in the Peace River region. At first there was difficulty in obtaining satisfactory catches on raw lands due to poor inoculation of the seed. Even with the soil properly inoculated, alfalfa establishes itself slowly and is a poor competitor of weeds. Moreover, it demands care in seed-bed preparation if good stands are to be obtained. The forage is subject to loss from defoliation and in wet seasons is difficult to cure. While alfalfa equals brome in yield of hay it does not surpass a brome-alfalfa mixture.

Good Hay From Sweet Clover. — The popularity of sweet clover was originally due to its ability to improve grey wooded soils rather than to its hay qualities. However, settlers on these whitish soils soon found that if it was cut with a binder in early bloom and cured in the stook it made very satisfactory forage. If sweet clover is tied loosely in small bundles set six to the stook it cures into bright hay except in periods of prolonged wet weather. Moreover, it is consumed readily by livestock once they become accustomed to the flavour.

An important advantage of sweet clover is that it can be very readily worked into short rotations. Much concern has been expressed from time to time as to sweet clover becoming a weed. This need be only where it is grown repeatedly for seed. If the seed is well scarified, the crop cut for hay and the stubble ploughed under as soon as feasible after haying there need be little fear of it contaminating the farm. Application of 2,4-D will eradicate sweet clover from stands of grain or grass but lethal doses may be too heavy for cereals.

Satisfactory stands of sweet clover can be obtained on most soils. The Station's long-term average yield for Arctic sweet clover is 1·83 tons of cured hay per acre, as compared with alfalfa at 1·63 tons for the same period.

Other Grasses and Legumes. — Except for special localized conditions all other grasses and legumes are inferior as hay crops to brome, alfalfa, sweet clover or mixtures of these. Crested wheat grass has a place only on the driest uplands. However, it catches readily and is useful in holding steep slopes subject to wash as its roots form a thick, fibrous sod. On most soils it is much inferior to brome in hay production.

Timothy is advocated for hay only in areas assured of extra moisture. Like brome, it forms a tough sod, which when broken may be followed by sparing grain crops. On average soils and with average moisture it produces less hay than brome.

At one time western rye, or slender wheat grass, gave evidence of becoming an important forage but is now little grown. It does not withstand drought successfully and is subject to root-rot infection which may seriously affect an ensuing crop of wheat. It fails to spread across vacant spaces, thus stands tend to become weedy. Although it cannot compare with brome in hay yield it produces an excellent sod that breaks easily.

Other grasses tested for hay production are Kentucky blue, meadow fescue, red top, reed canary and orchard grass. None of these is worthy of mention for meadow purposes unless for rather exceptional locations. Kentucky blue and red top are primarily pasture species and do well only where there is ample moisture. Reed canary grass may be satisfactory on very wet lands or fields subject to flooding but under normal moisture conditions cannot compete with brome from a hay standpoint. The present strains of meadow fescue and orchard grass are not sufficiently winter-hardy.

Alsike and Altaswede red clover are the only legumes other than alfalfa and sweet clover which may be considered. Normally, both yield much less than alfalfa. Altaswede, in particular, is more difficult than alfalfa to cure. Alsike does well on heavy clay lands in districts of above-average precipitation. Altaswede also requires a plentiful supply of moisture but prefers an open, friable soil.

Hints for Better Meadows. — Most forage crops are perennial, emphasizing the need for securing full, strong stands. Seeding without a companion crop is one way to ensure early, vigorous growth but this practice is costly as a crop year is sacrificed. Then too, for a non-nurse-crop seeding to be successful the land must be reasonably free of weeds. Fortunately, such seedings can be delayed till early July and yet permit the grass and clover time to establish themselves firmly before winter. Thus, in most years many weeds can be killed by a cultivation

or two before seeding. Late fall seeding of forage crops is not recommended for the Peace River region.

Nurse-crop seedings are more economical and, if successful, are less troublesome than those where no companion crop is used. Where weeds are not a problem flax is an ideal nurse crop except in the case of sweet clover where the growth of the latter may swamp the flax. Peas also serve as a satisfactory companion crop. Of the cereal grains Olli barley is outstanding for the purpose. If wheat is used it should be seeded at slightly reduced rates, while with oats the rate may well be halved.

The small size of most forage seeds renders them very sensitive to depth so that they must be sown shallow. This demands that every effort be taken to conserve moisture and to ensure a firm seed-bed. Seeding on new, loosely worked ploughing should be avoided. While brome can safely be seeded at one and one-half inches, crested wheat grass, creeping red fescue and the larger seeded legumes such as alfalfa, sweet clover or red clover are best sown at about one inch in depth. Smaller seeds such as timothy, Kentucky blue and alsike should be covered by not more than one-half inch of soil. For this reason and to ensure better packing of the seed-bed it is urged that where a nurse-crop is employed the meadow crops be seeded by a second drilling operation.

Rates of seeding should be in line with the purpose for which the stand of forage is intended. Thus, hay lands should be seeded heavier than where seed production is the object, yet somewhat lighter than where pasture is desired.

Top dressing of meadow lands with commercial fertilizer has not generally proved economical. Barnyard manure has been found to be more effective. Applications made in the early winter period serve to trap snow and to reduce spring run-off.

Better Pastures

Cultivated Pasture Mixtures. — In seeding down a pasture cultural practices similar to those outlined for hay crops are advised. Rates of seeding should be increased somewhat and some modification made in the selection of the forage crops employed. Preliminary pasture trials indicate that the standard brome-alfalfa mixture is very satisfactory. By use of this mixture the danger of bloat from alfalfa is lessened and a highly nutritious forage is obtained. Growers of creeping red fescue for seed production have found this grass to provide excellent late fall and winter pasture. Chemical analyses substantiate this observation. Although fescue during the spring and summer is not more nutritious than brome it does not winter-off like the latter but retains a moderately high feeding value after freeze-up. Indications are that the addition of creeping red fescue to a brome-alfalfa mixture is also an excellent means of improving summer pasture.

Timothy and Kentucky blue grass provide nutritious pasture but their successful establishment is limited to areas of extra moisture as neither grass does well under dry conditions. Crested wheat grass, on the other hand, is only recommended on soils too dry for the ready establishment of other grasses. Alsike and Altaswede red clover cannot be regarded under most conditions as pasture species. White or Dutch clovers, though known to make admirable pastures elsewhere are not sufficiently winter hardy or productive under Peace River conditions.

Productive Pastures on Burnt-over Lands. — Burnt-over areas can be seeded to valuable pastures if certain precautions are taken. The essentials are that the grass and the legume seeds reach the ash before wild herbs become established. This can be accomplished by scattering the seed early in the spring

following the year of the fire. Spreading the seed on top of the last of the snow and trampling by livestock will aid its dispersal in the ash. By this means good catches of brome, crested wheat grass, creeping red fescue, timothy, sweet clover, alsike and occasionally even alfalfa have been obtained. Care of the rough pasture should not end with its establishment. Grazing the first season or two must be light to permit the species to reseed. Additional scattering of seed may be advisable.

FIG. 13.—Stand of crested wheat grass on area burnt over the previous year. Unseeded area in foreground.

Native Pastures Can Be Valuable. — Many settlers have found it necessary to improve their native pastures to meet their grazing requirements. To incorporate tame grasses or legumes into a permanent native meadow is a much more difficult task than getting cultivated forages established on areas newly burnt-over. One difficulty is getting the seed to germinate and to maintain itself. The seed is best scattered in the very early spring or during a time of intensive and prolonged summer rainfall. Intensive trampling by livestock for a short period after seeding is beneficial. Over-pasturing must be avoided and repeated scattering of seed may be necessary. With care, cultivated species such as brome, sweet clover and timothy have been established and have in time added greatly to the carrying capacity of the pasture.

SEED PRODUCTION

The significance of grass seed production in the Peace River region was brought out by a survey completed late in 1947. This indicated that of a total of 102,000 acres in forage crops, 77,000 were employed for seed production.

Row Versus Broadcast Seeding. — To establish forage crop stands for seed production the same practices apply as in obtaining successful meadows or pastures. Reduced seeding rates must be employed, however, as close competition will seriously curtail heading and seed filling. In some regions grasses and legumes are grown in rows to overcome this turf-like condition. In this way seed yields are enhanced and the productive period of stands prolonged. Weeds must be controlled and severe water erosion is the aftermath of any

attempt to cultivate between the rows. The practice is not feasible in the Peace River region. Thinly-sown broadcast seedings are preferred for seed production.

Brome, a Reliable Seed Crop. — Brome has long been a popular seed crop. One obvious reason is that stands of it are fairly easy to obtain and unlike some grasses such as creeping red fescue it will produce satisfactorily for at least four or five years. Although adaptable to most soils it does best on the darker types. A 200-pound seed crop is considered normal. The binder is usually preferred for harvesting as the crop is subject to loss by shattering and the threshed straw is moderately palatable to livestock. Stands can be renovated relatively cheaply by ploughing followed by light top working. Couch grass is a most dangerous weed in brome and every effort should be made to prevent its establishment.

In recent years some 2,500,000 pounds of brome seed have been produced annually in the Peace River region.

FIG. 14.—Duraturf creeping red fescue in rows for seed production, July 14.

Creeping Red Fescue. — During the war years a ready market and an attractive price made creeping red fescue popular as a seed crop. It requires more care than brome for its successful production. If creeping red fescue is seeded with a nurse crop it should be arranged that the grass seedlings do not have to compete directly with the more robust young cereal plants. This can be assured in part by cross-drilling the grass seed as a second operation. Another satisfactory method is drilling the grass and cereal seed through alternate grain spouts.

For reasons not well understood, creeping red fescue is somewhat uncertain in its seed set. In general, stands produce substantial yields the second and third years after seeding. A productive crop may be secured the year following seeding if the grass is seeded without a nurse crop and if there is sufficient moisture for normal growth.

Yields of creeping red fescue have ranged from almost nothing to over 700 pounds per acre. However, 200 pounds is considered an average yield. Total production of creeping red fescue seed in the Peace River country has in recent years approximated 400,000 pounds annually.

The Station has grown the variety Duraturf for several years. Although this variety has never been compared directly with the Olds strain there is every indication that it sets seed satisfactorily.

Other Grasses for Seed Production. — Fairway crested wheat grass has from time to time been grown for seed and has given fair returns. Usually it produces only two or three good crops after which it throws heads sparingly. A yield of 300 pounds per acre is considered satisfactory. Couch grass can be a serious problem with this crop.

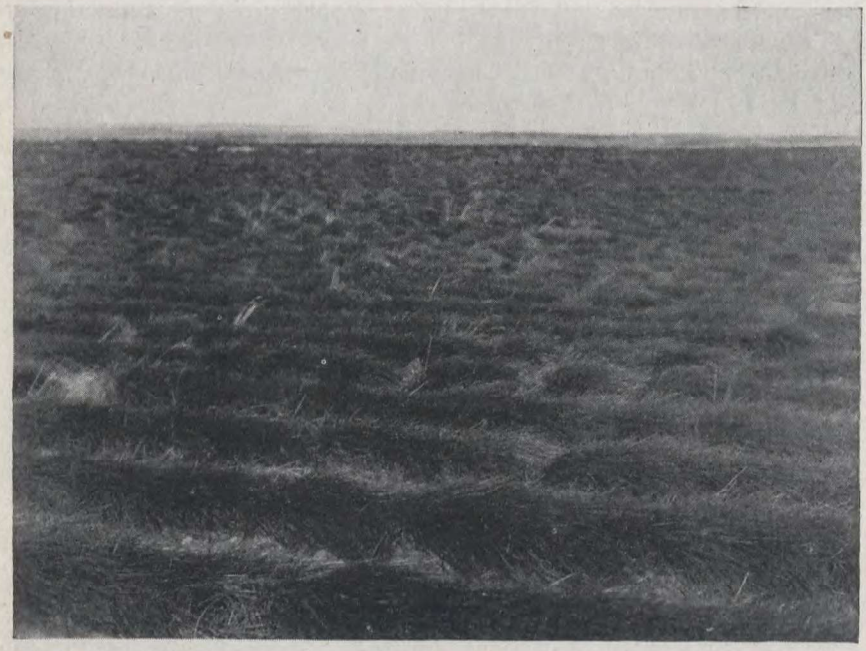

FIG. 15.—Late autumn growth of creeping red fescue after removal of seed crop, July 30.

Timothy was at one time grown extensively for seed but has reacted to market trends. It suffers extensively during dry years. Moreover, it is regarded as a weed in districts where alsike seed is grown.

The Case of Alfalfa. — Alfalfa as a seed crop has been a great boon to settlers on grey wooded soils. It has also done remarkably well on river bottom lands enclosed by hills or steep banks. Possibly the reason for this is due to soil type or localized climatic condition, but close observation suggests that wild bee activity is a more important factor. It is known that seed setting of alfalfa is largely dependent on the work of wild bees. Wind and sudden changes of temperature and humidity may aid tripping of alfalfa flowers but are not greatly effective in cross-pollination, an essential for a satisfactory seed set of alfalfa. Honey bees, unless forced, play a minor role in pollinating alfalfa. Wild bees and suitable weather for their activity would seem to be the answer. Alfalfa seed yields are roughly proportional to the amount of wild land nearby.

Seed yields of alfalfa vary considerably. Production may range from almost nothing to as high as 700 pounds per acre, with 150 pounds considered a fair average. In recent years approximately 3,000,000 pounds of alfalfa seed have been produced annually in the Peace River region.

Problems With Sweet Clover. — To grow sweet clover for seed is to invite this crop on your farm to stay. For certain crops this may not be a serious disadvantage, but if alfalfa or red clover is to be grown for seed sweet clover must be regarded as a serious weed. In the commercial trade sweet clover is sold as white or yellow blossom, and it is a point of controversy which type is most suitable. Yellow blossom sweet clover is earlier and in certain years produces seed more prolificly. It is the more dangerous of the two types from a weed standpoint. Seed of the white blossom clover is often in stronger demand.

Seed yields of sweet clover vary greatly depending on the season. A yield of 300 pounds per acre is considered normal. Of late the production of sweet clover seed in the Peace River region has approximated 6,400,000 pounds annually.

FIG. 16.—Sweet clover for seed production in swath.

Alsike, a Productive Seed Crop in Certain Areas. — Alsike is not entirely adapted to the Peace River region. It is subject to winter-killing and in the occasional season losses from this cause may be severe. Heavy, moisture-retaining land is the natural habitat of alsike and in areas of extra precipitation productive crops can usually be secured. Weeds are a constant threat and some like night-flowering catchfly and American dragonhead have seeds which are almost impossible to remove. Timothy grows well with alsike and if care is not taken this grass will volunteer freely.

In areas suited to alsike, yields may range from 100 pounds to as much as 800 pounds per acre, though 200 to 300 pounds is regarded as average. Great loss of seed both before and during harvest is associated with alsike. There is no way this loss can be entirely prevented but with care it can be considerably reduced. The two best methods of harvesting are direct combining or swathing and combining after the seed has cured in the windrow. The first practice may involve considerable pre-harvest shattering of seed, the latter serious loss in the swath.

Alsike seed production in the Peace River region has increased markedly in recent years. Production for a normal year is estimated to be 1,900,000 pounds.

FIG. 17.—Alsike for seed production, Hinton Trail district.

Altaswede Not Entirely Adaptable. — Districts in which Altaswede red clover can be grown successfully are fairly restricted. Although Altaswede prefers more open and friable soils than alsike it nevertheless requires additional moisture to that normally afforded by Peace River precipitation.

Like alfalfa, Altaswede must largely rely for fertilization of its flowers on wild bees and other native pollinating insects. Its flower heads do not shatter their seed readily so that straight combining has proved satisfactory. Some growers prefer binding and threshing and find it profitable to run the clover through the thresher twice. In areas suited to it Altaswede shows perennial tendencies to the extent that five and six crops have been frequently harvested from a single seeding.

Yields of Altaswede seed vary greatly according to moisture supply. A yield of 200 pounds per acre is considered satisfactory. The annual production of Altaswede seed in the Peace River region is estimated to be in excess of 300,000 pounds.

Seed Production of Other Legumes. — Various white clovers have been tested at the Station for seed production. Ladino clover has proved to be a shy seed producer. Moreover, it has killed out severely in some years. Some of the Danish white clovers have proved much hardier and set seed more profusely than Ladino. However, their low growth, especially in dry years would necessitate the use of special harvesting equipment. In favourable years yields of 500 to 700 pounds of plump, bright seed have been secured without harvest loss from the Danish strains as well as from ordinary white Dutch clover. Such yields would be highly profitable if they could be secured commercially.

VARIETAL TRIALS

Many Alfalfa Varieties Tested. — Over a twenty-year period a number of alfalfa varieties have been tested for hay and seed production, hardiness and disease resistance. Grimm is taken as the standard for comparison. Ladak is the keenest rival of Grimm. It is distinctly a single cut alfalfa and over the ten years it has been under test it has surpassed Grimm in yield of forage by 13·5 per cent.

In yield of seed it is essentially the same as Grimm. It is as hardy as the standard and in addition, is reported to possess partial resistance to bacterial wilt, which may soon be an important consideration in the alfalfa seed trade.

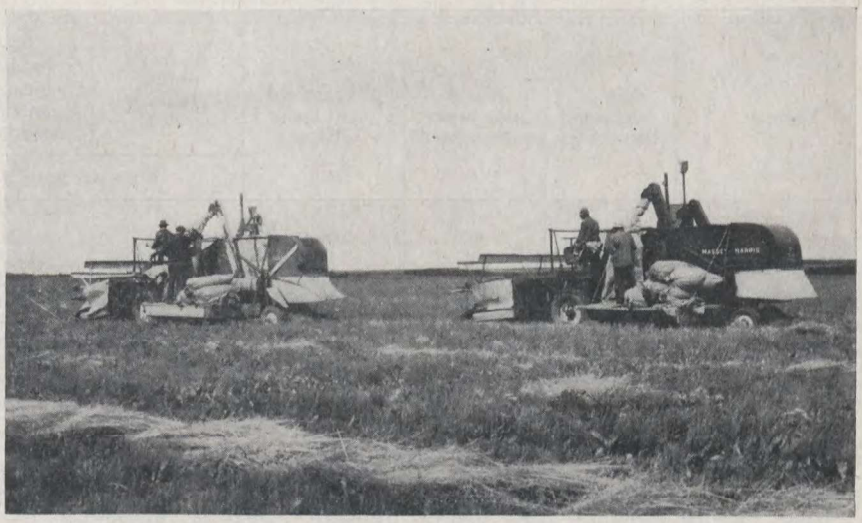

FIG. 18.—Combining seed crop of creeping red fescue in broadcast stand, Beaverlodge district.

Ferax is a high seed-setting alfalfa but has no other characteristic to recommend it over Grimm. In three years' limited testing for seed production it surpassed Grimm by 37 per cent, but in seven years' testing for forage it fell below it by 12 per cent. Like Grimm, it is not resistant to bacterial wilt. Canauto, a self-tripping strain developed at the Dominion Forage Crops Laboratory, Saskatoon, in three years produced 13·4 per cent more seed than Grimm but over seven years 5·9 per cent less forage. It does not appear entirely adapted to Peace River conditions and is also susceptible to bacterial wilt.

Rhizoma, the creeping-rooted variety developed at the University of British Columbia, has in seven years' testing outyielded Grimm in forage by 8·5 per cent. Although it possesses a high percentage of plants with low crowns it does not exhibit the true creeping habit under Peace River conditions.

Viking is a variety noted for its hardiness and is said to withstand pasturing well. At Beaverlodge it has shown itself to be extremely hardy. In eight years' testing it surpassed Grimm in yield of forage by 2·7 per cent. Cossack, another very hardy variety, yielded over twenty years 4·8 per cent less forage than Grimm. Both Viking and Cossack exhibit partial resistance to bacterial wilt. Yellow-flowered Siberian, a *falcata* type, is undoubtedly the hardiest and most agressive of all alfalfas under trial. However, it gives a poor yield of forage in dry years and has the undesirable habit of volunteering freely.

Newest in development are the varieties Ranger and Buffalo, produced in the United States for resistance to bacterial wilt. Ranger, selected for use in the north-central States has in two years' testing at Beaverlodge, averaged 6·2 per cent less forage than Grimm, while Buffalo, bred for more southern areas, averaged

in the same period almost 20 per cent less than Grimm. Buffalo definitely lacks winter hardiness.

TABLE 16.—COMPARATIVE PERFORMANCE OF ALFALFA VARIETIES DURING THE PERIOD 1925-1947 INCLUSIVE

Variety	No. of seedings represented	No. of plot years represented	Percentage yield basis Grimm	Average actual yields of cured hay	Comparable yields of Grimm grown in the same years
				Tons per acre	
Grimm	17	292	100·0	1·38	–
Ladak	10	152	113·5	1·51	1·33
Viking	5	56	102·7	1·14	1·11
Ferax	4	40	88·1	1·04	1·18
Canauto	4	40	94·1	1·11	1·18
Rhizoma	4	40	108·5	1·28	1·18
Ranger	2	8	93·8	0·76	0·81
Buffalo	2	8	80·2	0·65	0·81

Sweet Clover Varieties. — In the commercial trade sweet clover usually goes as either "white blossom" or "yellow blossom" with no indication of what varieties constitute these two types. In the Peace River region "white blossom" is presumably Arctic and "yellow blossom" the variety Erector. Each has its merits and each its advocates. Over a five-year period at Beaverlodge, Arctic has yielded seven per cent more forage than Erector. However, the coarser growth of the white-blossom variety makes for less palatable fodder and in wet years more difficulty in handling.

Redfield Yellow yielded 29·3 per cent more forage than Arctic over a three-year period but is late maturing and coarse growing, hence it cannot be generally recommended. Zouave, a yellow-flowered type of about the same growth habit as Arctic, averaged in a ten-year period 2·1 per cent more hay than the white-blossom variety. Alpha, a dwarf type noted for its high quality forage, yielded over seven years 16·2 per cent less than Arctic. Alpha does not seem to be suited to Peace River conditions.

Intertilled Annual Crops

Ensilage Corn Not Practicable. — Production of fodder corn is not consistent. In warm, moist summers some remarkable yields have been obtained. In 1941 one of a group of hybrid corns yielded 33·9 tons of green forage or 5·1 tons of dry matter per acre. In that year Falconer produced 20·5 tons of green weight or 3·3 tons of dry matter per acre. Much below the 1941 returns are the long-term average yields. Falconer over a six-year period yielded on an average 9·6 tons of green fodder or 1·6 tons dry matter per acre, while Northwest Dent, a more precocious variety averaged over the same period 6·3 tons of green or 1·1 tons of dry matter per acre. Obviously, the use of corn for ensilage is not warranted in the Peace River region.

Field Roots. — The growing of roots under field conditions is fraught with hazards. Cold spring winds, dry weather and insect attack are the worst offenders. Danger of autumn frost compels early lifting. Mangels have been crown-injured

TABLE 17.—YIELD NORTHWEST DENT CORN 1937-1942 INCLUSIVE

Year	Yield in tons per acre	
	Green weight	Dry matter
1937	0·09	–
1938	4·07	0·65
1939	10·25	1·61
1940	5·67	1·13
1941	13·33	2·23
1942	4·17	0·83
Average, 6 years	6·26	1·07

as early as mid-September, while swedes, most frost-resistant of all root crops, are unsafe in the field after the middle of October. Since storage and feeding present further problems, field roots seem destined to play a minor role in Peace River agriculture, though a few grown in moist, sheltered spots and stored in cellars conveniently adjoining the stables have a place.

TABLE 18.—COMPARATIVE YIELDS OF FIELD ROOTS 1936-1940 INCLUSIVE

Crop	Variety	Five-year average, green weight per acre, tons
Swedes	Ditmars	21·4
Turnips	Greystone	21·1
Mangels	Yellow Intermediate	12·3
Sugar beets	Rabbethge and Giesecke	7·9
Carrots	Oxheart	5·8

Rape and Kale. — Fleshy annuals, such as rape and kale, have only a limited place as soiling crops or as pasture. Furthermore, they cannot be feasibly stored for any length of time for feeding purposes. Over a ten-year period Dwarf Essex rape gave 15·0 tons and Thousand-Headed kale 17·2 tons of green forage per acre annually.

Special Investigations

A More Adaptable Clover Needed. — Sweet clover has been widely used as a forage crop and soil improver but its volunteering tendency and the danger of melilot taint in wheat have made it somewhat unpopular. One solution would be an alternative legume and this has caused renewed interest in Altaswede, a hardy selection of late Swedish red clover. Although earlier trials had shown Altaswede to be less winter-hardy and less drought-resistant than sweet clover, a test of these two clovers seeded with brome, timothy and crested wheat grass was undertaken in 1941.

The experiment comprised six seedings made in consecutive years with three hay crops taken from each seeding. Each seeding involved sweet clover and Altaswede in mixture with three grasses, viz., brome, timothy and crested wheat grass. Yields have indicated that the type of grass with which the clovers were grown was of no great importance. In all cases the advantage, though slight, was

FIG. 19.—Heavy crop of hybrid corn on Station, 1941.

consistently in favour of sweet clover and ranged from three per cent in the case of timothy to nine per cent in the case of brome and crested wheat grass. Sweet clover, a true biennial, did not promote the first year's hay yields over those where Altaswede was the legume component, neither were the second and third season's cuttings from the stands below those taken from the red clover-grass plots even though the perennial clover constituted a considerable portion of the stands.

Meadow Crops in Short Leys. — It has been a common observation that brome and timothy sods which have been down for several years are followed for a time by rather poor grain crops. The sods are slow to decompose, especially if the season be dry or the breaking done late.

An experiment, embracing the use of three grasses, brome, timothy and crested wheat in leys of one and two years' duration, was conducted over an

TABLE 19.—YIELDS OF SWEET CLOVER AND ALTASWEDE IN GRASS MIXTURES DURING THE PERIOD 1941-1945 INCLUSIVE

Mixture	Average yields in tons of cured hay per acre			
	First crop year	Second crop year	Third crop year	Total crop 3 years
Sweet clover plus:				
Brome	1·25	1·04	0·99	3·28
Timothy	1·12	0·73	0·59	2·44
Crested wheat grass	1·31	0·89	0·79	2·99
Altaswede plus:				
Brome	1·24	0·86	0·90	3·00
Timothy	1.07	0.63	0.68	2.38
Crested wheat grass	1.31	0.66	0.77	2.74

eight-year period. Because sweet clover worked in very nicely with short leys and because it tends to augment the first hay crop, it was chosen as the legume component. Results indicate that if brome, timothy or crested wheat grass is sown with sweet clover there is no particular advantage with respect to hay production if the stand is not cropped more than two years. Moreover, the sods broken after two years' crop did not present the usual deleterious effect on following grain crops. Furthermore, these sods did not offer any particular difficulty in breaking and working.

Plant Introduction

The Beaverlodge Station is on the alert for species of plants that may have agricultural value to the Peace River region. A forage plant nursery is kept for this purpose and new plants are tested in rows or in small broadcast plots. Those that prove promising are set out in comparative trials against standard crop varieties. Since the Station was established over 300 plant selections have thus been studied. Noteworthy amongst the material tested have been strains of brome, timothy, crested wheat grass, creeping red fescue, red and white clovers and alfalfa. Perhaps the most significant result of the work is the confirmation of the dependability of standard material regardless of claims attributed to new material.

FIELD HUSBANDRY

Fertilizers

Commercial fertilizer applications to farm crops have produced inconsistent returns. Their benefits have frequently been overruled by drought or other cause, but, on the whole, applications of phosphorus, and to some extent nitrogen, have proved advantageous.

Light Fertilizer Application for Cereals Recommended. — Although few of the present agricultural soils in the Peace River area require fertilizers to bolster their basic plant food supply, light applications may serve an important function. It is now recognized that there is a period in early spring when phosphorus and nitrogen are not readily available in the surface layers of the soil. Some leaching of nitrates may occur at times and temperatures are too low in early spring to stimulate micro-organic activity for release of further supplies. Light dressings of ammonium phosphate fertilizers correct these conditions to a large extent since they supply the seedling plants with essential nutrients until the time that the soil warms up and roots have penetrated to the deeper soil layers. Given a strong start, the cereals can compete with weeds more effectively as well as resist disease and insect attack. In certain years, however, this strong early growth has proved a disadvantage, as the heavy stand which developed suffered during subsequent periods of restricted moisture.

Ammonium phosphate (11-48) has proved the most effective and economical fertilizer for cereals. In favourable years the application of a 35-pound dressing has increased yields of wheat by as much as five bushels per acre but in average seasons a two to three bushel increase is the rule. The same increases apply generally to oats and barley. It is considered that 20 pounds per acre may be as satisfactory as 35 pounds and except for special cases applications of over 50 pounds are not recommended.

Fertilizer Application to Meadows Not Profitable. — Commercial fertilizer application to meadow or pasture lands has not been found profitable. Dressings made annually for a period of five years on a brome-alfalfa meadow indicated that although fertilizers containing phosphorus produced some increase in yield, in no instance were they sufficient to pay for the cost of the fertilizer. Fertilizers lacking phosphorus gave no yield increase. Contrary to results obtained on the grey wooded soils of west-central Alberta, application of sulphur to Peace River soils has not promoted extra growth of forage crops.

TABLE 20.—ANNUAL SPRING APPLICATIONS OF FERTILIZER TO BROME-ALFALFA MEADOW 1943-1947 INCLUSIVE

Fertilizer	Rate per acre	Pounds plant food per acre				Tons cured hay per acre					
		N	P_2O_5	K_2O	S	1943	1944	1945	1946	1947	Average
Borax	20	–	–	–	–	1·85	1·03	0·89	0·34	0·59	0·94
Sulphur	20	–	–	–	20	2·03	1·17	0·85	0·39	0·53	0·99
Gypsum	112	–	–	–	20	2·13	1·17	1·09	0·47	0·70	1·11
Complete	62	4·6	20	10·4	–	2·04	1·16	1·13	0·53	0·77	1·13
Ammonium sulphate	80	16	–	–	20	2·07	1·17	1·08	0·47	0·83	1·12
Ammonium phosphate (11-48)	42	4·6	20	–	–	2·05	1·18	1·11	0·52	0·79	1·13
Ammonium phosphate (16-20)	100	16	20	–	14	2·06	1·16	1·21	0·57	0·89	1·18
Triple superphosphate	47	tr	20	–	tr	2·09	1·18	1·09	0·49	0·97	1·16
Check	–	–	–	–	–	1·87	1·10	1·04	0·46	0·81	1·06

The Carry-over Effect of Fertilizers Usually Slight. — Trials with commercial fertilizers have indicated that unless rates are increased considerably over those generally recommended the effect is not carried into a second season. It is much more economical to apply light dressings of fertilizer to the crop at hand rather than to fertilize heavily with the intention of increasing yields over a period of years.

Fertilizer For Intertilled Crops. — Applying light rates of fertilizer when seeding intertilled crops has produced no worthwhile results. A seven-year experiment wherein 30 pounds of ammonium phosphate (11-48) was suitably placed near seed of seven different row crops, corn, rape, mangels, sugar beets, carrots, swedes and turnips indicated that only in the case of corn and carrots were yields of green and dry matter promoted to any extent.

TABLE 21.—FERTILIZER APPLICATIONS TO INTERTILLED CROPS 1934-1940 INCLUSIVE

Crop	Average yield in tons per acre			
	No fertilizer		Ammonium phosphate at 30 pounds per acre	
	Green weight	Dry matter	Green weight	Dry matter
Corn	7·78	1·30	9·01	1·58
Mangels	12·14	1·52	11·65	1·44
Sugar Beets	7·23	1·70	7·58	1·82
Carrots	5·05	0·57	5·84	0·67
Swedes	19·76	2·52	20·92	2·68
Rape	16·61	3·18	17·53	3·56
Turnips	20·76	1·94	20·14	1·85

Fertilizer Application to Potatoes. — Five years' testing with potatoes has suggested that yields can be improved by commercial fertilizer. However, it is doubtful if the increases were produced economically. Three hundred pounds of ammonium phosphate (11-48) increased yields about 20 per cent. Nitrate of soda caused a slight drop in yield. Barnyard manure applied in the furrow at the rate of ten tons per acre was about as effective as the ammonium phosphate application.

TABLE 22.—FERTILIZER APPLICATION TO POTATOES 1936-1940 INCLUSIVE

Fertilizer	Average yield in bushels per acre per year	
	Irish Cobbler	Carman
Superphosphate @ 300 lb	196	271
Ammonium phosphate (11-48) @ 300 lb	222	291
Nitrate of soda @ 217 lb	176	224
Muriate of potash @ 150 lb	184	240
Superphosphate @ 300 lb., nitrate of soda @ 217 lb	212	267
Ammonium phosphate (11-48) @ 300 lb., muriate of potash @ 150 lb	229	289
Barnyard manure, 10 tons	232	271
No fertilizer	182	242

Barnyard Manure Is Effective Over Several Years. — The use of barnyard manure in crop rotations has been extensively studied. Experiments have repeatedly shown its pronounced carry-over effect. In a four-year rotation of fallow, wheat, wheat, oats where manure was applied at the rate of ten tons per acre in the fallow year and ammonium phosphate (11-48) was drilled in at thirty-five pounds per acre with each wheat crop, the commercial fertilizer affected only the crop to which it was applied, whereas the single application of manure carried rather strongly throughout all three years.

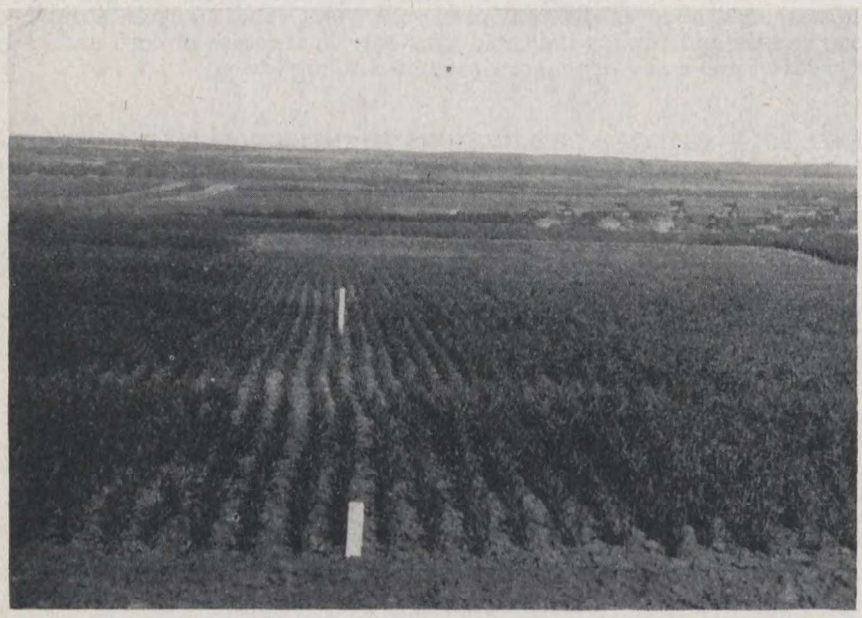

FIG. 20.—Reward wheat showing effect of ten tons barnyard manure applied the previous year. Stakes mark centre of unmanured plot.

TABLE 23.—MANURE AND FERTILIZER IN WHEAT-WHEAT-OATS ROTATION 1936-1944 INCLUSIVE

Treatment	Yield per acre		
	First wheat crop after fallow	Second wheat crop	Yield oat hay, third crop after fallow
	bu.	bu.	tn.
No fertilizer	19·5	18·6	1·66
Barnyard manure	28·5	21·4	1·91
Ammonium phosphate (11-48)	25·9	20·1	1·77
Manure plus fertilizer	29·7	20·9	2·13

Barnyard manure at ten tons per acre applied in summerfallow year.
Ammonium phosphate (11-48) applied to each wheat crop.

Another experiment involving a four-year rotation of wheat, wheat, oats, sweet clover in which manure was applied at ten tons per acre following the

harvesting of the clover hay and ammonium phosphate (11-48) drilled in with the first and second wheat crops indicated that the effect of the fertilizer had disappeared entirely with the second crop after application but that the effect of the manure was apparent in the oat and the sweet clover hay crops harvested three and four years, respectively, after its application.

TABLE 24.—MANURE AND FERTILIZER IN A WHEAT-WHEAT-OATS-CLOVER ROTATION 1936-1944 INCLUSIVE

Treatment	Yield per acre			
	First wheat crop	Second wheat crop	Oat hay	Sweet clover hay
	bu.	bu.	tn.	tn.
No fertilizer	22·2	19·1	1·65	1·60
Barnyard manure	26·3	22·0	1·95	1·77
Ammonium phosphate (11-48)	24·5	21·6	1·69	1·54
Manure plus fertilizer	24·8	22·2	1·94	1·71

Barnyard manure at ten tons per acre applied to clover stubble.
Ammonium phosphate (11-48) applied to each wheat crop.

Green Manuring Often Wasteful. — With the recognition of the beneficial effects of sweet clover on grey wooded soils the practice of using this crop as a green manure was soon adopted. Heavy yields of forage have been ploughed under on the assumption that the lush mass of green material would add large quantities of organic matter to the soil. Experimental evidence has indicated, however, that the good wrought by sweet clover on the soil is mainly through its roots and that the benefit brought about by turning under the top growth is usually of secondary importance.

A twelve-year experiment was conducted on a greyish soil on the Station to investigate this matter. There was very little difference whether the sweet clover was green-manured or whether its stubble was ploughed as soon as feasible after haying. Either practice gave higher yields of wheat than ploughing the aftermath under in the autumn or early the following spring. These later ploughings also resulted in volunteering of the sweet clover and less efficient weed control. The length of the fallow period afforded by the different times of ploughing apparently exerted more influence than the quantity of forage ploughed under. The effect of time of ploughing did not carry into the second wheat crop.

TABLE 25.—EFFECT OF TIME OF PLOUGHING SWEET CLOVER ON TWO FOLLOWING WHEAT CROPS 1936-1944 INCLUSIVE

Treatment	Yield of grain in bushels per acre	
	First wheat crop after clover	Second wheat crop after clover
Clover ploughed before haying (green-manuring)	26·9	21·3
Clover ploughed after haying (stubble-ploughing)	25·3	21·1
Aftermath ploughed in autumn	23·7	20·9
Aftermath ploughed in following spring	21·9	21·5

Crop Rotations

Crop Rotation Can Be Modified to Suit Conditions. — In a properly designed rotation the component crops should be subject to change without defeating the purpose of the rotation. Thus the sequence and even the duration of the rotation may be flexible.

Sweet Clover as a Substitute for Fallow. — A rather comprehensive experiment was conducted over a twelve-year period to determine the value of sweet clover in a grain rotation on grey wooded soils. The basic rotation employed was one common to the area, namely, oats (seeded to sweet clover), sweet clover, wheat, wheat. Compared with this was a straight grain rotation of oats, fallow, wheat, wheat. Results from this experiment and observations from trials elsewhere indicate that sweet clover may serve as a substitute for summerfallow. When the sweet clover was handled in the most advantageous way, that is, hayed and the stubble ploughed under, yields of the following crops were, if anything, somewhat higher than from those following fallow. During the final years of this experiment the ameliorative effect of the sweet clover on the soil was quite evident. Moreover, no weed problem by volunteering of the clover was experienced.

TABLE 26.—EFFECT OF CLOVER VERSUS BARE FALLOW ON FOLLOWING CROPS 1936-1944 INCLUSIVE

Rotation	Yield of grain in bushels per acre		
	First crop wheat	Second crop wheat	Third crop oat hay
Oats seeded to sweet clover, sweet clover, wheat, wheat. (Sweet clover stubble ploughed)	21·4	18·3	1·69
Oats, fallow, wheat, wheat	19·5	18·6	1·66

FIG. 21.—Gullying in brome field before the sod became established, Huallen district.

Sod Crops in Rotation. — Although sweet clover roots penetrate deeply and are very efficient in improving the mechanical nature of the soil they do not add large amounts of fibre. This is primarily the function of the grasses. Unfortunately, grasses are slower to establish themselves than is sweet clover and therefore do not function readily with grain in a rotation. Moreover, some grasses, such as brome and timothy, are known to depress yields of following grain crops if left down for some time. These disadvantages can be overcome to a large extent by sowing the grasses with sweet clover in leys of only two or three years duration. In this way the first hay crop, which would normally be scant, is substantially increased by the sweet clover and the deleterious effects of the sod can be overcome.

TABLE 27.—THE EFFECT OF VARIOUS GRASS-SWEET CLOVER MIXTURES ON SUBSEQUENT WHEAT CROPS 1938-1945 INCLUSIVE

Mixture	Yield of Reward wheat in bushels per acre					
	One-year ley			Two-year ley		
	First crop	Second crop	Total	First crop	Second crop	Total
Sweet clover plus:						
Timothy	23·5	22·7	46·2	21·7	22·6	44·3
Common brome	21·9	20·7	42·6	19·7	20·9	40·6
Parkland brome	22·5	22·5	45·0	20·4	21·5	41·9
Crested wheat grass	22·7	22·8	45·5	20·9	21·9	42·8

A Suggested Rotation. — For the established farm the following six-year rotation is recommended:

1. Fallow
2. Grain (seeded to grass and legumes)
3. Hay or pasture
4. Hay or pasture (break and fallow for the remainder of the season)
5. Grain
6. Grain

This rotation (1) possesses balance between grain, sod land, and fallow, (2) permits various crops to be sown under conditions suited to their growth, (3) ensures that fibre and humus are maintained in the soil, thereby serving to control erosion, (4) allows for the use of leguminous crops, (5) provides a reasonable measure of control for weeds, insects and disease and (6) can be so laid out that only two permanent cross fences are necessary.

Rotation and Cultural Methods. — The application of fertilizer or manure and the cultural methods must be adjusted to the rotation it it is to be fully effective. Two four-year rotations conducted on the Station may be taken to illustrate this point. The applications of fertilizer and of manure were much more effective in a rotation containing a year of fallow than in one where the latter was substituted by sweet clover. The reason was principally one of moisture, which in the clover rotation was too limited to permit the crops to make full use of the fertilizer and the manure. Without fertilization, however, this same rotation gave better yields than the grain-fallow rotation.

Crop Sequence Studies. — A well planned rotation recognizes the effect of crops on those which follow. Attention has been drawn to the deleterious effect of brome and timothy sods on succeeding crops and how this condition can be overcome. The excellent residual effects of sweet clover have also been considered. Alfalfa and red clover have like effect although that of the latter is possibly less marked than either sweet clover or alfalfa. Creeping red fescue is noted for its fine-textured sod which rots quickly and which usually supports thrifty grain crops. The sod of crested wheat grass is similar in appearance but is rather slow to decompose.

Seeding Methods

Companion Crops Useful. — Study has been given to the question of using companion crops. The problem is whether it is more important to secure a cereal crop the year of seeding the forages or to sacrifice this and obtain a much thriftier stand of forage the following year. Numerous investigations on the Station and observations elsewhere have made a stronger case for nurse-crop than for non-nurse-crop seedings. This is particularly true on weedy land.

In an experiment involving the seeding of sweet clover with and without a nurse crop of oats the yield of the sweet clover hay was considerably reduced the ensuing year by the use of the nurse crop and there was also a decrease in the grain yield of a crop of wheat following the breaking of the clover stubble. To compensate for these disadvantages, however, an additional crop was added to the rotation. It was further observed that the nurse crop served to control weeds and insect ravage.

TABLE 28.—NURSE-CROP versus NON-NURSE-CROP SEEDING 1935-1944 INCLUSIVE

Method of Seeding	Yield per acre			
	First year Oat hay	Second year Sweet clover	Third year Wheat grain	Fourth year Wheat grain
	tn.	tn.	bu.	bu.
Nurse crop (oats)	1·81	1·32	22·7	20·7
No nurse crop	–	1·99	26·2	21·7

Date of Harvesting or Seeding the Nurse Crop Not Important to Meadow Stands. — Another experiment on the use of nurse crops indicated that it made very little difference to the meadow stand what time the nurse crop was harvested. Thus, cutting a nurse crop of oats at different dates commencing in the early milk stage and through to full maturity, had no appreciable effect on the following meadow crop. It should be pointed out, however, that these conclusions are the result of a number of years data. In individual years some differences were brought about by time of harvesting the nurse crop. Much depends on the weather after the removal of the nurse crop and the amount of second growth from the cereal crop. If moist conditions prevail the grass and clover seedlings benefit, but if

the season continues dry, growth will be slow and the plants may suffer more from sun and wind than they would from continued competition of the nurse crop.

TABLE 29.—THE EFFECT OF HARVESTING NURSE CROP AT DIFFERENT STAGES OF MATURITY 1940-1944 INCLUSIVE

Cropping Year	Yield of cured hay in tons per acre		
	Cut when heading	Cut in milk	Cut when mature
First crop (Oat hay)	2·14	2·47	2·35
Second crop (Meadow hay)	1·24	1·18	1·18
Third crop (Meadow hay)	1·63	1·64	1·58
Total	5·01	5·29	5·11

It has also been found that time of seeding the nurse crop and forages during spring and early summer has little influence on the ensuing meadow stands. This was shown by a trial laid down consecutively for four years in which oats were used as a nurse crop to a brome-alfalfa-sweet clover mixture. Seedings made at eight successive weekly dates commencing as soon as feasible in the spring indicated that meadow hay yields the subsequent year were only slightly favoured by the medium-to-late seedings.

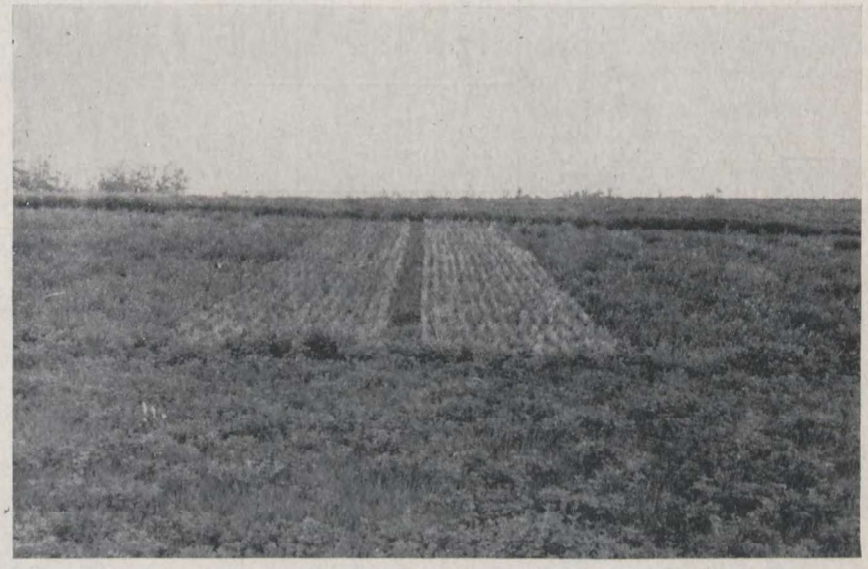

FIG. 22.—Effect of Hannchen barley as nurse crop to a brome-alfalfa seeding, centre, compared with effect of Olli barley.

TABLE 30.—THE EFFECT OF DATES OF SOWING ON ENSUING CROPS 1939-1942 INCLUSIVE

Cropping Year	Yield of cured hay in tons per acre								
	First Seeding	Second Seeding	Third Seeding	Fourth Seeding	Fifth Seeding	Sixth Seeding	Seventh Seeding	Eighth Seeding	No nurse-crop Seeding
First crop (Oat bundles)	2·36	2·31	2·26	2·15	2·22	2·21	2·23	2·17	-
Second crop (Meadow hay)	1·17	1·09	1·20	1·23	1·31	1·20	1·21	1·31	2·23
Third crop (Meadow hay)	1·55	1·53	1·58	1·47	1·53	1·54	1·52	1·58	1·63
Total	5·08	4·93	5·04	4·85	5·06	4·95	4·96	5·06	3·86

Type of Nurse Crop Important in Seeding Meadows. — Of more importance in seeding forage crops is the type of nurse crop employed. The merits of flax in this respect are, of course, well known. Olli barley and all varieties of wheat even when seeded at the usual rate have functioned as satisfactory nurse crops, while oats, seeded at reduced rates, has served only moderately well. Hannchen barley when sown at the normal rate proved an exceptionally poor nurse crop.

TABLE 31.—KINDS OF NURSE CROP 1940-1942 INCLUSIVE

Cropping Year	Yield of grain bundles and hay in tons per acre							
	Wheat		Oats			Barley		No Nurse Crop
	Reward	Marquis	Legacy	Early Miller	Banner	Olli	Hannchen	
First crop (Cereals)..	1·72	2·01	2·16	1·95	2·35	1·93	2·15	
Second crop (Meadow hay).....	1·41	1·54	1·18	1·17	1·18	1·31	1·07	2·20
Third crop (Meadow hay).....	1·55	1·66	1·61	1·63	1·58	1·63	1·45	1·67
Total.....	4·68	5·21	4·95	4·75	5·11	4·87	4·67	3·87

Some Methods of Seeding Winter Grains. — Two methods have been tried to lessen winter killing of autumn-sown grains. Besides drilling winter wheat or rye in the normal way, seedings were made which included drilling followed by ridging with a cultivator with all but the rear shovels removed and broadcasting of the seed followed by ridging. The purpose of ridging was to lessen sheet ice formation. Trials over six years have shown that on the average there was less winter killing and more thorough weed control when the seed was drilled in without ridging.

TABLE 32.—METHODS OF SEEDING WINTER GRAINS 1939-1941 INCLUSIVE

Kind	Yield of grain in bushels per acre	
	Drilled	Broadcast and ridged
Winter wheat.....	29·6	27·1

TABLE 33.—DRILLING WINTER GRAIN ON GROWING SPRING GRAIN 1940-1942 INCLUSIVE

Treatment	Yield of grain in bushels per acre	
	Wheat	Rye
Reward alone.....	22·3	–
Rye on Reward.....	22·6	14·5
Rye on fallow.....	–	37·3

Drilling winter grains on growing spring grains has not justified itself in Peace River agriculture. This was shown by a number of trials in which oats and spring wheat were cross-drilled by both winter wheat and rye. The cross-drilling was done about a month to six weeks after the seeding of the spring grain, depending on the growth of the latter. Although cross-drilling did not normally reduce the yields of the spring grains the cross-drilled winter grains yielded less than half of what they would have if sown on fallow at the usual time. In drought years the practice of cross-drilling was at a distinct disadvantage.

Soil Erosion

Peace River Soils Are Prone to Erode. — Peace River soils are highly vulnerable to water erosion. The fine silty texture of the soil is such that during periods of heavy rain or spring run-off the surface portion forms a thick soupy mass that moves easily and may on occasion literally slide over the plough sole. This readiness to sheet wash is promoted, unfortunately, by the impervious nature of the subsoil and by the heavy, dashing rains that frequently occur after a period of comparative drought.

Fig. 23.—Sheet erosion on 1.2 per cent slope caused by heavy rain following prolonged drought.

Forage Crops Essential in Erosion Control. — Forage crops are essential in any soil conservation program. They offer the only practical means by which fibre and humus can be restored to the soil. They are the only crops that adequately protect the soil surface from the action of wind and water, while alfalfa and sweet clover have root systems which effectively open up the impervious subsoil. Actually little more than seven per cent of the cultivated acreage of the Peace River region is seeded to grass or clover. It is recommended that at least thirty per cent of the cropped land must be occupied by forage crops if a permanent system of agriculture is to be effected.

Certain measures effective in preventing soil erosion in other regions cannot be relied on to save Peace River lands. Terracing, a rather drastic though effective form of erosion control in some regions, is out of the question with a topography of innumerable shallow draws and swales on every slope. Contour ploughing and

ridging is more or less impracticable for the same reason and is ineffective when spring run-off waters freeze in the contour furrows.

By the use of shallow run-ways, seeded to grass, surplus waters have been safely directed off sharp slopes. Cultural and cropping practices must be used that will lessen the present soil erosion. Ploughing and cultivation across the prevailing slopes should be practised. As mentioned previously, grass and hay crops should be grown to a much greater extent, and longer rotations should be employed in which forage plants are emphasized. The use of cross-cropping should not be neglected in combating soil erosion.

FIG. 24.—Severe gullying on 1 per cent slope, Prestville district.

Another measure successfully adopted on the Station to lessen erosion has been the use of trash covers, such as leaving a long cereal stubble or the spreading of straw and manure. Crop rotations so arranged as to interpose broad belts of sod or of unploughed stubble across the direction of slopes have proved advantageous. Ploughing and cultivation across the prevailing slopes and the filling or damming of runways with manure in the autumn has also reduced soil washing.

Wind Erosion Could Be Serious. — The silty texture that makes the soil so vulnerable to wash, places it in jeopardy to the forces of the wind. There is reason to believe that soil blowing could become as serious in the Peace River region as it has in some other parts.

Keeping the soil bound with fibre and breaking the force of the wind are the chief means of controlling wind erosion. Although much of the Station is located on exposed slopes there has never been a serious instance of soil drifting. Tillage methods are closely watched so that the soil surface is left rough and pulverization avoided. More important still is the adequate use of forage crops. By keeping a fairly high percentage of the land in grasses and clovers the fibre content of the soil is maintained at a safe level. Plantings of trees have also been effective in minimizing the abrasive action of the wind.

WEED CONTROL

Eradication of Perennial Weeds by Tillage Can Be Expensive. — Farmers realize that the successful control of persistent perennial weeds by cultivation

can be a very costly practice. A good example of this was experienced in the eradication of hoary cress. In some instances two years of black summerfallow have not completely destroyed this weed. A patch of hoary cress cultivated every time growth showed and which was considered killed out by the summer of the second year sent up a few plants late that autumn. Not only does the eradication by cultural means become expensive but it is often very destructive to the soil since continued cultivation is invariably followed by soil washing and blowing.

FIG. 25.—This infestation of hoary cress was eradicated by 2,4-D in conjunction with a competing grass.

Sodium Chlorate, a Soil Sterilizer. — Sodium chlorate functions as a soil sterilizer. In a loose, friable soil four pounds per square rod proved insufficient to eradicate perennial sowthistle. On a heavier soil type a treatment of seven pounds per square rod did not effect a complete kill of hoary cress, which under certain conditions seems capable of building up considerable immunity towards sodium chlorate. Couch grass and toadflax were quite effectively eradicated by five pounds of this chemical per square rod. It should be stressed that with the application of sodium chlorate to any running-rooted weed treatment should be extended to at least six feet beyond the margin of the infestation. Two years' testing has indicated no consistent difference whether it is applied wet as a spray or scattered on dry.

Time of Application Important. — Trials have shown that sodium chlorate is best applied when the weed is in a rapid and full-growth stage, such as at time of budding. Another vulnerable period is in late autumn. It has been found good practice to split the rate, applying half in summer and the remainder before freeze-up. Because of the cost of the chemical it is not economical to treat patches of more than a few square rods in area.

Sinox Only Effective on Seedling Weeds. — Investigation with the dinitro-selective sprays such as Sinox and Dow Selective chemical was of a preliminary nature. Sinox proved ineffective for the eradication of established dandelions in lawns. However, with seedling weeds very satisfactory results were obtained. A carpet of seedling weeds in a brome meadow, laid down the previous year, was eighty per cent destroyed by Sinox and those weeds not killed outright were

so severely injured that they offered little competition to the grass. The brome was not affected. Seedling weeds in growing grains were similarly controlled by Sinox.

One great disadvantage of the dinitro herbicides is the inconvenience of application. The chemical discolours clothing and is mildly caustic to the throat and eyes. With powered units operated for any length of time Sinox proved to be extremely irritating. The large amounts of water required for their application places the dinitro sprays at a further disadvantage.

Sinox for Flax and Peas. — Use of the dinitro herbicides would seem limited to those crops that are sensitive to 2,4-D, such as flax and peas. Tests have shown that seedling weeds can be very effectively killed in either crop without harm to the crops themselves. However, the operator may be faced with the inconvenience of special equipment. The low-volume units employed for 2,4-D treatment are not entirely suitable for the use of the dinitro sprays.

2,4-D, No Cure-all. — Investigation with 2,4-D has constituted a major part of the weed control studies since their inception in 1946. It was soon observed that the nature and action of this chemical was radically different from any herbicide hitherto employed. The veteran herbicides relied simply on mechanical injury of the plant tissue, while 2,4-D, a plant hormone or growth regulant, upset the growth processes of the plant.

Although 2,4-D is a formidable weapon in the fight against weeds it must not be regarded as the answer to all weed problems. It is rather a supplement, albeit an excellent one, to the accepted means of controlling weeds. The prudent farmer will not cast aside proved tillage and cropping methods with the adoption of 2,4-D.

The Selective Action of 2,4-D. — The selective nature of 2,4-D permits its use in the control of weeds in growing crops. Investigations have shown the practicability of eradicating seedling weeds in growing grain as well as the control of annuals in newly-established grass stands. However, there is sometimes a very delicate balance between killing of the weed and injury to the crop by the chemical.

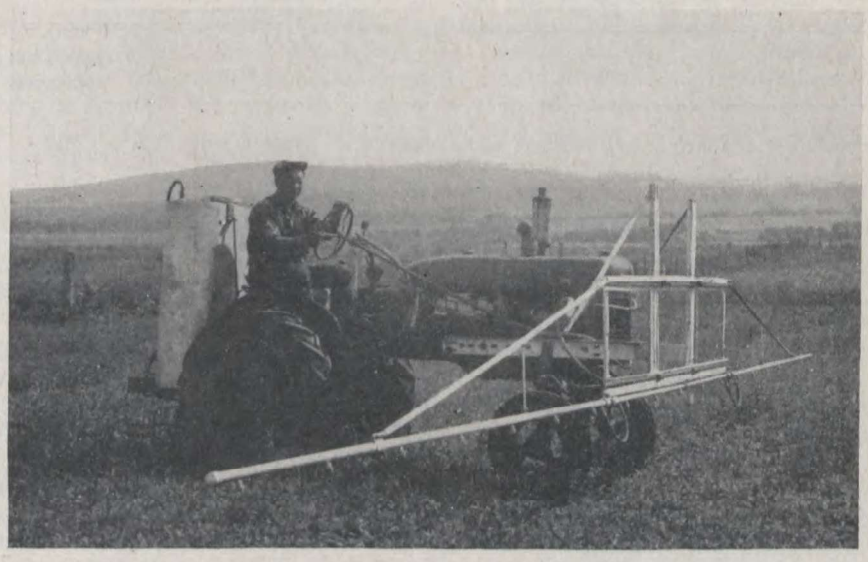

FIG. 26.—A compact unit for 2,4-D application.

How 2,4-D Can Be Effectively Applied. — A major factor in the effective application of 2,4-D is the weather. Treatment should not be done under threat of rain, while a brisk breeze will result in uneven distribution of the spray or dust. High summer temperatures are desirable but are not essential. Another factor is the stage of weed growth. In the Peace River region the proper stage for treatment of some weeds can be passed through very quickly, possibly in a week, and the operator must avail himself of every opportunity to meet this limitation. Seedling weeds in growing crops can be most effectively killed when in the early stage of not more than a dozen leaves. Normally, the weeds will not be more than two or three inches high at this time. It was found that most susceptible weeds became somewhat resistant to 2,4-D once they were in flower. A further consideration is the kind of weed to be treated. Thus, rate of application must be carefully gauged according to the species of weed. Treatment of such semi-tolerant weeds as shepherds' purse and lambs' quarters may be ineffective, for instance, if sprayed at rates recommended for a more sensitive weed such as stinkweed or ball mustard. The tolerance of the cultivated crop should also be considered. For instance, the development of flax has been seriously delayed by a heavy application of 2,4-D.

The many preparations of 2,4-D can be grouped under three main types: sodium salts, amine salts and esters. On the whole, the action of the amine salt was found to be half-way between that of the sodium salt and the ester. The esters were the most effective of the three formulations if treatment was closely followed by a rain. Their action, too, was very rapid but was prone to injure the grain. However, there is every reason to believe that by applying them at lighter rates than the amine or the sodium salts they will damage the weeds to as great an extent and yet not cause any greater injury to the grain.

The rate of applying any 2,4-D preparation is calculated from the amount of 2,4-D acid it contains. This may vary considerably depending upon the particular brand of 2,4-D employed. Following are suggested amounts of 2,4-D acid by weight per acre to use to control annual weeds in grain crops in the Peace River region.

TABLE 34.—RATES OF APPLICATION OF 2,4-D TO GRAIN CROPS

Group	Form	Ounces acid per acre
Susceptible weeds such as ball mustard and stinkweed..	Sodium salt	8-12
	Amine salt	5-7
	Ester	3-5
Less susceptible weeds such as shepherds' purse and lambs' quarters.....	Sodium salt	14
	Amine salt	9
	Ester	6

For susceptible weeds a range is indicated since the dosage should be increased as growth advances. With less susceptible weeds it may be inadvisable to treat later than the very young stage since the necessary dosage strength may injure the grain.

Period for Effective 2,4-D Treatment Very Short for Most Weeds. — 2,4-D can be applied in either spray or dust form but experience has shown that in this region of frequent winds and low humidity the spray method is the more effective. The purchaser should gauge the size and cost of the machine to the job at hand. However, since the period over which treatment of seedling weeds can be success-

fully sprayed is very short, possibly less than a week, it would seem advisable for a farmer to own his own small unit rather than rely on the custom work of a larger machine.

FIG. 27.—This stand of stinkweed in oats was effectively controlled by 2,4-D.

Many Perennial Weeds Can Be Controlled By 2,4-D. — Much of the effort expended by the Station on the investigation of 2,4-D has been directed towards the eradication of perennial weeds. Some of these represent the more pernicious types such as perennial sowthistle, Canada thistle, hoary cress and toadflax. It was soon realized that perennial weeds were not generally so vulnerable to 2,4-D as seedling annuals or winter annuals and dosages up to two pounds per acre may be necessary for the more persistent types. Investigation also showed that the susceptible stage of perennials was not the same as that of annual weeds. Thus, 2,4-D treatment of perennial weeds should be made at the late-bud stage, which is a much later growth stage than that recommended for the control of most seedling weeds. The superiority of the ester types in the control of perennial weeds has been demonstrated.

The eradication of perennials is not a matter of a single application of 2,4-D. Treatments extending over several years are sometimes necessary. With the more persistent types, such as Canada thistle and hoary cress, the use of a competitive crop in conjunction with 2,4-D application was found advisable not only because it aids in choking out the weed but because it is present to take over the area as the weed dies out. Grasses are admirable for this purpose as they are usually strongly competitive while at the same time tolerant to heavy applications of 2,4-D.

The eradication of dandelions in lawns and elsewhere is rather difficult in this region, though seemingly a simple matter in other parts. Treatment for their eradication must be along the lines suggested for that of perennial sowthistle.

One year's investigation with toadflax has shown this weed to be very tolerant towards 2,4-D. It is doubtful if this chemical is the answer to its control. Unfortunately, weeds such as couch grass and wild oats are completely resistant to 2,4-D.

A SELECTED LIST OF WEEDS AND CROPS CLASSIFIED AS TO THEIR REACTION TO 2,4-D

ANNUALS AND WINTER ANNUALS

Generally susceptible, at least at early, rapid growth stages:

Ball mustard	Rape
Common mustard	Stinkweed

Intermediate in susceptibility:

Blue bur	Peas
Flixweed	Shepherds' purse
Lambs' quarters	Tansy mustard

Resistant:

Cereals	Wild buckwheat
Darnell	Wild oats

PERENNIALS AND BIENNIALS

Generally susceptible — Tops and roots killed readily, frequently with one application:

Sweet clover	Other clovers

Intermediate — Tops injured readily but more than one application is required to effect eradication of the roots:

Alfalfa	Hoary cress
Canada thistle	Perennial sowthistle
Dandelion	Wormwood

Resistant:

Couch grass	Toadflax
Horsetail	Wild barley
Other grasses	

HORTICULTURE

Protection

Windbreaks. — It is essential that all horticultural plantings have adequate protection from wind, otherwise much effort will be wasted and discouragement result. Trees break the sweep of the wind, cause snowdrifts to form and otherwise supplement moisture supplies. They also form the background of the landscape plan. Native shelter should be utilized if at all possible and may be supplemented by plantings. Protection should be on all sides, with heavier plantings to the west and north, and should be set back sufficient distance so that induced snowdrifts will not impede passage around buildings. The area to be enclosed should include the farm buildings, gardens, and restricted stock runs.

Unfortunately the choice of planting material is limited. Caragana should form the outside or windward row of the break because of its hardiness and its bush form which protects the trunks and lower branches of the trees which constitute the inner rows. Northwest poplar set six feet apart and six to eight feet from the caragana is recommended for the second row. The third row, set six feet from the poplar may be planted to green ash and American elm alternated at six-foot intervals. Manitoba maple is no longer recommended as it is subject to late growth and consequent winter killing.

The windbreak is completed by one or more rows of evergreens, particularly white spruce, Colorado spruce or Scotch pine, set twelve to sixteen feet to the leeward. The entire break is flanked by twelve to sixteen feet of land kept under continuous cultivation. The row intervals should also be kept black as long as possible. No thinning or tree removal is required.

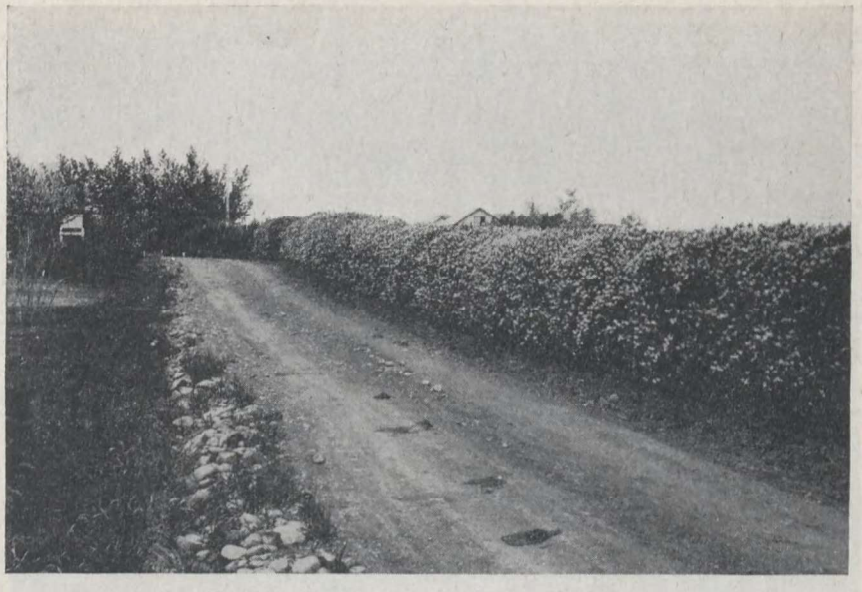

FIG. 28.—Saskatoon hedge flanking driveway.

Hedges. — Further protection within the enclosed area is afforded by hedges and individual plantings of shrubs and trees. Trimmed hedges have their place but require annual pruning and must be uniform and vigorous to be attractive. For this purpose use:

Amelanchier alnifolia — Native Saskatoon: Hardy. Attractive bloom. Fruit.
Caragana arborescens — Siberian Pea Shrub: Hardy. Compact.
C. pygmaea — Pygmy Pea Shrub: Dwarf hedge or edging.
Cotoneaster acutifolia — Peking Cotoneaster: Dwarf. Attractive autumn foliage.
C. lucida — Hedge Cotoneaster: More compact than Peking.
Picea glauca — White Spruce: Hardy. Very attractive.
Shepherdia argentea — Silver Buffaloberry:

Hardy. Thorns. Grey foliage. Attractive fruit.

Loose or untrimmed hedges may well form the background and require little attention. The following are satisfactory:

Amelanchier alnifolia — Native Saskatoon: Very attractive bloom. Fruit.
Caragana arborescens — Siberian Pea Shrub: Hardy. Drought resistant.
Lonicera coerulea edulis — Sweetberry Honeysuckle: Compact. Semi-dwarf.
L. tatarica — Tartarian Honeysuckle: Bloom. Non-edible fruit. Attractive.
Potentilla fruticosa — Bush Cinquefoil: Dwarf. Long-season bloom.
Syringa josikaea — Hungarian Lilac:

Hardy. Bloom. More attractive leaves than late lilac.
S. villosa — Late Lilac: Hardy bloom.

FIG. 29.—Superintendent's residence and main lawn of Station.

ORNAMENTAL TREES AND SHRUBS

Ornamental trees and shrubs should be counted on for the major landscape effect and to provide the setting for other plantings.

Trees. — The list of proved deciduous and evergreen trees is limited but is sufficient for moderate needs.

Acer negundo — Manitoba Maple.
Fraxinus pennsylvanica var. *lanceolata* — Green Ash.
Larix sibirica — Siberian Larch.
Picea glauca — White Spruce.
P. pungens — Colorado Spruce.
P. pungens var. *Kosteriana* — Koster Blue Spruce.
Pinus sylvestris — Scotch Pine.
Populus hybrid — Northwest Poplar.
Quercus macrocarpa — Manitoba Native Oak, Bur Oak.
Salix acutifolia — Sharpleaf Willow: For moist locations.
S. alba vitellina — Yellowstem Willow: For moist locations.
S. pentandra — Laurel Willow: For moist locations.

Tall Shrubs. — Tall-growing shrubs provide much suitable hardy material carrying attractive bloom.

Caragana arborescens — Siberian Pea Shrub, Common Caragana.
C. lorbergi — Lorberg Caragana, Fern-leaved Caragana.
Lonicera tatarica — Tatarian Honeysuckle.
Prunus maąckii — Amur Chokecherry.

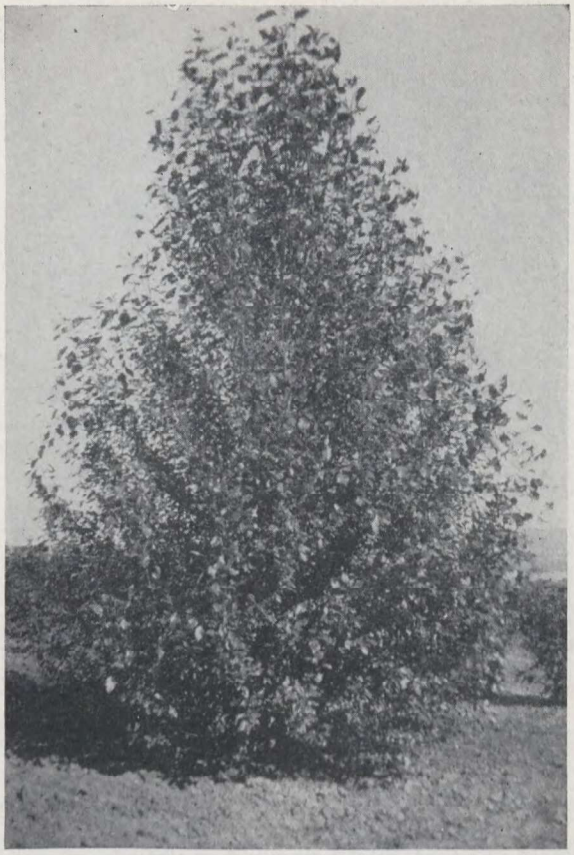

FIG. 30.—Hybrid poplar, Griffin No. 4 selection.

P. padus — European Birdcherry, May Day Tree.
P. pennsylvanica var. Stockton — Double-flowering Pincherry.
Shepherdia argentea — Silver Buffaloberry.
Sorbus aucuparia — European Mountainash:

Grow in bush form. Shelter from southwest.

Syringa amurensis — Amur Lilac.
S.×hyacinthiflora — American Lilac var. Pocahontas, Excel, Evangeline etc.
S. prestoniae — Preston Lilac var. Jessica, Redwine, Royalty, Coral etc.
S. villosa — Late Lilac, Chinese Lilac: Excelled in bloom by Preston hybrids.
S. vulgaris — Common Lilac and hybrids Charles X, Belle de Nancy etc.
Thuja occidentalis — Eastern Arborvitae, Northern White Cedar:

Needs shelter from southwest.

Viburnum lentago — Nannyberry Viburnum.
V. trilobum — American Cranberrybush, Pembinaberry.

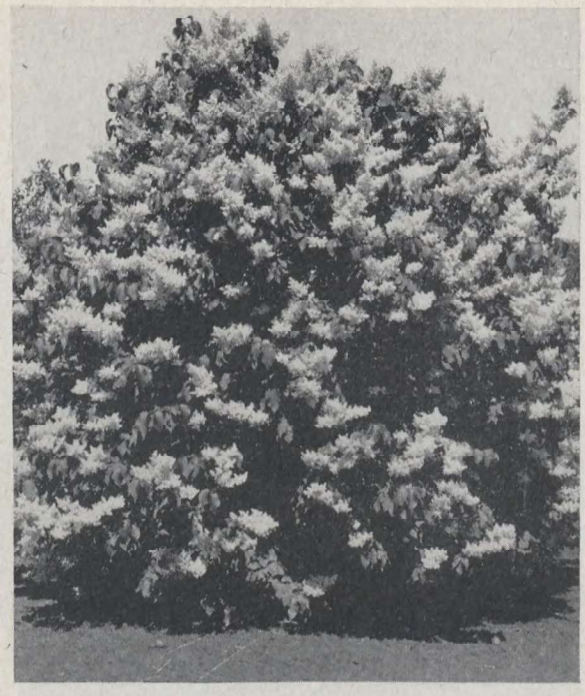

FIG. 31.—Amur lilac in full bloom, June 20.

Medium Shrubs. — This group includes a number of hardy shrub roses, spireas and other material useful for large foundation plantings.

Cotoneaster acutifolia — Peking Cotoneaster.
C. lucida — Hedge Cotoneaster.
C. integerrima — European Cotoneaster.
Lonicera coerulea edulis — Sweetberry Honeysuckle.
Prinsepia sinensis — Cherry Prinsepia.
Ribes odoratum — Clove Currant, Missouri Currant.
Rosa spinosissima var. altaica — Altai Scotch Rose.
Rosa var. — Betty Bland.
" Hansa.
" Harison's Yellow: Protection advised.
" Tetonkaha.
" Yatkan.
Sorbus americana — American Mountainash: Native.
S. scopulina — Greenes Mountainash.
Spiraea chamaedryfolia — Germander Spirea.
S. media — Oriental Spirea.
S. pikoviensis — Pikow Spirea.
S. trichocarpa — Korean Spirea.

FIG. 32.—Siberian crab in bloom, June 3.

Small Shrubs. — Small shrubs provide material for the front of shrub borders, foundation planting, and edgings or small hedges.

Caragana pygmaea — Pygmy Pea Shrub.
Daphne cneorum — Rose Daphne.
Juniperus communis — Common Juniper.
Potentilla fruticosa — Bush Cinquefoil: Blooms all summer.
Prunus tenella — Russian Almond: Early-season bloom.
Rosa var. — Agnes: Protection advised.
" Burnet.
" Grootendorst: Protection advised.
" Grootendorst Pink: Protection advised.

In addition to the shrub roses listed above are several very choice varieties useful for cutting purposes. These are moderately winter hardy if protected by soil covering.

General Jacqueminot — H.P.
General McArthur — H.T.
Gruss an Teplitz — H.T.
Hugh Dickson — H.P.
Mrs. R. G. Sharman Crawford — H.P.
Souvenir de Claudius Pernet — *R. Pernetiana*

Climbers

Climbing vines may be extremely ornamental and, on occasion, may be used to provide protection. The hardiest climber is the hop, a herbaceous perennial which may reach a height of twenty to thirty feet in one season. It is rather coarse, however, and vine growth is renewed each spring.

Virginia creeper is less hardy but much more attractive. It is slow growing but well worth the effort. On the Station the self-fastening species, *Parthenocissus quinquefolia hederacea*, has not proved so hardy as a sub-species of *P. quinquefolia* probably native to Manitoba. Unfortunately the latter needs training to a trellis. The colour in autumn is particularly attractive.

Two types of clematis appeal to some. One is golden clematis, *C. tangutica*, which may grow to eight or ten feet and which carries very attractive bell-shaped flowers. The other, western virginsbower, *C. ligusticifolia*, grows to fifteen feet and carries clusters of starry white flowers.

Herbaceous Perennial Flowers

Under conditions of moderate rainfall, limited length of growing season, and the usual rush of spring work it is now generally accepted that herbaceous perennials should be freely utilized in landscaping, leaving minor attention to annuals. A large amount of material has been subjected to rigid testing and the following kinds are recommended:

(E) Early (to June 30)
(M) Mid-season (during July)
(L) Late (after July 31)
* Specially selected material

Short Growing. — Varieties under one foot in height suitable for border frontings and edgings.

Convallaria majalis — Lily-of-the-Valley:
(E) White. Fragrant. For shade.

**Dianthus plumarius* — Cottage Pink:
(E) Mixed colours. Fragrant.

D. brachyanthus — Branched Pink:
(M) Rose.

D. brevicaulis — Mt. Taurus Pink:
(E) Red.

**Erigeron alpinus* — Alpine Fleabane:
(M) Purple to white flowers.

Gaillardia aristata var. Goblin — Blanket Flower:
(M) Yellow and brownish red.

**Genista sagittalis* — Broom:
(E) Very attractive yellow flowers. Shrubby growth.

**Lychnis*×*arkwrighti* — Arkwright Campion:
(M) White to bright red flowers.

Opuntia polyacantha — Plains Prickly Pear:
(M) Yellow flowers. Oddity.

Primula vernalis — Cowslip:
(E) Yellow flowers. Fragrant.

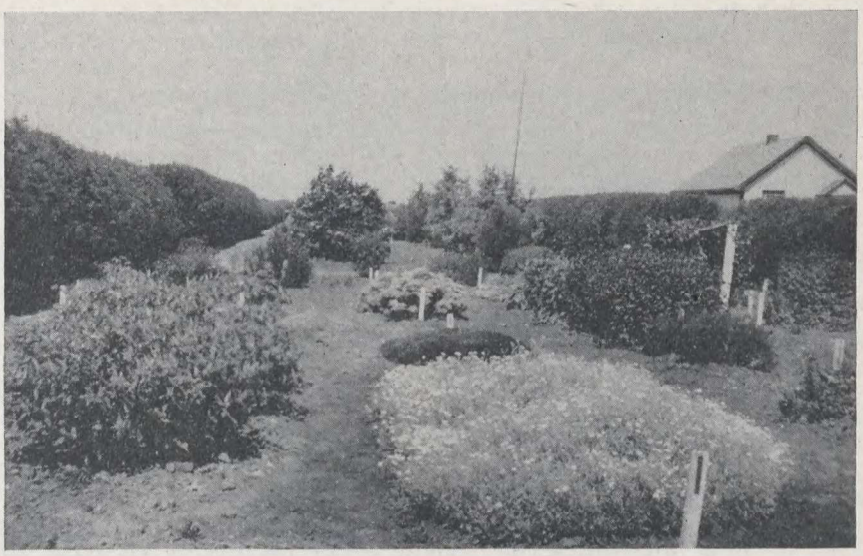

FIG. 33.—Border plants in trial plots.

Medium Height. — This group is more embracing as it includes popular flowering plants such as the peony as well as other less familiar kinds ranging from one to two feet in height.

Achillea millefolium rubrum — Red Common Yarrow:
(M) Red.

**A. ptarmica* var. The Pearl — Sneezewort Yarrow:
(M) Double white, daisy-like flowers.

**Alyssum argenteum* — Yellow-tuft:
(E) Yellow.

Anemone sylvestris — Snowdrop anemone:
(E) White. Fragrant.

**Aquilegia sp.* — Columbine:
(E) Various species and varieties.

Campanula glomerata dahurica — Clustered Bellflower:
(M) Rich purple.

C. pyramidalis — Chimney Bellflower:
(M) Blue.

**Centaurea pulcherrima* — Rose Centaurea:
(M) Purple and white effect.

Chrysanthemum leucanthemum — Ox-Eye Daisy:
(M) White.

**Dianthus barbatus* — Sweet William:
(M) Biennial. Mixed colours.

Dracocephalum nutans — Nodding Dragonhead:
(E) Blue. Tends to be weedy.

Filipendula hexapetala — Dropwort, Meadowsweet:
(E) White, attractive foliage.

*Iris — Tall Bearded or Garden. Several hundred varieties have been tested and all but a few have winter-killed or succumbed to root-rot disease.

The following surviving varieties are highly recommended:

Dora Campbell — Clear blue.
Fro — Lavender and purple.
Hiawatha — Light blue and purple.
Mrs. Sherwin Wright — Yellow.
Perfection — Light blue.
Quaker Lady — Smoky lavender.
Rhein Nixe — Smoky lavender.
Susan Bliss — Lavender.

**Linum perenne* — Perennial Flax:
(E) Blue. Reseeds freely.

**Lychnis viscaria* — Clammy Campion, German Catchfly:
(E) Rosy-purple. Attractive.

**Mertensia virginica* — Virginia Bluebell:
(E) Light blue to pinkish white.

**Paeonia* — Peonies are considered hardy. They are not difficult to grow but respond to special care. Deep preparation of the soil and the working in of well rotted cow manure before planting is advisable. Roots should be planted with the crown two inches below the soil surface and the soil well packed about the roots. Late September or early October is the best time for planting. The following recommended varieties should provide a wealth of bloom over a long season. Many are fragrant and all are in the low priced class.

White — Festiva Maxima: Early.
Albatre: Late mid-season.
Marie Lemoine: Late.

Pink — Monsieur Jules Elie: Early.
Reine Hortense: Mid-season.
Sarah Bernhardt: Late.

Red — Adolphe Rousseau: Early.
Karl Rosenfield: Mid-season.
Felix Crousse: Late.

**Papaver nudicaule* — Iceland Poppy:
(E) Biennial mixed colours. Reseeds freely.

Pentstemon glaber — Sawsepal Pentstemon, Smooth Beard Tongue:
(E) Attractive plant. Clear blue or rosy-pink blooms.

Physostegia virginiana — False Dragonhead:
(L) Attractive soft pink tubular flowers.

Ranunculus acris — Tall Buttercup:
(E) Small glistening yellow flowers.

R. acris florepleno — Double Buttercup:
(E) Similar to *R. acris* but double-flowered.

Scutellaria baicalensis var. *coelestina* — Baikal Skullcap:
(L) Blue. Showy.

Smilacina racemosa — Feather Solomonplume, False Solomons Seal:
(E) White. Red berries. Attractive.

**Veronica incana* — Woolly Speedwell:
(M) Blue flowers with silver foliage.

Tall. — Included in this group are herbaceous perennials in excess of two feet in height useful for background planting.

**Aconitum fischeri* — Azure Monkshood:
(L) Pale blue flowers.

**A. napellus* — Aconite Monkshood:
(M) Deep blue.

A. napellus — Aconite Monkshood:
(M) Pink.

Althaea rosea — Hollyhock:
(M) Red, yellow and white. Biennial.

Anchusa azurea — Italian Bugloss:
(E) Beautiful blue flowers.

Aster amellus — Italian Aster:
(L) Large pink and lavender blue flowers.

**Campanula persicifolia* — Peach-leaved Bellflower:
(M) Blue or white. Bell shaped.

Centaurea montana — Mountain Bluet, Perennial Corn Flower:
(E) White and blue flowers larger than annual varieties of *C. cyanus.*

Chrysanthemum majus — Costmary Chrysanthemum, Mint-Geranium:
(L) Grown for its fragrant foliage.

**C. coccineum* — Florists Pyrethrum, Painted Daisy:
(E) Mixed colours, doubles and named forms.

C. corymbosum — Mediterranean Chrysanthemum:
(M) White.

Delphinium — Larkspur:
(E) Different strains available.

**Dicentra spectabilis* — Bleeding Heart:
(M) Very attractive pink flowers and graceful foliage. Transplant every two or three years.

**Eremurus robustus* — Giant Desert Candle:
(E) Pink. Showy. Unusual.

Eryngium amethystinum — Amethyst Eryngo:
(L) Blue. Attractive foliage.

**Gypsophila paniculata* — Baby's Breath:
(M) There are named double forms.

Helenium hoopesi — Orange Sneezeweed:
(E) Orange-yellow flowers.

**Hemerocallis flava* — Lemon Daylily:
(E) Attractive yellow. There are many fine named varieties.

Hesperis matronalis — Dames Rocket, Sweet Rocket:
(E) Purple or white. Fragrant. Biennial.

Hypericum punctatum — Spotted St. Johnswort:
(M) Yellow. Attractive.

**Incarvillea olgae* — Olga Incarvillea:
(M) Pink. Unusually attractive. Shrub-like.

*Iris — Very hardy Siberian, grass-leaved type.

Gatineau — Light blue.	Rideau — Light blue.
Madawaska — Dark blue.	Rimouski — Creamy white.

**Lavatera thuringiaca* — Siberian Rose Mallow:
(M) Attractive rose-pink.

**Lupinus sp.* — Lupin:
(E) Not very hardy. Short-lived.

**Lychnis chalcedonica* — Maltese Cross:
(M) Bright red. Good but common.

Macleaya microcarpa — Plume Poppy:
(L) Attractive foliage.

Malva moschata rosea — Musk Mallow:
(M) Rose pink. Easy to grow.

Mertensia sibirica — Bluebell:
(M) Purplish to white.

Nepeta ucranica — Ukraine Catmint, Russian Catmint:
(E) Blue.

**Papaver orientale* — Oriental Poppy:
(E) Scarlet, also named varieties.

Phalaris arundinacea — Ribbon Grass:
(M) Foliage effect. Useful for bouquet arrangement. Spreading.

**Phlox paniculata* var. Ada Blackjack — Perennial Phlox:
(L) Mauve. Attractive.

**P. paniculata* var. Pyramid White — Perennial Phlox:
(L) White. Attractive.

Polemonium caeruleum — Greek valerian Polemonium, Jacob's Ladder:
(E) Lilac or white. Attractive foliage.

**Rudbeckia laciniata hortensis* — Golden Glow:
(L) Handsome double yellow bloom. Spreading.

Salvia pratensis — Meadow Sage:
(E) Bright blue.

Saponaria officinalis — Bouncing Bet:
(M) Spreading and weedy.

Stachys grandiflora — Big Betony:
(M) Violet.

S. officinalis — Common Betony, Spike Speedwell:
(M) Purple.

Flowering Bulbs. — This group comprises some delightful and worthwhile material.

Allium flavum — Yellow Onion, Flowering Onion:
(L) Yellow flowers. Dwarf.

**A. kansuense* — Kansu Onion, Flowering Onion:
(L) Bright blue. Dwarf.

Fritillaria pudica — Yellow Fritillary:
(E) Brownish-yellow. Dwarf.

Lilium — *Lilium dauricum, L. umbellatum* and *L. tigrinum* are among the hardiest. Others sometimes winter-kill but where wind protection is supplied and bulbs are given special cultural care the following varieties give good results.

Lilium tenuifolium — Coral Lily:
(M) Brick red. Tall.

L.×concolor Dropmore — Morningstar Lily:
(M) Brilliant scarlet. Tall.

L.×coronation — Stenographer Lily:
(M) Clear yellow. Tall.

L.×Edna Kean — Stenographer Lily:
(M) Dark red. Tall.

L.×Grace Marshall — Stenographer Lily:
(M) Dark red. Tall.

L.×Maxwill — (M) Bright orange-red. Tall.

Narcissus poeticus — Poets Narcissus:
(E) White. Fragrant. Dwarf.

**Scilla sibirica* — Siberian Squill:
(E) Intense blue or white. Excellent for naturalizing. Dwarf.

Tulipa — Most varieties of tulips have fared moderately well and have made notable showings. Plantings should include a few of the early type but concentration should be made on Darwins and other large-flowered types.

Gladiolus. — This popular flower has received its full share of attention but to date recommendations are not positive. Most otherwise satisfactory varieties do not form corms satisfactorily and in many instances replacements are not available from the trade. Selection seems to offer some possibilities and a few varieties, notably Bit O'Heaven, seem to withstand drought conditions better than others. The following are recommended:

Bit O'Heaven — Orange with yellow throat.

Dusty Miller — Smoky old rose with cream lines.

Early Rose — Rich rose, shading lighter in throat.

Hokus Pokus — Golden yellow mixed with deep carmine.

Huntress — Lavender.

Intercepter — Orange crimson.

J. S. Bach — Red.

Margaret Wood — Mauve purple.

Marlene Both — Salmon-pink with cream throat.

Mother Machree — Soft smoky lavender.
Pelegrina — Dark violet blue.
Polar Ice — Pure white.
Snow Princess — Milky white.
True Love — Light pink.
Vredenburg — Pure white.
W. R. Reader — Medium rose.

Rockery. — For the rockery enthusiast or for locations requiring plants which can endure exposed conditions the following are recommended:

**Adonis vernalis* — Spring Adonis:
(E) Yellow flowers. Attractive foliage.
Anemone montana — Mountain Anemone:
(E) Violet flowers.
**Cerastium tomentosum* — Snow-in-summer:
(E) White. Very attractive.
**Dianthus deltoides* — Maiden Pink:
(E) Rose.
Dodecatheon media — Shooting Star:
(E) Pink. Very fragrant.
Erysimum pachycarpum — Blister Cress:
(E) Orange yellow.
Helianthemum alpestre — Alpine Sunrose:
(E) Yellow-flowered. Dwarf. Shrubby.
**Iberis sempervirens* — Edging Candytuft:
(E) White bloom.
**Iris pumila* — Dwarf Iris:
(E) Purple. Very early to bloom.
Liatris spicata — Blazing Star:
(L) Blue. Very attractive flowers.
Phlox amoena — Hardy Phlox:
(E) Attractive.
P. subulata lilacina — Moss Phlox, Moss Pink:
(E) Pale lavender blue flowers.
**Sedum acre* — Goldmoss Stonecrop:
(M) Yellow.
**S. ewersi* — Ewers Stonecrop:
(L) Purplish pink.
**S. kamtschaticum* — Orange Stonecrop:
(M) Yellow.
**Sempervivum montanum* — Houseleek:
(M) Red foliage subject.
**S. tectorum* — Hen and Chickens:
(M) Red foliage subject.
Thymus serpyllum — Mother-of-Thyme, Creeping Thyme:
(E) Purple flowers.
Tunica saxifraga — Saxifrage Tunicflower, Coat Flower:
(E) Pink to purple flowers.
**Viola missouriensis* — Missouri Violet:
(E) Blue. Very fragrant. Useful.

Annual Flowers

Annual flowers in a wide range of form and colour have been found adaptable. Unfortunately, however, they require attention during a busy season and their success is largely dependent on shelter and on favourable moisture supply. Early development is essential for best results and the amateur is well advised to commence with popular kinds. Seeding of hardy annuals may be done May 10 to 15 but a wide range of choice kinds should be sown indoors in early April and transplanted outside in early June. In the following list species marked * must be started indoors and those marked † may be treated likewise though outdoor seeding is optional.

Edging. — These are short compact plants generally utilized for edging beds and pathways or for effectiveness in group plantings. For the most part they are free blooming in attractive shades.

Linaria sp. — Toadflax:
*A dwarf compact plant. Many tiny snapdragon-like flowers in a variety of colours. Easily raised.

Lobelia erinus — Edging Lobelia:
*A very satisfactory edging plant compact and dwarf in various shades of blue.

Lobularia maritima — Sweet Alyssum:
†One of the best edging plants. Colours white and violet. Blooms profusely until hard frost.

Malcomia maritima — Virginia Stock:
†Makes a pretty edging. Outside sowing gives best results.

Phacelia campanularia — Harebell:
†Pretty blue bell-shaped flowers. Blooms early. Short blooming plant but is dependable.

Petunia hybrida — Miniature Petunia:
*Very desirable dwarf-type petunia for borders or edging. Various colours.

Tagetes tenuifolia pumila — Mexican Marigold:
*Suitable for edging or borders. Foliage attractive, flowers single golden yellow.

Bedding. — Plants of medium growth utilized for mass effect.

Antirrhinum majus — Common Snapdragon:
*Many varieties suitable for massed beds. Very effective.

Brachycome iberidifolia — Swan River Daisy:
*An attractive annual with dainty blue flowers also good edger.

Calendula officinalis — Pot Marigold:
†Very hardy and produces a wealth of yellow and orange blooms until severe frost. A general favourite.

Callistephus chinensis — China Aster:
*There are many varieties of this popular flower. Early ones best. Good for cutting.

Centaurea cyanus — Cornflower, Bachelor's Button:
†An easy annual to grow. The blue varieties most attractive. Other colors are pink and white.

Clarkia pulchella — Clarkia:
†Easily grown from seed sown where they are to bloom. Attractive sprays of flowers in pink, red and white.

Coreopsis — Calliopsis:
†Good for cutting and massing. Attractive colours.

Cosmos bipinnatus — Common Cosmos:
*Very showy in mixed colours. Grow only early flowering varieties as they need a long season.

Dimorphotheca aurantiaca — Cape Marigold:
*Daisy-like flowers in beautiful shades of cream, lemon and orange. Spreading plant easily grown.

Eschscholtzia californica — California Poppy:
†An easily-grown plant with brilliant orange flowers.

Gilia capitata — Globe Gilia:
†Attractive bright blue flowers useful for cutting.

Godetia grandiflora — Godetia:
*Very showy satin-like flowers in various shades of carmine, salmon, orange, etc., with white edging.

Gypsophila elegans — Annual Baby's Breath:
†White and pink flowers used with good effect in bouquets.

Iberis amara — Candytuft:
†A very easily grown fragrant flower in shades from white to dark pink.

Layia elegans — Tidy Tips:
†Outside sowings often give good results. Yellow, tipped white, daisy-like flowers.

Linum grandiflorum — Scarlet Flax:
†Grown easily from seed sown outdoors. Its rich colour makes it a favourite. Can also be used as an edger.

Machaeranthera tanacetifolia — Tahoka Daisy:
*Blue flowers. A good bedding plant. Easily grown.

Mathiola incana var. *annua* — Ten Weeks Stock:
*A very satisfactory bedder. Flowers have a pleasing fragrance and bloom until hard frost.

Mesembryanthemum cryophytum crystallinum — Iceplant:
*A curious plant with thick leaves covered with glistening dots. Flowers white and light rose.

Papaver rhoeas — Corn Poppy, Shirley Poppy:
†A blaze of colour at little cost and easily grown.

Papaver somniferum — Opium Poppy:
†Very showy. Single and double varieties in several bright colours.

Petunia hybrida — Petunia:
*A very popular drought resistant bedding plant. Many colours. Single and double flowers.

Phlox drummondii — Drummond Phlox:
*Many varieties useful bedders. Not always satisfactory being late, but highly recommended.

Portulaca grandiflora — Rose Moss:
*A good bedder for hot sunny locations. Useful for rock gardens.

Reseda odorata — Mignonette:
†An old fashioned favourite. Not showy but very fragrant. Seed should be sown where it is to grow.

Schizanthus pinnatus — Butterfly Flower:
*Attractive fern-like foliage with orchid-like flowers in many combinations of colours.

Silene armeria — Sweet William Catchfly:
*The flowers are deep rose, star-shaped and borne in clusters.

Tagetes erecta — African Marigold:
*Plants bloom freely until frost. Good bedder and cut flower.

Tagetes patula — French Marigold:
*Brilliant colour combinations of red and yellow. Excellent cut flower and very attractive in massed beds.

Tropaeolum majus — Nasturtium:
†Attractive various colours. Fragrant single and double flowers. Satisfactory for bed or window boxes.

Viola tricolor — Pansy:
*Many strains in a great variety of colours.

Background. — Frequently tall-growing, loose-textured plants employed for landscape effect, particularly for blending with shrubs.

Kochia scoparia-trichophylla — Burning Bush:
*Tall foliage turning red in autumn. When kept trimmed can be used as a border.

Lathyrus odoratus — Sweet pea:
†A general favourite. Many old and new varieties.

Mathiola bicornis — Night Scented Stocks:
†Not a very attractive plant in daytime but exudes a heavy fragrance at night. Easily grown.

Mentzelia lindleyi — Blazing Star:
*Showy golden yellow, poppy-like flowers. Very attractive and fragrant at night.

Nicotiana sp. — Flowering Tobacco:
*Petunia-like blossoms in shades from white to crimson which open towards evening and become very fragrant.

Zinnia elegans — Youth and Old Age:
*Many varieties in a wide range of colours. Showy dahlia-like blooms good for cutting.

Everlastings. — A few species make very satisfactory bouquets for winter decoration.

Ammobium alatum — Winged Everlasting:
*Good small white flowers with yellow centres.

Helichrysum bracteatum — Strawflower:
*The largest showiest and best of everlastings. A wide range of coloured flowers from white to purple.

Helipterum manglesi — Swan River Everlasting:
*Slender stems. Flowers bell-shaped, pink and white. Not showy.

Helipterum roseum — Rose Everlasting:
*Used in making attractive winter bouquets.

Limonium bonduelli — Sea Lavender:
*Yellow flowers. Popular for sprays.

Small Fruits

For many years the Station has demonstrated that Peace River settlers can produce abundant supplies of fruit provided they plan accordingly. In recent years there have been changes in recommended lists and most of the newer material is superior to the older varieties.

Raspberry. — Formerly, Herbert was the only variety recognized by the Station and its quality is still held in high regard. It has, however, produced small, crumbly fruit in dry years. It is only passibly winter-hardy and is quite susceptible to mosaic. For these reasons it gave way to Chief, a variety with more hardiness and drought tolerance. Some have faulted Chief for its greyish cast when preserved.

In recent years several new varieties have been under test, and some of them are much superior to Herbert in all respects. At present the choice seems to rest between Madawaska, Rideau and Trent. Their flavour is superb; they appear to be almost completely resistant to mosaic, and their winter-hardiness is at least equal to Herbert.

Investigations suggest that a week of mild weather in mid-winter may cause a break in dormancy and result in killing. This may explain why the Station has insisted that canes be bent over and the tips covered in autumn.

TABLE 35.—RASPBERRIES

Variety	Yields in pounds per acre									
	1939	1940	1941	1942	1943	1944	1945	1946	1947	Average
Block A										
Adams 87	390	331	3623	4022	2809	2945	2468	1488	2650	2303
Chief	494	381	2519	2730	2301	2364	2409	1416	2632	1916
Herbert	327	1012	2447	3064	2623	1716	1597	1216	3213	1913
Viking	208	281	2643	1982	876	1116	1597	962	1779	1272
Block B										
Latham						127	454	309	871	440
Madawaska						159	921	1089	2614	1196
Rideau						499	1112	835	2759	1301
Ruddy						140	1222	828	2160	1087
Starlight						0	207	748	887	461
Trent						372	608	835	3376	1298

Strawberry. — This crop has suffered a general decline of late principally because of the difficulty experienced in maintaining strong, healthy stock. Contributing factors are susceptibility of most varieties to disease and insect attack, reluctance of some varieties to establish new plants and the tendency to shallow rooting. The disease situation, so far as the individual grower is concerned, can be controlled by planting of disease-free stock followed by vigilant roguing. Cyclamen mite causes some plants to take on a diseased appearance and this also calls for roguing and burning. Make a careful selection of varieties and adapt cultural methods to conserve moisture. Aim to replace beds every second year. Strawberries are at least moderately resistant to 2,4-D, which suggests improved methods of weed control.

Recommendations are:

Dakota — Probably the hardiest of cultivated varieties. A good plant maker. Fruit medium in size, bright red, quality above medium.

Senator Dunlap — Hardy and a good plant maker. Fruit above medium in size, glossy red, moderately firm, quality above medium to good.

Gem (everbearing) — Plants are hardy, healthy and fairly vigorous. A good propagator for an everbearing variety. Fruit above medium size, bright red, medium firm flesh, quite acid flavour, medium quality.

Two introductions show promise. Glenmore (June-bearing) is somewhat similar to Senator Dunlap but has better plant character, while the fruit averages larger and is of better quality. Pixie (everbearing) is a very early and productive variety particularly promising because of its fall crop.

Gooseberry. — This fruit has some very staunch supporters. The recommendation of Oregon Champion has been changed to Pixwell and Abundance because of superior winter hardiness and greatly increased yield. Pixwell rates high in jam quality.

The large-fruited European varieties invariably attract attention in the plantation but all those tested have had thick skins and rated low in quality. All lack sufficient winter hardiness and are highly susceptible to mildew.

TABLE 36.—GOOSEBERRIES

Variety	Yields in pounds per acre								
	1939	1940	1941	1942	1943	1944	1945	1946	1947
Abundance				525	1149	1184	5497	4289	3082
Oregon Champion	737	794	326	1186	430	522	3148	2481	2515
Pixwell	1078	993	1555	1947	279	754	5091	5091	2776

Currant. — Recently some twenty varieties of red currants were removed from the orchard in favour of the three now recommended.

Victoria — Very hardy, vigorous and productive. Berries small to medium, acid and of fair quality.

Raby Castle — Very hardy, vigorous and very productive. Berries small to medium, acid and of fair quality.

Red Cross — Hardy and productive, vigorous growth but canes inclined to droop under the load of fruit. Berries are large, mild and of quite good quality. Large seeds.

The dessert quality of white currants is not generally appreciated. Two varieties are now recommended:

White Grape — Bush is hardy, vigorous and productive. Berries are medium in size and very high in quality.

White Imperial — Bush is hardy, vigorous and very productive. Berries are medium to large in large clusters and are of excellent quality.

FIG. 34.—Prince Albert red currants in full crop, July 29.

The situation with respect to black currants is also clarified. Actually, the eighteen varieties which have been tested by the Station show only minor differences and a general clearance was in order.

Climax — Bush is hardy, vigorous and productive. Berries are medium to large, uniform and of excellent quality.

Eclipse — Bush is hardy, vigorous and productive. Berries are medium to large, quality good. Season is early and ripening even.

Magnus — Bush hardy, vigorous and heavy yielding. Berries are large, ripen evenly and are of excellent quality.

TABLE 37.—CURRANTS

Variety	Yields in pounds per acre									
	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
Red Currants										
Fay's Prolific	–	–	312	383	1801	0	1122	2325	2382	1021
Franco German	–	–	–	3545	4225	0	3469	2358	3177	284
Raby Castle	–	–	–	–	–	–	544	2116	3403	851
Red Cross	–	2864	3063	3786	2198	47	1252	4306	3233	2524
Red Lake	–	–	–	–	–	–	388	1588	2609	1531
Victoria	–	–	709	1453	2489	0	2503	4183	2623	2382
White Currants										
White Cherry	–	–	340	1014	2609	0	1770	3840	2113	1390
White Grape	–	–	–	–	–	–	99	879	794	851
White Imperial	–	–	–	283	1723	0	3694	6175	3479	2306
Black Currants										
Boskoop Giant	–	1361	2581	662	780	132	1111	2902	765	737
Climax	624	2184	2581	785	411	57	1744	1777	1163	851
Kerry	–	–	–	–	0	0	0	0	624	1021
Magnus	–	–	–	–	0	0	0	950	1545	1418

Large Fruits

Crabapples. — Some seventy-five varieties of crabapples have been under trial on the Station, indicating that the growing of this fruit is now accepted. One tree of Osman has borne consistently, with crops ranging up to 290 pounds per year. This variety is hardy and makes excellent jelly and preserves but in dry years the sample is rather small. It is, unfortunately, very susceptible to fireblight and losses will inevitably result should this disease become rampant. The Station has a number of selections in prospect and for the present recommendations must carry some qualification:

Columbia — Very hardy and moderately productive. Fruit is of excellent quality but lack of colour detracts from its products.

Florence — Moderately hardy, and because of its habit of overbearing, the fruit is often undersized unless thinned. Excellent quality.

Olga — Hardy productive tree but is subject to chlorosis after mid-summer. Fruit quality is excellent.

Osman — Very hardy. Consistent cropper of excellent quality fruit.

Silvia — Tree hardy and very upright, moderately productive of golden yellow elongated fruit. Early ripening is this variety's main virtue.

Fig. 35.—Heyer No.12 apple in bloom, June 3.

Promising new varieties are Porter, Large Yellow and Gibson. Calros is very hardy and a fair cropper. Its fruit is attractive and keeps well but is only fair in preserving quality.

It is unfortunate that Columbia is the only proved variety which is resistant to fireblight. Varieties such as Osman, Olga etc., are susceptible to loss from this dread disease.

TABLE 38.—YIELDS OF SOME WELL KNOWN APPLES AND CRABAPPLES—1937-1947

Variety	Planted	Yields in pounds per tree										
		1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
Apples:												
Heyer No. 12	1937	–	–	–	1	2	6	18	33	8	69	6
Hibernal	1925	1	4	13	35	19	67	15	53	–	64	–
Crabapples:												
Columbia	1926	–	–	2	3	4	15	13	14	–	–	–
Dolgo	1926	1	3	14	8	5	16	13	26	–	–	–
Florence	1926	6	20	46	69	85	81	43	53	43	81	18
Olga	1926	6	12	60	28	51	101	70	133	62	126	23
Osman	1926	3	55	110	157	127	231	173	245	95	291	73

Apples. — In 1931 the Station proudly displayed its first standard apple when the Hibernal commenced fruiting. At present in the orchard there are some twelve varieties which bear more or less satisfactory fruit. The choice of these is Heyer No. 12, an excellent fall apple which comes into bearing in its third year. A single tree of Early Minnesota has produced well for three successive years and the fruit keeps into January.

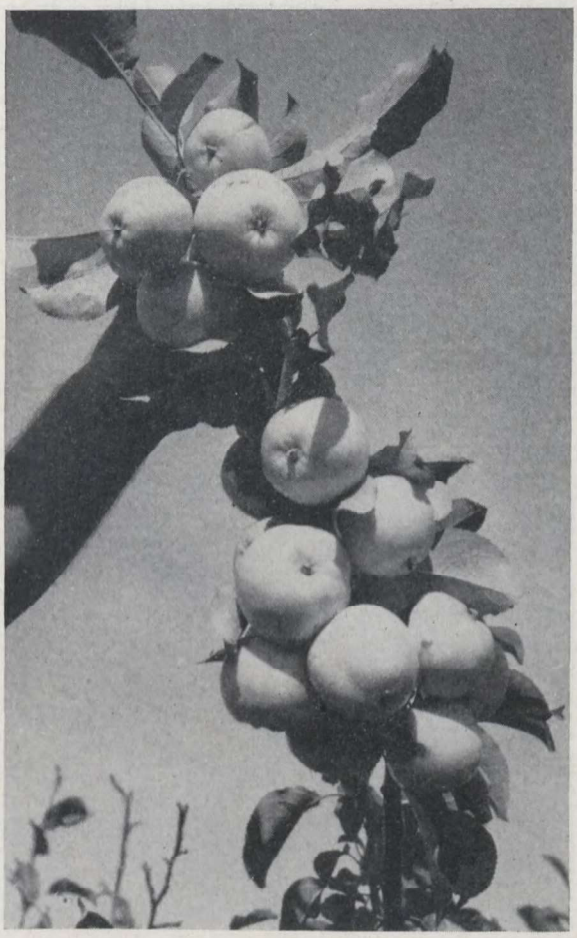

FIG. 36.—Rosthern No. 15 apple, September 8.

Apple-crabs. — Intermediate between apples and crabapples is a group with apple quality and crabapple size and which for the present contains many interesting varieties and selections. Notable among these are:

Rescue — Hardy to winter tip killing but evidently subject to internal trunk injury. Fruit excellent as a small dessert apple, fair for preserve and jelly.

Trail — Resistant to fireblight but only moderately hardy. Worth growing because of the excellent apple quality fruit.

Rosilda — Rather tender and only fruits under ideal conditions. Fruit is of excellent quality.

Rosthern No. 17 — Fairly hardy and comes into heavy production at an early age. Fruit of good preserving quality and keeps well.

Rosthern No. 30 — Hardy and productive of almost apple-size fruit. The quality is only fair. Fruit bruises easily and does not keep long.

FIG. 37.—Mount apple, September 8.

Pears. — Pears show hardiness and prospects of quality sufficient to warrant development but for the present fruits have been obtained only from *Pyrus ussuriensis* and Tait-Dropmore.

Apricot. — Apricot is in much the same position though present stocks are not particularly hardy and the early bloom frequently is frosted. However, Scout has fruited a very acceptable product and the challenge has been accepted.

Plums. — Under favourable conditions this fruit shows very good promise but most varieties are only moderately winter-hardy, have late maturity or produce fruit with a high degree of astringency.

FIG. 38.—Tait-Dropmore pear in full bloom, June 4.

Dandy — Hardy and quite early maturing seedling of Assiniboine selected by Boughen Nurseries, Valley River, Manitoba. Good quality.

Mandarin — Very hardy, productive plum of Korean origin selected by Dr. F. L. Skinner. Makes rather an astringent preserve or jam but fruit is quite pleasant eaten off the bush.

Norther — Hardy, very early maturing seedling of Assiniboine selected at the Morden Experimental Station. Good quality.

Olson — Hardy native selected in Northern Manitoba. Quality quite good and early maturity.

Cherry-plums. — This group shows much more promise though astringency prevails generally and most varieties maintain satisfactory bush form for only five to eight years. On the other hand, they usually come into production the year after planting.

Manor — Hardier and earlier in maturity than the old variety Opata. Produces excellent quality purple-fleshed fruit. Very good for jam and preserving.

M. 118 — A day or so earlier than Manor but not as good quality. Promising.

Cherry. — This is a miscellaneous group, some members of which have very definite possibilities. Manchu cherry has very attractive bush form and although lacking somewhat in winter-hardiness warrants very special attention. Fruit colour is white to dark red and the jam superb with complete lack of astringency. Drilea is the only named variety.

Moscow sour cherry has most attractive fruit but the bush is not entirely hardy. Bessarabian seedlings are slightly more hardy but the fruit is smaller, carries less quality and is produced sparsely. The Station has not fruited *P. fruticosa* as yet but results elsewhere suggest that it has possibilities for northern regions.

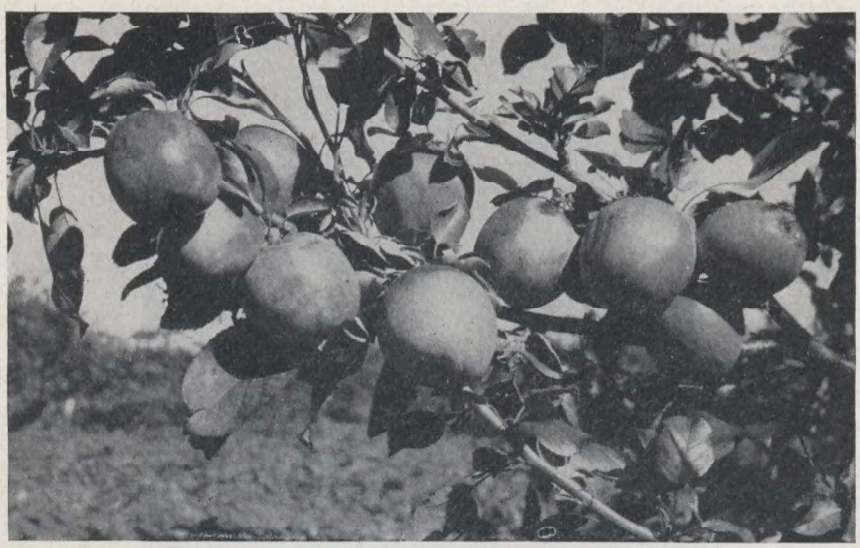

FIG. 39.—Early Minnesota apple, September 8.

The sandcherry has limited appeal, particularly because of the semi-prostrate bush of some of the better selections and the mild astringency of the fruit. Those who have grown unselected seedlings are well advised to replace them with Brooks, Manmoor or Mando.

WILD FRUIT

A very distinct phase of horticultural effort lies in the search for, domestication and improvement of native wild fruit. The Station has investigated pincherry with little avail. Black currants have been received from several sources but none are worth propagating.

FIG. 40.—Branch of saskatoon selection No. 9 bearing heavy load of fruit, July 20.

Saskatoon. — The native saskatoon has responded and the Station's No. 9 selection and reselections from it have elevated this fruit in the opinion of every visitor to the Station. The quality is much improved over that usually secured from the wild. Unfortunately many seedlings have been lost to root-rot and distribution has largely been restricted to root sprouts.

Vegetables

Asparagus. — Slow to establish but well worth the effort. Start with purchased plants and thorough preparation of the bed. Plant eighteen inches apart in rows six to eight feet apart. Do not cut until the third year. Mulch with well-rotted manure. Giant Washington and Mary Washington are the hardiest and most productive.

Rhubarb. — Best adapted to rich deep loam which is well drained. Ruby and Macdonald are recommended, with Valentine (deep red) and Early Sunrise (deep red, vigorous growth) showing promise.

Beans. — Most so-called stringless varieties have developed objectionable fibre under drought conditions. Varieties recommended are:
Bountiful — Flat-podded green.
Round Kidney Wax — Round-podded yellow.
Stringless Green Pod — Productive, round-podded green.

Pole beans are late. Broad Windsor is the choice of the broad beans.

Shell beans are worthy of a trial as the seed has table quality equal or superior to most commercial stocks. Try Princess of Artois or Pacer.

Beet. — Detroit Dark Red and Globe (Cardinal and Rennie XXX) have the best cooking quality of the varieties tested. The former bolts readily, while the two strains of Globe rarely became unsuitable from this cause.

Broccoli. — Italian Green (sprouting type) is recommended. Leads all other vegetables as a source of both vitamin A and calcium and is rich in vitamin C.

Brussels Sprouts. — Rather late for good results. If interested try Amager Market.

Cabbage. — Best results are obtained from plants started indoors.
Chieftain — Savoy.
Golden Acre — Early.
Copenhagen Market — Mid-season.
Pennstate Ballhead — Late.
Red Haco — Red.
Succession — Mid-season.

Carrot. — It is no longer necessary to grow coarse varieties. Use Chantenay and Danvers for satisfactory yield and cooking quality.

Cauliflower. — Start indoors. Valuable as a source of vitamin B_1 and vitamin C. Snowball is recommended for early use and Veitch's Autumn Giant for late crop. This crop does not stand drought well.

Celery. — Quality very acceptable when satisfactorily grown, particularly Cornell No. 19 (partial green), Salt Lake (green) and Golden Self Blanching (white). Plants must be well advanced when set out. Crop requires abundant moisture and a deep loam soil. Grow in trenches and blanch by hilling.

Chard. — Preferred to spinach for mid-season and late greens. Rhubarb chard is attractive when growing but loses its colour in cooking. Lucullus is the standard.

Corn. — Not recommended except for favoured locations. Squaw is early but has poor quality. Altagold, Seneca 60, Spancross, Golden Gem, Pickaninny and Banting have given best results and are listed in order of earliness. The variety situation is changing rapidly as a result of plant breeding efforts, hence catalogue recommendations should be followed closely, paying particular attention to hybrids. Sow early, about May 15, and take a chance on frost. Do not crowd. Suckering has improved yield and quality but has not resulted in increased earliness.

FIG. 41.—Early varieties of corn for hybridizing, in greenhouse.

Herbs. — The following can usually be grown satisfactorily: Caraway, chives, dill, mint, sage, summer savory, and thyme.

Lettuce. — Leaf lettuce produces well until mid-summer. Use Grand Rapids. Head lettuce follows and usually has excellent quality. Bolts readily under dry conditions. Recommended varieties are New York No. 12, Great Lakes and Solid Head.

Onion. — Production frequently dependent on the control of onion maggot. The season is rather too short for this crop particularly as improperly ripened bulbs do not keep well. Recommended varieties are Yellow Globe Danvers and Red Wethersfield. Arctic Sweet Spanish shows promise. For pickling try Barletta.

Parsnip. — Dependable if sown early. Short Thick is early and easy to harvest but may not keep well. Hollow Crown is deep-rooted.

Peas. — Sow early for good results. Recommended varieties are Little Marvel (early), Lincoln or Homesteader and Laxall (mid-season) and Stratagem (late). Some varieties, particularly Alaska, have poor quality.

There are good commercial prospects for the production of canning pea seed stocks, particularly because of the freedom from weevil and the general freedom from diseases which are particularly troublesome in other areas. Some twenty varieties have been catalogued. The following indicates the rating of selected varieties.

Vine — Alaska, Little Marvel (too short), Lincoln (satisfactory).

Yield — Little Marvel (very light), Alaska (light-medium), Lincoln (satisfactory). Price should be considered along with yield in determining commercial prospects.

Potato. — The recommended list is now narrowed down to four varieties, Carters Early Favourite, Irish Cobbler, Canus and Carman No. 1. All have good quality. Irish Cobbler is the heaviest yielder of the group but has deep eyes. Carters Early Favourite is early, moderate yielding and quite susceptible to scab infection. Carman No. 1 is attractive in most years but in late seasons may be wanting in table quality. Canus is the newest variety and has good quality and shallow eyes.

Radish. — Saxa, French Breakfast and Icicle are recommended. Comet shows promise in one year's trial.

Spinach. — A valuable source of iron and vitamin A. Victoria is early but bolts freely. New Zealand is later and more satisfactory.

Tomato. — Recommendations are changing rapidly and several early maturing varieties of determinate type are now available. The earliest of these is Farthest North but its small fruit and tartness make it acceptable only in short-season areas. Early Chatham and Bounty are recommended for general use but every effort must be made to have the plants well advanced by the time they are set out in the garden (about June 10). Many others have been tested and a number of hybrid populations are being investigated.

Protect from wind. The determinate type requires neither staking nor pruning.

Vine Crops. — Vine crops are generally poorly adapted because of the short cool season. In a few areas, particularly where the soil is light or where there is a concentration of heat, cucumber, pumpkin and squash do well. Vegetable marrow is more widely adapted.

If interested try:

Cucumber — Early Russian, Mandarin, Mincu.
Pumpkin — Early Cheyenne.
Squash — Giant Summer Crookneck, Hubbard.
Marrow — Long White Bush.

Pests

Horticultural effort presupposes some difficulties from disease, insects, rodents etc. Fortunately most outbreaks can be readily controlled if prompt

action is taken. Some of the most common ailments are listed below, with control measures used by the Station.

Vegetables. — Derris dust controls flea beetles, cabbage worms, and to some extent beet web worms. DDT dust is also a control for flea beetle and cabbage worms but should not be used within three weeks of harvest. Cabbage root maggot is frequently troublesome but responds to a treatment with corrosive sublimate. Corrosive sublimate may also be used to control onion root maggot but experimental work suggests seed treatment with calomel since it is cheaper, with a follow-up dosage of corrosive sublimate later in the season if the outbreak is severe.

Potato diseases, notably scab and rhizoctonia are controlled by rotation and annual dipping of seed in a mercuric chloride solution. Other diseases, such as purple top, leaf roll and witches' broom are kept in check by field roguing.

Fruits. — Principal diseases of fruit crops are mosaic in raspberry and mildew in raspberry, gooseberry and currants. Mosaic is usually kept in check by roguing but Madawaska, Rideau and Trent seem to be resistant and should therefore, be grown if serious trouble arises from this disease. Control for mildew is lime-sulphur sprayed in early spring (dormant), pre-bloom, and post fruit-set, if required. So much mildew infection has occurred in European gooseberries that this type is not recommended.

Aphids on currants are controlled by nicotine sulphate spray to the underside of the leaves. Arsenate of lead readily kills green gooseberry worm but derris should be used after the fruit is well sized. The Station has not found satisfactory control measures for currant fruit fly, though recent work elsewhere suggests that cryolite may be effective. Fireblight in apples has not been noted on the Station.

Flowers. — Most of the troubles encountered on the Station with peonies have been caused by botrytis blight induced by unfavourable growing conditions or by partial winter killing. This suggests careful attention to the plant but should it become diseased the plant should be lifted, scraped free of rot, and disinfected with corrosive sublimate before replanting. Other flowers have been remarkably free of disease.

Ornamentals. — The main cause of concern to ornamentals centres on evergreens. Woolly aphid has been troublesome but has been controlled by one spraying of nicotine sulphate. Spruce budworm has been effectively treated with DDT and derris dust.

Damage from mice may be expected wherever litter is encountered in the dormant season. Obviously nesting can be discouraged by the removal of such litter.

Rabbits are the greatest single scourge to horticulture and unfortunately cannot be controlled in any feasible way other than by fencing the enclosure or by wrapping individual specimens during epidemic periods.

Co-operative Testing

Before communication services in the district were highly efficient and when horticultural recommendations were not very concrete the Station made an effort to supply surplus stock to settlers in the hope that it would encourage garden endeavour and relieve a monotonous diet. In time other agencies were developed to serve this need, thus enabling the Station to concentrate on experimental effort.

Eventually the Station found that it was testing on the basis of one location only, which might or might not, be generally effective. Accordingly, in 1946, a policy of co-operative testing was formulated which allows for the testing of a

limited amount of material at scattered points whenever suitable contact is made. This broadens the scope of the Station's work and should strengthen its recommendations.

No further general distribution of nursery stock can be made although each mail brings requests for material normally supplied by the nursery trade.

ILLUSTRATION STATIONS

Seven Illustration Stations and one District Experiment Substation are supervised from the Beaverlodge Station.

During the period 1937-1947 work was discontinued at four of the original Stations, Baldonnel, Dreau, High Prairie and Pouce Coupe. J. W. Abbott, operator of the Baldonnel Station from its inception in 1924 until 1939 is now Officer-in-charge, Dominion Experimental Substation, Whitehorse, Y.T.

A Supervisor was appointed to the staff of the Beaverlodge Station in 1942, at which time Illustration Stations were established at Baldonnel, B.C. near the original site, at Progress, B.C. and at Goodfare and Wapiti in Alberta. In 1943 a Station was established at Falher to replace the Dreau Station but was discontinued at the end of 1946. In 1944 a Station was started in the Black Duck district on a phase of unproductive grey wooded soil, and by late 1946 a site was located for the District Experiment Substation at McLennan on a similar type of grey wooded soil.

Illustration Stations are located on privately-owned farms on the basis of a co-operative agreement between the owner and the Dominion Experimental Farms Service. In this way farm problems may be studied in their local environment, thus serving to extend and substantiate the work of the Experimental Station. The work has been steadily broadened in scope and has developed from the original purpose of demonstrating sound farming methods to include experiments of a fact-finding nature.

The Illustration Stations have been so located that work is possible on all the major soil types existing in the region. At Fairview the soil is classed as shallow black. Baldonnel is situated in an area of semi-wooded soil of good fertility, whereas the Debolt, Goodfare, Progress and Wapiti Stations are located on wooded soils which are extremely grey and quite lacking in fibre. The Black Duck and McLennan Stations are located on grey wooded soils having a particularly tough and impervious subsoil. Though climatic conditions do not vary widely some differences do exist. Debolt, for instance, generally has a more abundant moisture supply than the other Stations. An investigation of farm problems under varying conditions of soil and precipitation is thus made possible.

Some of the more important phases of work being studied are the value of fertilizers, crop rotations and soil management, cereal varieties, costs of production, and meadow crops and mixtures for hay and pasture.

ILLUSTRATION STATIONS

Location	*Operator*
Baldonnel, B.C.	H. G. Hadland
Black Duck, Alberta	W. H. Smith
Debolt, Alberta	Wm. Perkins
Fairview, Alberta	K. R. Macdonald
Goodfare, Alberta	C. Third
Progress, B.C.	H. Bentley
Wapiti, Alberta	M. E. Lofstrom

DISTRICT EXPERIMENT SUBSTATION

McLennan, Alberta	Lamoureux Bros.

TABLE 39.—LONG-TERM PRECIPITATION DATA

Station	Number of years records kept	Period of years records kept	Average for summer months April-July inclusive	Average for calendar year
			inches	inches
Baldonnel	18	1927-47	7·50	16·43
Debolt	7	1940-46	7·59	18·11
Dreau	11	1932-42	6·11	14·55
Fairview	16	1932-47	5·95	15·70
High Prairie	9	1931-39	8·08	18·71
Pouce Coupe	12	1928-39	7·14	17·37
Progress	5	1943-47	6·52	14·76
Beaverlodge	32	1915-47	6·71	17·37

Crop Rotations

Systematic Layout, the Basis of Illustration Station Work. — The importance of rotating crops is becoming more apparent to the farmers of the region. Those in the more fertile black-soil belts are recognizing the loss of natural fertility and of fibre. In the grey-soil areas the settler has learned that legumes are necessary before the land will produce cereal crops successfully. Thus, experimental findings have been substantiated by the observations of farmers in many different localities and there is now a definite awareness of the need for soil conservation. In line with the need for experimental work in connection with soil conservation, crop rotations have been carefully studied on most of the Illustration Stations for a number of years. In some districts definite recommendations can now be made as to the most satisfactory system of cropping, while in others further work must be carried out.

Fig. 42.—Severe washing following heavy July shower, Dawson Creek district.

Three-Year Rotation: Summerfallow-Wheat-Wheat.

This rotation has been under way at Fairview for a number of years and serves as a check with which to compare other rotation studies. The six-year-average yield of wheat on summerfallow is 22·0 bushels per acre. Wheat after wheat in this rotation averaged 17·9 bushels for the same period.

A portion of the field is manured every summerfallow year at ten tons per acre. In this part of the field wheat on summerfallow averaged 30·5 bushels per acre, while wheat after wheat averaged 22·3 bushels per acre. Thus, ten tons of barnyard manure has been instrumental in producing about thirteen extra bushels of wheat. The three-year rotation has given good results to date but the soil is becoming pulverized and is subject to soil drifting.

Three-Year Rotation: Summerfallow-Wheat-Coarse Grain.

This rotation is under way at four Stations and serves as a basis for a comparative fertilizer experiment on grey wooded soil. At Debolt since 1944 wheat after summerfallow has averaged 36·4 bushels per acre, while the three-year-average yield of oats after wheat is 34·7 bushels. At the other three Stations results are only available for one or two seasons.

Three-Year Rotation: Summerfallow-Wheat-Hay.

This rotation is also under way at four Stations but only at Debolt has the work been carried for more than two years. The four-year-average yield of wheat is 39·9 bushels per acre. Altaswede red clover has averaged 1·83 tons of cured hay per acre for three crops following wheat.

Four-Year Rotation: Summerfallow-Wheat-Sweet Clover (Hay)-Wheat.

This rotation was established at three Stations on grey wooded soil in 1942 to study the effect of sweet clover on the ensuing grain crops. On the basis of a two-year average for the three Stations, sweet clover increased the yield of wheat, following the turning under of the clover stubble, by five bushels per acre or 21 per cent, as compared with wheat following oats in the same series. At Debolt where the land had been cropped for over ten years the differences were particularly outstanding. The wheat following the sweet clover was a rich green in colour, while that following the oats was a sickly yellow and the stand was considerably thinner. The sweet clover was hayed in the early blossom stage and the stubble ploughed immediately after haying. In this way volunteering of sweet clover in the subsequent crops was held at a minimum. This rotation is now under way at Goodfare and Progress.

Six-Year Rotation: Summerfallow-Wheat-Hay-Hay-Coarse Grain-Coarse Grain.

Established as the farm rotation at Baldonnel in 1943 this cropping sequence has proved to be quite satisfactory. Wheat is seeded as a companion crop to brome and alfalfa the year after summerfallow to ensure the best possible supply of moisture to establish stands of the grass-legume mixture. The sod is broken after the removal of the second hay crop and worked well to kill the brome and alfalfa.

Five crops of wheat grown on summerfallow have averaged 19·7 bushels per acre. Four crops of brome-alfalfa hay following wheat have averaged 0·68 ton per acre. The second hay crop has averaged 1·16 tons per acre for three crops grown. One crop of oats grown after hay yielded 30·0 bushels per acre in 1947 despite an extremely dry season.

This rotation has also been studied at Fairview where wheat after summerfallow has averaged 24·2 bushels per acre for three crops grown. The grass-legume mixture, sweet clover and timothy, has averaged 1·25 tons per acre for three crops following wheat, while second year hay has averaged 0·91 ton per

acre for the same period. Oats after hay has averaged 64·6 bushels, while oats after oats has averaged 56·9 bushels per acre for three crops.

The second hay crop should be cut as early in July as possible so that the field may be ploughed and worked down in readiness for cropping the following year. If moisture is not in good supply the first crop following the breaking of the sod may be light.

This is an excellent rotation where abundant supplies of feed are required and where the soil is in need of fibre.

FIG. 43.—Two-year stand of brome and alfalfa in rotation. Yield two tons cured hay per acre, Debolt Station.

Six-Year Rotation: Summerfallow-Wheat-Coarse Grain-Coarse Grain-Hay-Hay.

This rotation was established at Debolt in 1942 where it has proved very satisfactory. Good catches of brome and alfalfa have been obtained three years after summerfallow when seeded with oats or barley as a companion crop. It has one advantage over the previous rotation in that a full year is allowed for the working and eradication of the grass-legume sod. This is worthy of consideration as most farmers find brome difficult to kill.

Hay yields have been very satisfactory, the four-year-average yield of brome-alfalfa mixture following oats or barley being 1·07 tons per acre. Second-year hay has averaged 1·76 tons per acre on a three-year basis. Wheat after summerfallow after hay yielded 25·0 bushels per acre in 1946.

The fibre content of the soil at Debolt has been substantially increased by the use of brome and alfalfa in this rotation.

Six-Year Rotation: Summerfallow-Wheat-Wheat-Summerfallow-Coarse Grain-Coarse Grain.

This rotation has given good results at Fairview, three crops of wheat after summerfallow averaging 27·2 bushels per acre. Wheat after wheat has averaged 17·9 bushels per acre for the same period. Three crops of oats after summerfallow have averaged 71·6 bushels per acre, while three crops of oats following oats

have averaged 59·2 bushels per acre. Though giving good results as far as yields are concerned an examination of the soil reveals the needs for fibre if this land is to continue producing good crops.

Seven-Year Rotation: Summerfallow-Wheat-Wheat-Hay-Hay-Grain-Grain.

Established at Fairview in 1947 as the main farm rotation, this cropping sequence is aimed especially at combating soil drifting, which has become a serious threat in recent years. The fields have been paired so that a minimum of cross fencing will be necessary should the operator wish to pasture the mixture of brome and sweet clover. Experience has shown that even soils with a high fibre content may drift if a large area is exposed, hence the fields have been run crosswise to the prevailing wind. Actually, modified strip farming is being practised.

This rotation is worthy of consideration for many districts where soil drifting is a threat.

Recommendations. — For grey soil areas a short term rotation of 4 or 5 years, which includes legumes, is recommended. Legumes increase the amount of nitrogen available to succeeding grain crops, and improve the physical condition of these grey wooded soils. In short rotations on these soils sweet clover, and, in some areas, red clover or alsike can be grown satisfactorily. A longer rotation can be used in those cases where alfalfa can be grown for seed or forage.

In the more open, black-soil belts longer term rotations may be employed. Here a grass should be included along with the legumes to add fibre and so help to prevent wind and water erosion.

Plant Food Requirements

During the past seven years experiments have been conducted on several of the Stations to study the effect of the application of plant food in the form of commercial fertilizers. Preliminary experiments resulted in a carefully planned experiment being established in 1944.

Fertilized Wheat as Companion Crop for Sweet Clover. — Fertilized wheat was used as a companion crop for sweet clover at three grey-soil Stations for the two-year period 1942-1943, seeding being done after summerfallow. Moisture was in good supply during this period and the yield increases were quite satisfactory. The rates of application were heavier than those recommended for the region. Fertilizers were applied by means of attachments mounted on the grain drills.

TABLE 40.—FERTILIZED WHEAT AS A COMPANION CROP TO SWEET CLOVER 1942-1943 INCLUSIVE. THREE STATIONS

Treatment	Rate per acre	Yield per acre basis 6 crops	Increase or decrease over check
	lb.	bu.	+ or − bu.
None	–	27·5	–
Borax	20	26·9	−0·6
Sulphur	20	27·2	−0·3
Gypsum	112	26·7	−0·8
Nitrogen-Phosphorus-Potash-Sulphur (Ammonium phosphate [11-48] @ 42 plus muriate of potash @ 20)	62	33·6	+6·1
Nitrogen (Ammonium sulphate)	80	29·5	+2·0
Nitrogen-Phosphorus (Ammonium phosphate [11-48])	42	32·5	+5·0
Nitrogen-Phosphorus-Sulphur (Ammonium phosphate [16-20])	100	36·5	+9·0
Phosphorus (Triple superphosphate)	47	33·5	+6·0

Results indicate that while nitrogen in the form of ammonium sulphate produced extra growth, little, if any, response has been measured in increased yield of grain and in some instances there was actually a decrease. On the other hand, all fertilizers carrying phosphorus have given substantial yield increases.

Yields of sweet clover were taken the year following the harvesting of wheat, but in no case was a definite increase in yield of hay recorded as the result of fertilization the year previous.

To supplement these findings a further experiment was laid down at Debolt and Falher in 1944, at Progress and Baldonnel in 1946 and at McLennan in 1947. In this experiment the fertilizers were applied by hand and worked into the soil by the action of the drill disks. While it is recognized that this method of application is only about 50 per cent as effective as drilling the fertilizer into the soil it was resorted to in order to apply the exact amounts of fertilizer called for. Manure was applied in the year of summerfallow.

The period 1944-1947 was below average as far as moisture was concerned, nevertheless in most cases fertilizers carrying phosphorus paid for their cost and application and hastened maturity by two or three days. Nitrogen fertilizers such as ammonium nitrate and ammonium sulphate produced extra growth but the response was not carried through to increased grain yields. Manure produced marked increases at most Stations and at times served to double the yield.

TABLE 41.—FERTILIZED WHEAT, FIVE STATIONS, 1944-1947

Treatments	Rate per acre	Average yield of wheat basis 12 crop tests	Increase or decrease as compared with check
	lb. or tn.	bu.	+ or − bu.
Manure	15T	38·9	+9·9
None	–	29·0	–
Nitrogen (Ammonium nitrate)	50	28·2	−0·8
Sulphur	20	28·0	−1·2
None	–	29·2	–
Nitrogen-Sulphur (Ammonium sulphate)	80	29·5	+0·3
Phosphorus (Triple superphosphate)	45	31·7	+2·5
None	–	29·2	–
Nitrogen-Phosphorus (Ammonium phosphate [11-48] @ 45 plus ammonium nitrate @ 36)	81	33·8	+4·6
Nitrogen-Phorphorus-Sulphur (Ammonium phosphate [16-20] @ 100 plus sulphur @ 6)	106	32·0	+3·7
None	–	28·3	–
Nitrogen-Phosphorus-Potash-Sulphur (Ammonium phosphate [16-20] @ 100 plus potassium sulphate @ 40)	140	31·7	+3·4

Small Plot Tests also Point to Phosphorus. — In 1947 a small plot experiment was conducted at all Stations. The plots were randomized in quadruplicate. The rod-row seeder was used and the fertilizer was drilled with the seed. The manure was applied just previous to seeding and worked in with a garden rake. This leaves much to be desired but seemed to be the only way the manure could be applied.

Yield data are available for nine points. Manure increased the average yield of wheat for the nine points by 3·1 bushels per acre. The nitrogen fertilizers and sulphur have not increased yields, while the phosphorus-bearing fertilizers have increased the yield of wheat by 4·8 to 7·6 bushels per acre.

TABLE 42.—FERTILIZED WHEAT ON SMALL PLOTS AT NINE STATIONS—1947

	Rate per acre	Wheat yields in bushels per acre									Average yield 9 points	Average increase over check
		Baldonnel	Beaverlodge	Black Duck	Debolt	Enilda	Fairview	McLennan	Progress	Wapiti		
	lb. or ton											+or - bu.
Manure	15T	25·2	24·8	17·5	20·5	21·8	44·0	8·3	8·5	19·4	21·1	+3·1
Check	–	20·7	22·4	16·5	16·6	19·6	34·2	12·0	3·6	16·6	18·0	–
Nitrogen (Ammonium nitrate)	50 lb	17·6	20·2	15·8	11·8	21·5	38·7	9·3	2·5	15·8	17·0	−1·0
Sulphur	20	19·8	22·9	15·9	16·4	–	41·5	8·7	1·8	18·0	*18·1	+0·1
Nitrogen (Ammonium sulphate)	80	17·7	23·1	15·3	15·5	21·2	39·9	10·3	2·5	15·5	17·9	−0·1
Phosphorus (Triple superphosphate)	45	24·7	30·6	16·0	21·9	–	44·3	14·4	10·2	20·1	*22·8	+4·8
Nitrogen-Phosphorus (Ammonium phosphate [11-48] @ 45 plus ammonium nitrate @ 36)	81	23·0	36·4	19·7	23·5	26·3	44·5	17·0	11·4	19·5	24·6	+6·6
Nitrogen - Phosphorus - Sulphur (Ammonium phosphate [16-20] @ 100 plus sulphur @ 6)	106	26·8	36·0	19·1	23·8	24·8	44·3	17·6	9·8	21·1	24·8	+6·8
Nitrogen - Phosphorus - Potassium - Sulphur (Ammonium phosphate [16-20] @ 100 plus potassium sulphate @ 40)	140	29·0	31·2	20·1	26·9	24·5	42·5	19·7	13·4	23·4	25·6	+7·6

*Average eight points.

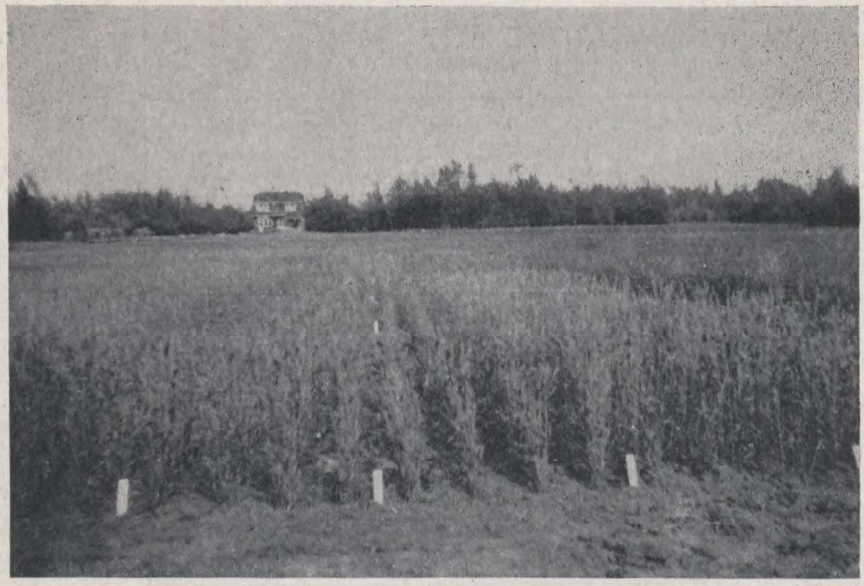

FIG. 44.—Fertilized wheat plots. Treatments (left) no fertilizer, ammonium nitrate, ammonium phosphate (16-20) plus potassium sulphate, barnyard manure (right), Baldonnel Station.

Fertilizer for Flax. — Two rates of applying ammonium phosphate (11-48) to flax were compared in seven tests during the period 1944-1945. Six of these tests were conducted on grey wooded soils and one on black soil.

In almost every case the 20-pound application of fertilizer produced better results than did the 40-pound application. The average increase obtained with the 20-pound application was 1·1 bushels per acre. With the heavier application the increase in yield was 0·5 bushel, or seven per cent. These results would indicate that a light application of ammonium phosphate (11-48) is worthwhile.

TABLE 43.—FERTILIZED FLAX, SEVEN TESTS 1944-1945

Treatment	Rate per acre	Average yield per acre	Average increase over check per acre
	lb.	bu.	bu.
None	–	7·1	–
Ammonium phosphate (11-48)	20	8·2	1·1
Ammonium phosphate (11-48)	40	7·6	0·5

Fertilizer for Legumes. — Experiments have been undertaken on the grey wooded soils to determine the effect of commercial fertilizers on alfalfa for hay and seed production. Similarly, sweet clover and red clover have been either directly fertilized or used as a residual test crop. In no instance have yields of hay or seed been materially affected by commercial fertilizers. In one season phosphatic fertilizer appeared to have brought about an increase in the alfalfa

seed set at Wapiti, however, later tests did not substantiate this. Contrary to findings in west-central Alberta, sulphur has failed to bring about any increase in yield of hay or seed.

Fertilizer Recommendations. — It is emphasized that every use should be made of barnyard manure. Legume crops should also be employed where they can be used to advantage since they help to build up humus in the soil and at the same time add valuable plant food. Nitrogen can be supplied cheaply by legume crops. In many instances, however, commercial fertilizers can be used to better advantage and when this is the case the following points should be borne in mind:

A phosphate fertilizer is recommended for grain, the accepted formula being ammonium phosphate (11-48). The suggested rate of application is 20 to 35 pounds per acre.

For best results the fertilizer should be used where moisture conditions are favourable, i.e., to grain on summerfallow.

Water Development Studies

Close attention has been paid to the excavation of reservoirs since these are a necessity for both humans and animals where water is difficult to obtain. Excellent dugouts have been excavated at a number of the Stations over the past few years. They have for the most part been fenced to prevent animals from going into the water, and in some instances gravel filter beds have been put in leading to a well from which the water is pumped. In this manner the water used is kept pure.

Fig. 45.—Stock watering dam, Debolt Station.

The reservoir at Debolt was constructed with a heavy tractor and carryall at a cost of $256.00 to the operator. The capacity is 1,600 cubic yards. The carryall does a much neater and more satisfactory job than can be done with the ordinary bulldozer blade.

Cereals

Cereal testing is a major line of work carried on at the Illustration Stations. Standard varieties have been carried together with promising new material which warrants testing on a regional basis. In this manner Saunders wheat was tested on the Illustration Stations in 1945 and 1946 and the information obtained played an important role in the licensing of the variety in 1947.

As more suitable varieties are developed the operators are encouraged to grow and distribute seed supplies. During the period 1937-1947 Illustration Station operators sold 16,952 bushels of seed grain, 25,540 pounds of grass and legume seed and some 200 bushels of seed potatoes to over 400 farmers in the Peace River region. In addition, two operators undertook to qualify as Elite growers.

Forage Crops

Upon the establishment of an Illustration Station one of the first lines of work to receive attention has been the testing of various grasses, legumes and grass-legume mixtures. Because of the nature of Peace River soils they are doubly important, serving for forage on the one hand and aiding soil conservation and improvement on the other. Of recent years attractive seed prices have added impetus to seeding down and the acreage devoted to forage crops has been considerably increased.

Method of Growing Alfalfa. — For a number of years alfalfa was grown in rows and in broadcast stands in an effort to determine the relative merits of the two methods for hay production. In all cases the broadcast stands have produced considerably more hay than have the rowed stands. Moreover, they were easier to cut and there were fewer weeds to contend with.

TABLE 44.—YIELDS OF ALFALFA HAY FROM ROWS AND BROADCAST STANDS

Station	No. of years	Yields of cured hay in tons per acre	
		Rows	Broadcast
Baldonnel	4	1·31	2·19
Debolt	4	1·58	1·79
Progress	5	0·97	1·17
Average		1·29	1·72

Many Grasses and Legumes Tested. — Grasses, legumes and grass-legume mixtures have been tested extensively to determine their suitability for hay or pasture. Brome continues to be the best adapted grass for hay or pasture. For hay it has consistently outyielded timothy and crested wheat grass. At Debolt the seven-year-average yield is; brome 0·91 ton; crested wheat 0·78 ton; and timothy 0·73 ton per acre. At some Stations crested wheat grass has produced good hay crops for upwards of two years, after which it has fallen off rapidly in yield. Timothy has produced good crops in years of ample rainfall but on the average brome has proved superior in yield and in quality of hay.

Creeping red fescue has been under test for only a few years but cannot be considered as a hay crop. Indications are, however, that it has possibilities for pasture purposes, whether seeded alone or in mixture.

Sweet clover is a high yielding hay crop. The four-year-average yield at Debolt is 2·53 tons as compared with a six-year-average of 1·84 tons per acre for alfalfa. At Baldonnel the two-year-average yield of sweet clover is 2·76 tons while alfalfa during the same period averaged 2·53 tons of cured hay per acre.

Although alfalfa hay is superior to sweet clover in quality, the latter is fed to a considerable extent to cattle with excellent results. Altaswede red clover and alsike have yielded well in years of ample moisture but crops are generally too short to harvest easily. The three-year-average yield at Debolt is 1·92 and 1·97 tons per acre for Altaswede red clover and alsike, respectively. At Baldonnel Altaswede red clover has averaged 1·13 tons per acre for a two-year period, while alsike has averaged 1·10 tons per acre for a four-year period. At Progress the four-year average for Altaswede is 1·11 tons and alsike 0·85 ton per acre. Ladino clover has been under test at several of the Stations but present indications are that it is not sufficiently hardy. Under semi-dry conditions it does not produce sufficient forage to be considered for either hay or pasture.

Several grass-legume mixtures have been under test for a number of years, the one having the widest range of adaptability being alfalfa, timothy and brome. It is doubtful, however, if this three-way mixture has any advantage over brome and alfalfa.

FIG. 46.—A 40-acre field of alsike for seed production, Debolt district.

At Progress the former mixture has yielded 1·44 tons of cured hay per acre for a five-year average, as compared with 0·77 ton from an Altaswede-timothy-brome mixture and 0·71 ton per acre from an Altaswede-timothy-crested wheat grass mixture. It was found, however, that Altaswede red clover winter-killed badly. At Baldonnel the results have been somewhat similar, with yields as follows: alfalfa-timothy-brome 0·96 ton, Altaswede-timothy-brome 0·48 ton and the Altaswede-timothy-crested wheat grass mixture 0·47 ton of cured hay per acre. At Debolt for a seven-year period the alfalfa-timothy-brome mixture averaged 1·95 tons of hay per acre. In more recent seedings the red clover-grass mixtures have outyielded the alfalfa-timothy-brome mixture, indicating that where extra moisture is available the former can be grown quite successfully. A mixture of alfalfa-creeping red fescue and brome has more recently been under test and may find a place as a pasture combination.

Progress in Horticulture

Horticulture has been emphasized on all Stations, particularly in connection with farmstead planning and home beautification. While operators have been encouraged to try bush and tree fruits, this has not been done with any idea of fruits being grown commercially but rather with the hope that every farm family may find it possible to grow sufficient fruit for family use. Incidentally, most fruit trees serve as attractive ornamental shrubs.

Most Small Fruits Do Well. — Most small fruits have done consistently well in all areas of the Peace River region. Gooseberries, currants and raspberries have yielded well but strawberries have not been grown with the same success except in summers of good rainfall. In 1946 two bushes of Oregon Champion gooseberry at Fairview produced 32 pounds of large fruit of high quality. Herbert and Chief raspberries have proved to be good croppers. Sapa and Opata plums have yielded light crops at Fairview, the fruit being of fair quality. Fay's Prolific red currants have produced abundantly and other newer kinds are showing promise. The Baldonnel and Debolt orchards are not yet producing but the fruit material is becoming well established, with new material of all fruits being added each year to replace less hardy varieties.

Fig. 47.—Sapa plum bearing fruit, Fairview Station.

Apples and Crabapples Can Be Grown. — Apples and crabapples are now producing fruit at Fairview. Two Florence crabapple trees planted in 1942 were heavily laden in 1947, while Osman trees carried a moderate crop. Heyer No. 12 apple trees fruited for the first time in 1947. These apples were of good size and quality. Promising new material carrying hardiness and quality has been planted at Baldonnel, Debolt and Fairview and indications are that good tree fruits can be successfully grown.

Good Gardens. — Good gardens are the rule on all the Stations especially where windbreaks are provided. Most vegetables can be grown satisfactorily with the exception of tender vine crops and corn. The following vegetables have been grown successfully:

Beet — Improved Detroit, Detroit Dark Red.
Bean — Pencil Pod Black Wax.
Peas — Thomas Laxton, Laxtonian. Lincoln or Homesteader is widely grown. It is an early mid-season pea and well suited for freezing.
Corn — Most varieties are too late though Seneca 60 shows promise. An earlier variety is urgently needed.
Carrot — Nantes Half Long, Chantenay.
Swiss Chard — Lucullus is excellent.
Onion — Yellow Globe Danvers, Red Wethersfield. Best results obtained by planting in cold frame and transplanting.
Cabbage — Copenhagen Market, Danish Ballhead, Golden Acre. Best results obtained by starting indoors.
Lettuce — Grand Rapids has done well.
Radish — Scarlet Turnip White Tip.
Tomato — Early Chatham and Bounty have done well when started early indoors and set out in mid-June though they do not always ripen fruit. Farthest North is early but the fruit is small.
Parsnip — Hollow Crown satisfactory if sown early.
Cauliflower — Snowball. Best results obtained by starting indoors.
Potatoes — Irish Cobbler, Carman No. 1. Canus and Carters Early Favorite also appear promising.
Vine Crops — Vine crops are not generally successful. They can be grown only in favoured locations and on light soil. Marrow is the most common vine crop grown, with Long White Bush the recommended variety.

Livestock

The improvement of swine is an important objective and much of the present breeding stock, especially in the Baldonnel and Debolt districts can be traced to the Illustration Stations. Very creditable herds of purebred and grade Yorkshires are maintained at the Baldonnel, Debolt, Fairview and Progress Stations.

Good Grades Obtained. — Records have been kept on the gradings obtained by Station farms from 1944 to 1947. During this period a total of 632 hogs were

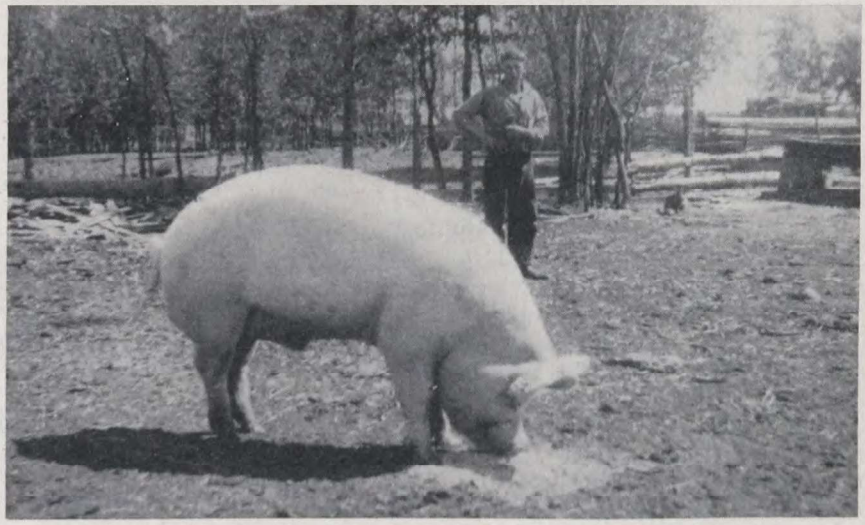

Fig. 48.—Yorkshire boar used as herd sire, Baldonnel Station.

marketed, with 73·6 per cent placing in the two top grades. Government premiums paid out to the operators during this period totalled $956.00.

Demand for Breeding Stock. — There has been a steady demand for breeding stock and the operators have accommodated their neighbors in this regard wherever possible. In the period 1937-1947 some 149 young boars and gilts were sold to neighboring farmers as breeding stock. In addition, farmers have been quick to take advantage of custom services offered. Several hundred boar services have been recorded by the operators during the past 11 years.

Since 1943 emphasis has been placed on the improvement of cattle herds. Assistance has been given in the selection of purebred sires. For the most part young bulls have been supplied from the Beaverlodge Station. Shorthorns are the breed maintained by most of the operators, the herds being kept both for milk and beef purposes.

At the Progress Station a very fine Hereford herd is maintained, with fully one-third of the animals purebred. Prior to 1944 only grade cows were kept but a purebred sire was used. Since that time, however, several purebred cows and heifers have been added to the herd and the bulls carefully selected. This is now one of the finest herds in the region and there is a steady demand for breeding stock from it.

FIG 49.—Hereford cattle, Progress Station.

POULTRY

In poultry work the objective is the maintenance of a choice flock from which distribution can be made to farmers interested in improving their flocks. All operators have at some time been supplied with poultry from approved flocks in an effort to foster the production of superior birds. With the exception of the Fairview Station where White Wyandottes are kept, the breed distributed has been Barred Plymouth Rocks.

The revenue from poultry varies with the size of the flocks but at some Stations the annual cash returns have run as high as $214.00, in addition to eggs and meat for the household.

Since 1938 the Stations have sold 429 birds for breeding purposes and 552 dozen eggs for hatching.

The investigation into farm costs on the Illustration Stations and District Experiment Substation is conducted with the general object of discovering ways and means of securing greater economy of production. It is designed to help farmers improve the organization of their farms through a wiser choice of farm enterprises and practices. The determination of profit and loss per acre or per animal is a secondary function of the study, except as far as such data is helpful in ascertaining how the unit cost of a product might be lessened. The procedure is so designed that all direct costs are charged to each enterprise concerned, while general operating expenses which cannot be directly classified are allocated to all on the basis of relative capital investment. Hence, if wheat production constitutes the main source of revenue it naturally follows that the bulk of general operating expenses is levied against this crop, but where a substantial investment in livestock is maintained that part of the farm organization receives a levy which is proportional to the capital investment. It is found that there is a close relationship between the cost of any one enterprise and the effectiveness of all other productive efforts within the individual organization. In effect, these cost studies are in the form of single enterprise accounts and comprise a correlated part of the complete farm business studies which are conducted on the Station units concerned.

Cost of Machinery Operations. — Cost data are collected annually on the operation of the various farm machines. While these vary to some extent they compare favourably where conditions and circumstances are comparable. Power machinery has been found to be more economical than horse equipment. This is in large part due to a speeding up of the operation by the use of tractor power.

Horses are being used to a lesser degree on the Stations and elsewhere with tractors being used for all heavy work. The average cost of one-waying is $1.10 per acre for eight records. The highest cost has been $1.82 per acre. This was at Debolt where a tough brome-alfalfa sod was well worked to kill the brome and alfalfa. The lowest cost of one-waying recorded on the Stations is $0.57. Stubble ploughing has been done for as little as $0.97 per acre, the highest cost being $2.50.

At Falher and at Progress costs of binding grain have been reduced by the use of labour-saving devices. These operators have so equipped their tractors that one man can control both tractor and binder from the binder seat.

Labour charges have been calculated on the basis of 50 cents per man hour for the regular farm work, while seasonal work has been charged according to

TABLE 45.—COST OF MACHINERY OPERATIONS PER ACRE 1943-1947

Item	No. of Records	Average Cost	Highest Cost	Lowest Cost
Harrow	23	$0.28	$0.46	$0.08
Double disk	25	0.73	1.17	0.34
One-way disk	8	1.10	1.82	0.57
Cultivator	11	0.63	1.10	0.39
Drill	26	0.58	0.89	0.25
Binder	23	0.88	1.42	0.55
Mower	13	0.81	1.13	0.53
Rake	13	0.40	0.67	0.25
Sp. tooth harrow	6	0.54	0.80	0.29
Packer	2	0.15	0.16	0.13
Combine	8	2.39	4.43	1.07
Tiller combine	4	1.03	1.09	0.96
Swather	1	0.70	–	–
Breaker plough	5	5.66	8.30	4.01
Stubble plough	24	1.40	2.50	0.97

going wages in the district. A charge of 10 cents per horse per hour has been made where horses have been used. The cost of combining does not include handling of grain.

Costs of Summerfallow Per Acre. — It is natural to expect that the cost of summerfallowing land will vary from one district to another depending upon the type of soil and the number of machine operations required to keep weeds under control. Records kept since 1943 reveal that the average cost of summerfallowing in this region is comparatively low. This is in large part due to the fact that weeds have not been particularly troublesome and also operations have been timely and therefore effective.

TABLE 46.—COST PER ACRE TO SUMMERFALLOW LAND

Station	1947								Average	
	Use of land and taxes	Use of Machinery	Gas, oil and grease	Horse labour	Man labour	General Farm Expense	Management	Total cost per acre	Years	Cost per acre
Baldonnel	$0.75	$1.54	$1.09	–	$1.55	$0.50	$0.60	$6.03	3	$5.38
Debolt	0.80	1.77	0.90	–	1.33	0.57	0.60	5.97	4	6.53
Fairview	1.74	0.95	0.56	–	0.65	0.00	1.13	5.03	4	5.15
Goodfare	No summerfallow in 1947								2	3.68
McLennan	0.80	0.55	0.34	–	0.33	0.71	0.60	3.33	1	–
Progress	0.59	1.07	0.73	–	1.00	0.47	0.50	4.36	4	3.41

Cost of Producing Wheat on Fallow. — In determining the cost of producing wheat on summerfallow it is necessary to include charges for summerfallowing, seed, spring preparation of land, seeding, harvesting, threshing and hauling. In addition a further charge is made to cover the use of general farm equipment, buildings, land and taxes and general farm expenses such as farm share of the cost of operating the farm car. A managerial charge is also made to take care of supervision by the operator. The effect of low, medium, or high yields upon the cost of production is readily seen and when properly analysed may be instrumental in bringing about a change of cropping practice. Consistent low yields of wheat will be reflected in high costs of production with little or no profit made. At Goodfare, for instance, the 1945-1947 average yield for wheat on summerfallow was 9·3 bushels per acre. The average cost of production for this period was $1.15 per bushel. At Debolt, where extra moisture has been the rule, the five-year-average yield for wheat grown on summerfallow was 27·8 bushels per acre. The corresponding cost of producing wheat was $0.57 per bushel.

TABLE 47.—COST PER ACRE OF PRODUCING WHEAT ON SUMMERFALLOW

Station	Years Grown	Yield per acre		Cost per acre		Cost per bushel	
		1947	Average	1947	Average	1947	Average
		bu.	bu.				
Baldonnel	4	20·0	24·4	$15.86	$15.73	$0.79	$0.64
Debolt	5	20·0	27·8	17.54	15.87	0.88	0.57
Fairview	4	–	17·7	–	11.33	–	0.64
Goodfare	3	6·0	9·3	9.19	10.70	1.53	1.15
Progress	5	7·0	21·6	11.63	12.65	1.66	0.59

Cost of Preparing Bush Land for Cropping. — Cost records were kept in 1946 on land clearing operations where large trac-tractors and brush cutters were used. Records of the cost of breaking such lands were also kept in order that information on the total cost of preparing bush land for cropping might be made available.

Where an eleven-foot V-type cutter was used on medium to heavy bush cover, clearing was done at a cost of $4.48 per acre; medium cover at $2.90; light cover at $2.00. Where an eight-foot angle blade was used with a smaller crawler tractor, medium to heavy cover was cleared at a cost of $4.76 per acre, light cover at $1.64. Brush piling with a specially built piler cost $2.99 per acre. Brush breaking costs ran from $4.01 to $8.30 per acre depending upon the former cover. Costs include charges for gas, oil and grease, depreciation on machinery and wages for operation. They do not include cost of moving from one job to another or supervision by the operator.

Basing costs on the rates charged by operators of clearing equipment, the cost to the farmer would be in the neighborhood of $18.00 to $30.00 per acre for clearing, piling and breaking. In addition there is the expense of burning brush, picking roots and working the land down preparatory to seeding.

FIG. 50.—Brush cutting equipment at work, Baldonnel Station.

FARM ORGANIZATION AND BUSINESS STUDIES

For some years studies have been under way to determine sources of revenue. The records collected have been used to determine the relative productivity of the various farming enterprises in terms of financial returns. A weekly report of farm revenue and expenditure is furnished by each operator and at the end of each year an inventory record is taken listing kind, acreage and production of crops grown, capital investment in land and buildings, livestock, machinery and equipment, feeds and supplies, accounts receivable and liabilities such as balances owing on agreements of sale and mortgage indebtedness. Other phases of this study are land utilization and farm capital.

TABLE 48.—CAPITAL INVESTMENT AND GROSS REVENUE PER ACRE OF CROP LAND

Station	Land and Buildings		Livestock		Machinery and Equipment		Total capital	Investment per acre crop land	Gross receipts per acre crop land
	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total			
Baldonnel	$10,077.57	63·30	$1,810.00	11·37	$4,033.57	25·33	$15,921.14	$93.11	$43.69
Debolt	7,242.50	55·73	1,741.50	13·40	4,011.67	30·87	12,995.67	51.57	18.61
Fairview	10,462.50	84·32	253.87	2·05	1,691.83	13·63	12,408.20	43.23	4.74
Goodfare	5,251.63	68·91	571.75	7·50	1,797.98	23·59	7,621.36	42·82	7.35
Progress	6,687.81	47·94	4,332.00	31·05	2,931.95	21·01	13,951.76	44.86	13.98
Average	7,944.40	64·04	1,741.82	13·07	2,893.40	22·89	12,579.63	*52.46	*15.99

*Weighted Average.

Land Utilization. — The 1947 inventories show that six operators of Illustration Station farms in the Peace River region own 3,982 acres of land, of which 1,591 acres, or 40·0 per cent, is under cultivation. The remaining 2,391 acres are in native pasture and waste land. In 1947 these operators grew 563 acres of wheat, 183 acres of oats, and 161 acres of barley and mixed grains. In addition 177 acres were in hay and 64 acres in legumes for seed production.

The average size of farms in the Peace River region is 480 acres, the Station farms being slightly in excess of that. Some of the larger Stations comprise land that is rented or leased and in many cases much of this land is used as native pasture. The Progress operator, for instance, makes good use of such native pasture for grazing purposes. Thus very little land is left entirely idle.

Farm Capital. — Inventory records for 1947 indicate that, on the average, 64·04 per cent of the capital investment is in land and buildings. Livestock constitute 13·07 per cent and machinery and equipment 22·89 per cent of the total capital investment. The average investment per acre of crop land is $52.46, whereas the average gross receipts amounted to $15.99.

Farm Revenue

Illustration Station operators submit weekly statements of their sales of farm produce as well as statements of expenditure. Results indicate what lines of production are receiving major attention and also show what enterprises can be engaged in advisably.

TABLE 49.—PERCENTAGE CONTRIBUTION OF FARM ENTERPRISES TO TOTAL REVENUE, 1943-1947 INCLUSIVE

Year	Cattle and Dairy Products	Field Crops	Hogs	Poultry	Horses	Garden and Orchard	Misc.	Farm Produce Consumed by Household
1943	13·9	30·3	37·0	3·1	3·0	0·1	3·5	9·1
1944	7·7	41·5	37·3	1·7	0·0	0·1	4·8	6·9
1945	13·5	46·0	24·4	1·4	0·0	0·0	10·4	4·3
1946	22·7	43·6	16·9	2·5	0·6	0·0	6·0	7·7
1947	14·4	41·7	29·7	2·3	0·6	0·0	5·9	5·4

Field crops, including grains, and grass and legume seed, have made up the bulk of the revenue, although in 1943 when hog production was near its peak the returns from this enterprise exceeded that from field crops. In 1946 revenue from hogs dropped off sharply, but sales of cattle and dairy products made an upward swing. Revenue from field crops has held consistently at about 40 per cent of the total in the 1944-1947 period. The total cash expense as per cent of total revenue for the five-year period 1943-1947 is 52·4. The average sales revenue per farm in 1943 was $2,990.49. By 1947 the average had reached $3,834.74. This was largely a result of the increased price for grain. Records are based on reports from five Stations in 1943, six in the period 1944-1946 and five in 1947.

FIG. 51.—Field day crowd, Fairview Station.

COMMUNITY SERVICE

Over the past eleven years 44 field meetings have been held with a total attendance of 2,735 adults. At these meetings experimental work has been reviewed and discussed and the farmers assembled have had an opportunity to view the work being conducted. The gatherings have become larger over the years and farmers are continually showing more interest in the topics under discussion. Attendance at six Station meetings in 1947 was 565.

Field days constitute the major part of the extension work undertaken but in addition the Supervisor addressed other agricultural meetings, wrote numerous articles for the press and delivered addresses on topics of interest over the local radio station.

ACTIVE PROJECTS

ANIMAL HUSBANDRY

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A–513	Breeding Yorkshire Swine.
A–786	Optimum Propertion of Oats in the Ration of Bacon Hogs.
A–897	Vitamin Supplements in Winter Swine Feeding.
A–913	Preparation of Oats for Young Pigs.

CEREALS

C–I	Testing Varieties and Strains of Grains in Comparative Field Trials — Spring Wheat, Winter Wheat, Oats, Barley, Field Peas, Flax, Winter Rye.
C–V	Development of Superior Varieties or Strains by Breeding and Selection — Spring Wheat, Oats, Barley, Flax.
C–XIII	Production of Elite Stock and Registered Seed.
C–XIV	Determination of Varietal Compositions of Farmers' Samples.

FORAGE CROPS

Ag–1	Indian Corn, Variety Tests for Ensilage Purposes.
Ag–16	Roots, Variety Test.
Ag–64	Fleshy Annuals — Rape, Kale.
Ag–101	Seed Production — Grasses, Clovers and Miscellaneous Crops.
Ag–111	Alfalfa Breeding.
Ag–126	Alfalfa, Variety Tests for Hardiness, Yield and Suitability.
Ag–130	Alfalfa, Seed Production.
Ag–161	Sweet Clover, Variety Tests.
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Ag–255	Forage Crop Nursery.
Ag–264	Perennial and Biennial Grasses and Legumes for Hay.
Ag–276	Herbarium.

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H–797	Flowering Bulbs, Variety Experiment.
H–802	Perennial Vegetable Crops — Asparagus, Rhubarb.
H–803	Root Vegetables, Variety Experiment — Beet, Carrot, Kohl Rabi, Parsnip, Radish, Salisfy, Swede Turnip, Onion, Turnip.
H–804	Leafy Vegetables, Variety Experiment — Brussels Sprouts, Cabbage, Cauliflower, Celery, Lettuce, Parsley, Spinach, Swiss Chard, Kale, Broccoli.
H–805	Vegetable Vine Crops, Variety Experiment — Cucumber, Muskmelon, Pumpkin, Squash, Vegetable Marrow, Watermelon, Citron.
H–806	Solanaceous Vegetables, Variety Experiment — Pepper, Egg Plant, Potato, Tomato.
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IS–W1.63	Six-Year Rotation — Fallow, Wheat, Hay, Hay, Coarse Grain, Coarse Grain.
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IS–W1.83	Eight-Year Rotation — Fallow, Wheat, Wheat, Part-season Fallow, Hay, Hay, Coarse Grain, Coarse Grain.
IS–W1.85	Eight-Year Rotation — Fallow, Wheat, Coarse Grain, Part-season Fallow, Hay, Wheat, Wheat, Coarse Grain.