DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL SUB-STATION

BEAVERLODGE, ALBERTA

REPORT OF THE SUPERINTENDENT

W. D. ALBRIGHT

FOR THE YEAR 1926

FIG. 1.—Cutting Banner oats in the date-of-planting test, 1926. Though the variety stood up better than most in the variety test, the growth was so rank that some lodging was bound to occur. Yield 134 to 146 bushels per acre.

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INTRODUCTION

After four somewhat dry seasons during which yields ran below par, while grasshoppers multiplied and wireworms took their toll, 1926 redeemed the Grande Prairie settler's situation with the greatest crop on record. Good prices persisted for both wheat and oats. The acreage of the former cereal had shown a substantial increase and in outlying districts men matured hundreds of bushels of the golden cereal who had not marketed any wheat from their homesteads before. Natural parasites put a period to the hopper infestation. Fodder supplies were abundant. To climax all, Herman Trelle, of Wembley, won the world sweepstakes in both wheat and oats at the International Hay and Grain Show, Chicago, proving that the Peace River country can produce top-notch quality as well as tremendous yields. Robert Cochrane, of Grande Prairie, repeated his 1924 winning of third prize on timothy seed.

Land values stiffened. Immigration quickened. The morale of the pioneers, which had been gradually recovering from post-war depression, improved rapidly.

The mildest winter on record ushered in an early spring. Seeding could have been done in March, but was deliberately deferred until April, most of the wheat being sown by the twenty-fourth of that month and practically all before the thirtieth.

Notwithstanding that an ice crust had covered much of the ground for weeks from early January onward, and that snow was thin or absent the greater part of the time after New Year's, it was found that little killing of perennials and winter annuals had occurred. A small field of alfalfa, which it had been sought to destroy by close autumn and winter grazing of horses, came through with scarcely a plant missing. Winter wheat and rye were killed in a few small depressions where the ice crust was exceptionally thick, but by harvest the gaps were scarcely discernible. By the middle of April the winter grains and grasses were greening nicely and a month later the rye was a foot high. In the first week of May tulips and hyacinths were blooming profusely.

Apart from a few light touches of frost and some strong wind early in June, causing drifting on a few badly worked fields, the conditions were generally excellent until June 8, when a drizzle of rain turned to snow that continued into the fourth day. Snow to a depth of ten inches accumulated. The total moisture in rain and snow amounted to 3.24 inches. It penetrated the ground with unusual thoroughness and uniformity, moistening sod knolls to a depth of twenty-eight inches. Additional rain the next week carried the moisture down further still. The total June precipitation was 4.45 inches.

While the June snow was fairly general in the Grande Prairie district it seems to have been deeper at Beaverlodge than at most other points. In certain sections best supplied with moisture during the preceding dry years this 1926 June storm amounted to little more than a drizzle and some of those sections suffered later from dry weather.

The snow proved a godsend to meadows and grain, although not particularly favourable to vegetables or field hoe crops.

At the end of June and in the first week of July a period of warm weather occurred and a few fields of grain in the neighbourhood of the Station evinced slight yellowing. At Beaverlodge the maximum temperature was 89 degrees Fahrenheit but at some other points it was higher, and north of the Peace John M. Lamont, of Berwyn, registered 93 degrees Fahrenheit. Unofficial temperatures of nearly one hundred in the shade were reported from river valleys. This hot period burned the crops considerably in the famous Waterhole section and less severely around Berwyn. Between Berwyn and Peace River were excellent crops. Spirit River escaped damage, the contrast between its crops and those across the river at Waterhole being remarkable. In a hot, dry period a few degrees lower temperature, coupled with a little ampler moisture supply, make the difference between injury and safety. Speaking broadly, it may be said that the districts which had suffered most during the preceding dry seasons were favoured in 1926.

Thenceforward on Grande Prairie the only serious trouble was lodging. On the eighth of August a suggestion of frost was noticed, though the thermometer read 35 degrees. However, in some other parts a little injury occurred, notably in the more bushy part of the Spirit River district—a remarkable occurrence because Spirit River is usually counted exceptionally safe from frost.

September 4 saw harvesting well advanced and some threshing commenced. The growth of corn on the Station was checked by frost on the mornings of September 8 and 11. Sunflowers continued to grow until a few days of snow and frost in the week ending September 18.

Threshing and cutting of late crops was interrupted by bad weather in September though not to anything like the extent reported from the lower parts of the province. On September 24 it was resumed after eleven days' suspension. A few further interruptions occurred, but it was pretty well cleaned up during three weeks of excellent weather terminated by rain on November 6. What little threshing remained in outlying neighbourhoods was accomplished at intervals thereafter.

The demand for twine, implements, and threshing outfits was heavy. Many farmers who expected to use two or three pounds of twine per acre required 3½, 4, and up to 5. Roads were fairly good until New Year's and the elevators at steelhead were continually choked.

Possibly the heaviest stand of crop was southwest of Beaverlodge towards the Halcourt and Rio Grande neighbourhoods. Pouce Coupe had a big crop in spite of grasshoppers, which had been slower in reaching and consequently in forsaking that region. Following are a few wheat yields vouched for by the Grande Prairie Board of Trade:—

"Oscar Pitman, Grande Prairie P.O., threshed 1,050 bushels from 15 acres. Average 70 bushels per acre.

"S. C. Anderson, Grande Prairie, threshed from new breaking 61 bushels to the acre.

"John Alstead, Valhalla Valley, threshed 2,110 bushels from 31 acres, an average of 68 bushels.

"John Lowe, Niobe P.O., threshed 6,400 bushels from 150 acres, 42 bushels to the acre, and J. C. Schroeder threshed over 5,000 bushels from his 110 acres.

"In the Pouce Coupe districts farmers have had yields running from 67 bushels to 71 bushels, and in the neighbourhood of Peace River town one farmer threshed 72 bushels to the acre."

NINE MONTHS GRAIN SHIPMENTS FROM THE 1926 CROP

In spite of the fact that part of the district north of the Peace had a much lighter crop than usual, the Central Canada railway running from McLennan to Whitelaw shipped more wheat and also more coarse grains in the nine months from August 1, 1926, to April 30, 1927, than in the twelve months

representing the crop year of 1925. The Grande Prairie district showed a very large increase, shipping during the nine months 1,763,533 bushels of wheat and 690,645 bushels of coarse grains, making a total of 2,454,178 bushels, of which 749,300 bushels originated at Wembley, the end-of-steel town whose two elevators were entirely inadequate, resulting in a chronic congestion that diverted considerable grain to other shipping points.

Taken as a whole the Dunvegan lines shipped during the nine months 4,151,401 bushels of wheat and 1,303,978 of coarse grains, or a total of 5,455,379 bushels, against 3,426,887 for the whole crop year of 1925.

The Alberta and Great Waterways shipped 435,301 bushels of grain in nine months against 657,096 from the 1925 crop but the Canadian National lines in Alberta north of Edmonton shipped during the same time less than half as much as they did from the 1925 crop. So that taking all the lines north of Edmonton the nine months showing is 8,453,680 bushels against a previous twelve-month record of 9,718,983 bushels.

GRAIN SHIPMENTS ORIGINATING ON ALL THE LINES NORTH OF EDMONTON FOR THE PERIOD BETWEEN AUGUST 1, 1926, TO APRIL 30, 1927, REPRESENTING IN PART THE CROP OF 1926

—	Wheat	Coarse Grain	Total
E. D. & B. C. Railway (including Pembina Valley Branch)	3,370,149	1,285,275	4,655,424
Central Canada Railway	781,252	18,703	799,955
Total Dunvegan Lines	4,151,401	1,303,978	5,455,379
Alberta and Great Waterways	367,993	67,308	435,301

Canadian National Lines

Athabasca line	1,014,000
St. Paul line	947,000
Whitecourt line	295,000
St. Albert line	307,000
Total, Canadian National lines	2,563,000
Grand total of all lines north of Edmonton	8,453,680

SUMMARY PRESENTING STATISTICS OF LIVE STOCK SHIPMENTS FROM ALL THE RAILWAYS OPERATING IN ALBERTA NORTH OF EDMONTON

—	Number of head each class				Number of cars
	Cattle	Hogs	Sheep	Horses	
Dunvegan lines, tapping chiefly the Peace River District	10,775	24,240	595	630	772
A. & G. W. Railway, running northeastwardly from Edmonton	1,700	5,920	170	80	148
St. Paul Branch, Canadian National Railways	14,159	46,914	1,819	308	.....
Athabasca Branch, Canadian National Railways	3,014	7,618	161	103	.....
Whitecourt Branch, Canadian National Railways	3,039	7,894	470	253	.....
St. Albert to Magnolia, Canadian National Railways	1,340	1,910	347	62	.....
Totals all lines north of Edmonton	34,027	94,496	3,562	1,436	.....

DAIRYING SHOWED A SLIGHT DECLINE

As might be expected in a season of heavy grain crops, with farmers working early and late to secure their harvest, dairy production in the Peace River Country declined somewhat, although still making an important contribution to the settlers' income.

Provincial Dairy Commissioner Marker advises that final reports for the five Alberta creameries situated along the Edmonton, Dunvegan and British

Columbia Railway gave their total butter production for 1926 as 601,268 pounds, being a decrease of around ten per cent from the previous year. Five other Alberta creameries north of Edmonton gave a production of 570,771 pounds compared with 616,688 pounds for 1925—a decrease of about 7½ per cent. New creameries opened at Athabasca and Lac La Biche, and the Chipman creamery, not included in last year's list, bring the total up to thirteen Alberta creameries north of Edmonton. These thirteen made 1,419,490 pounds of butter, with an average factory selling value of 31.8 cents per pounds. Including the Pouce Coupé Creamery, which, though in a different province, belongs to the same general territory, we have 1,451,079 pounds, selling for $461,495.04.

POULTRY PRODUCTION IN THE PEACE

Once more the Peace River country has demonstrated its special adaptability to turkey raising. It had already been demonstrated to the complete satisfaction of the coyotes, which turned from rabbits to poultry without compunction, devastating many flocks. In spite of this it is estimated by Mr. A. R. Judson, District Representative of the Provincial Department of Agriculture, that the Grande Prairie turkey production was about sixty per cent as large as in 1925. He puts the total for the whole Peace River country, including, as well, High Prairie at 130,000 pounds, dressed weight. The co-operative shipments, thanks to the influence of an excellent showing in the former year, amounted to 87,000 pounds, being an increase of 30,000 pounds. The net prices realized by the growers averaged around 35 cents per pound for No. 1 over 12 pounds; 33 cents for No. 1 weighing ten to twelve pounds; 31 cents for No. 1 eight to ten pounds; 28 cents for No. 1 six to eight pounds; 25 cents for No. 2 over ten pounds, and 23 cents for No. 2 under ten pounds. The returns varied slightly according to charges at the several kills. Only sixteen per cent of the co-operative shipment graded No. 2. The average weight per bird was 10½ pounds.

In addition to turkeys the shipments of mixed poultry were put at 25,000 pounds. Egg shipments showed a heavy decrease, attributed to marketing conditions.

CEREALS

With both spring and winter grain, cereal work was developed along the lines initiated in 1925. Varieties were tested in rod-row and drilled plots. Dates of planting were compared with both spring and winter grains. Thickness-of-seeding tests were repeated with two varieties each of wheat, oats, and barley. Mixtures of flax and cereals were tried; hybridization studies continued; selected strains of certain grains further compared; and attention was paid to the matter of wheat quality as affected by soil. In the rod rows alone there were 1,036 plots, occupying about an acre. This was all sown by hand, the seed for nearly every row having been weighed on a gram scale and the amount calculated according to the size of kernel and percentage germination of each run of seed.

After a series of rather dry seasons the land was ready to respond with a wonderful crop growth. Yields were extraordinary, with lodging the chief factor tending to restrict them.

EARLY SEEDING POSSIBLE

Though seeding could have been done in March, the first plots were not drilled until April 19. The barleys were seeded May 6. Their harvest commenced with O.A.C. No. 21 on August 21 and concluded with Bearer on Sep-

tember 1. The first frost to injure grain on the high land occurred September 14, with a temperature of 27 degrees Fahrenheit, followed by 25 degrees F. on the fifteenth, the same on the sixteenth, and 14 degrees on the seventeenth. Snow to a depth of nearly four inches fell September 14, 15, and 16, flattening any heavy crop then uncut.

HARROWED WHEN BLADES EMERGING

Excepting flax and buckwheat, all the drilled plots of cereals were harrowed as the blades were emerging, barring a few in the date-of-planting experiment which came up during a prolonged wet period. This harrowing, together with clean preparation and strong growth of grain, held weeds in check, so that the accustomed hand-weeding was speedily accomplished. The harrowing may have slightly delayed maturity.

SIZE AND TREATMENT OF PLOTS

The variety plots of spring wheat, oats, and barley were drilled 165 by 14 feet, divided by paths only a foot wide, allowing little tendency to excessive growth on the borders. At harvest, nevertheless, one drill was removed from each side of every plot, leaving slightly less than one-twentieth of an acre. The tests being in duplicate, each variety was represented by $^{10}/_{1015}$-acre, or just under one-tenth.

The pea plots were the same width but shorter and border drills were not removed from these nor from the vetches, flax, and buckwheat. The winter-grain plots were drilled seven feet wide and trimmed to five feet, giving an area of $1/140$-acre, or $1/70$-acre for the pair of each.

Each of the fourteen-foot plots of spring grain was cut with three swaths of a six-foot binder, the two outer ones being stooked and threshed together, with the centre swath stooked by itself and reserved for seed, as being least exposed to the danger of hybridization from adjacent kinds.

The cultural-test plots, in which eight, sixteen, or thirty-two plots of a variety were grown side by side, were not exposed to this danger and were sown seven feet wide on eight-foot centres, leaving twelve-inch paths. These were trimmed at harvest to a width of five feet and cut with a single swath of the binder.

Duplicate plots in each series were arranged in reverse order, with the later-maturing plots towards the centre, so that in harvesting, the binder could begin on the outside of the block and work progressively towards the centre.

DEDUCTIONS FOR DOCKAGE AND FOR MOISTURE ABOVE TWELVE PER CENT

From each plot harvested as scaled at threshing a two-pound sample was weighed on a scale graduated to one-sixteenth of an ounce, sacked, and set aside. Later on, each two-pound sample was carefully halved, one part being screened, fanned, and reweighed to determine the percentage of dockage; the other sent to Swift Current, Saskatchewan, for moisture determination. Yields were afterwards corrected by making precise allowance for all dockage and for any moisture in excess of 12 per cent. Only one variety of wheat exceeded 14 per cent of moisture, and that only by a mere trifle. The driest wheat contained 11.14 per cent moisture when threshed. The time of day when the threshing is done seems to have an important bearing on the matter. Thus the yields recorded, with the partial exception of peas, flax, and buckwheat, are of clean, dry grain grown under conditions of field competition, save for a trifling amount of hand-weeding.

BIG YIELDS FROM UNMANURED LAND

The variety plots of spring wheat, oats, barley, and spring rye were on summer-fallowed land which had been manured for potatoes in 1923. The peas, flax, buckwheat and all the date-of-planting tests with spring grain were on summer-fallowed land which had never seen manure. It is significant that the yields from the early-sown plots in the latter series generally rivalled, and in not a few cases surpassed, the production of the same kinds in the variety test. It is not implied, by any means, that the previous manuring had been detrimental. Certain minor factors probably entered, but it was not a season when crops on good summerfallow were likely to suffer from dearth of available plant food.

ROD-ROW TECHNIQUE

The quadruplicate rod-row plots were seeded on a good piece of summerfallowed land that had never been dressed with any manure or any fertilizer. Each plot consisted of three rows 18½ feet long, the centre one being the test row and the other two being guards to act as buffers from the competition of adjoining varieties. At harvest one foot was rejected from each end of the test row, leaving the yield to be taken from an area one rod long by seven inches wide. The gram weight of such a plot multiplied by ten is taken as the outturn in pounds per acre. The heads were plucked, sacked, and hung under cover to dry thoroughly. Waste in harvesting was almost negligible. When hand-threshed in winter this grain was in excellent condition and no moisture determinations of it were considered necessary.

COMPARISON OF ROD-ROW AND DRILLED PLOT RESULTS

It is very interesting to compare the average yields of those grains which occurred both in the drilled and the rod-row plots. They are remarkably close.

Nine spring wheats yielded 61 bushels 59 pounds per acre from the duplicate drilled plots and 63 bushels 24 pounds from the quadruplicate rod rows. Twelve oats averaged 123 bushels 3 pounds from the drilled plots and 127 bushels 24 pounds from the rod rows. Seven barleys yielded 82 bushels 33 pounds from the drilled plots and 83 bushels 8 pounds from the rod rows. Thus the hand-threshed rod rows of wheat exceeded the machine-separated, drilled plots by only 1 bushel 25 pounds, or less than 2.3 per cent, the oats less than 3.8 per cent, and the barleys less than 0.6 per cent. Combining wheat, oats and barley, we find that 110 rod rows averaged only 2.2 per cent more weight of grain per acre than did fifty-five drilled plots of the same varieties. Both series were on summer fallow, the rod rows on land which had never been manured; the drilled plots on land manured for a potato crop grown on it in 1923. The rod rows were threshed with practically no chance of waste. The drilled plots were threshed with a separator and some waste was practically unavoidable. The small margin of difference is therefore most satisfactory. If anything, the rating of the varieties in the rod-row test corresponds the more nearly to their previous long-term averages. It would appear that a quadruplicate rod-row test is more reliable than a duplicate test with drilled plots. The element of experimental error is liable to be less in the former instance.

VARIETY TESTS OF SPRING WHEAT

Forty-two varieties of spring wheat were tested in nursery rod rows. Nine were grown, as well, in duplicate drilled plots. Whilst the same four varieties appear in the top four places in each series, yet there are certain irregularities, attributable for the most part to experimental error from causes such as differences in stand, differences in degree of maturity at harvest, and other factors. As yet the yields of the drilled plots are chosen for essential calculations, but a supplementary table presents the 1926 standing of the nine varieties in each series and in the average of the two.

Huron and Marquis have been compared for twelve successive years, nearly always side by side. In that time Huron has required about a day longer to mature but has yielded almost twenty per cent more grain, the figures being 42 bushels 33 pounds, against 35 bushels 32 pounds. It is distinctly hardier but is discounted a grade or two by its lower gluten strength. It has filled a certain place in the less safe areas and is worthy of attention from a breeding standpoint, but the quest has been for a high-quality, stiff-strawed, good-yielding, beardless wheat a week or so earlier than Marquis.

Red Bobs proved a couple of days earlier, and in this rust-free zone (where a trap exposed all summer, caught not a single spore of wheat rust) has outyielded Marquis by over a bushel per annum on a seven-year average, but it shatters too easily and is inclined to run piebald.

Early Triumph, one of Dr. Seager Wheeler's own selections out of Red Bobs, has the same faults but averages a day earlier and yields slightly better. It rates fairly well in milling and baking though not quite so high as some others. According to the Dominion Cerealist it balances rather closely with Garnet in milling and baking tests when all points are considered, producing a little whiter crumb, as a rule, but not quite so great a volume nor quite so good a texture. It was the best yielder in 1926 with 68 bushels 4 pounds per acre.

Kitchener, introduced in 1920, has slightly outyielded Huron but both are later than is desirable for the average Peace River farm in the average season.

Early Red Fife ripens about a day behind Marquis, shells as freely as Red Bobs, and fails to outyield either one.

Ruby is a full week earlier than Marquis, may generally be depended upon for a grade of No. 1 or No. 2 Northern, and is thought by many to be a fairly good drouth resister. But it shatters far too easily and in nine years has averaged only 30 bushels 22 pounds against 37 bushels 34 pounds for Marquis.

Next comes Garnet, practically as early as Ruby, much like it in strength of straw, and a substantially heavier yielder. It grades well but the type is not yet fixed, the straw is not stiff enough for a rank-growing season, and the flour has a creamy tint not altogether favoured by the milling industry.

Wireworm Injury to Garnet.—An extraordinary peculiarity in the behaviour of Garnet to date is that in every instance within the writer's knowledge, either on the Station or in other hands, where Garnet has been sown beside other varieties on wireworm-infested land it has appeared to suffer greater injury than the other varieties.

This was particularly true in the duplicate variety test in 1926. In both ranges the arrangement was: Reward, Ruby, Garnet, Early Triumph, Red Bobs, Marquis, Early Red Fife, Huron, and Kitchener. The plots were sown fourteen feet wide and divided by only twelve-inch paths. The two Garnet plots were about 180 feet apart. Germination was prompt and uniform, yet in both ranges wireworms were observed to thin the Garnet severely, doing lesser injury to Early Triumph and Red Bobs and none of any account to the six other varieties. In both Garnet plots the injury occurred throughout the whole width of certain sections of the length, but did not at any point cross the twelve-inch

(Continued on page 12)

MILLING AND BAKING TESTS

AVERAGE ON CROP YEARS 1924, 1925, 1926 OF VARIETIES OF SPRING WHEAT GROWN ON BEAVERLODGE EXPERIMENTAL STATION

Variety	Year	Weight per bushel	Weight per 1,000 K.	Crude Protein	Flour extracted	Absorption	Loaf weight	Loaf volume	Texture	Crumb Colour	Flour Colour	
											Dry	Wet
		lbs.	grams	p.c.	p.c.	p.c.	grams	C.C.	p.c.	p.c.	p.c.	p.c.
Early Red Fife	1924	62·2	38·48	15·8	66·9	59·6	473	1,883	93·0	94·0	95	95
"	1925	62·4	.....	.....	70·5	61·8	478	1,948	98·0	94·0	97	97
"	1926	61·5	.....	.....	71·5	72·0	519	1,817	94·0	96·0	95	95
Average	.....	62·0	.....	.....	69·6	64·5	490	1,883	95·0	95·0	96	96
Early Triumph	1924	60·5	37·15	15·1	74·1	59·2	469	1,996	94·5	93·0	94	96
"	1925	61·3	.....	.....	71·2	62·7	491	1,977	96·0	93·0	98	97
"	1926	61·2	.....	.....	74·0	71·3	517	1,841	93·0	95·0	97	97
Average	.....	61·0	.....	.....	73·1	64·4	492	1,938	94·5	94·0	96	97
Garnet	1924	60·0	29·72	15·4	69·0	62·2	460	2,049	97·5	97·0	93	96
"	1925	59·5	23·01	13·8	69·5	60·9	476	2.189	95·5	89·5	89	94
"	1926	62·2	.....	.....	73·4	69·7	508	1,903	93·0	94·0	85	92
Average	.....	60·6	.....	.....	70·6	64·3	481	2,047	95·3	93·5	89	94
Huron	1924	62·2	37·36	13·8	72·6	63·0	476	1,926	93·0	89·5	93	91
"	1925	61·0	.....	.....	70·6	62·4	487	1,837	93·0	85·5	92	92
"	1926	62·5	.....	.....	73·3	72·8	521	1,738	91·0	94·0	98	97
Average	.....	61·9	.....	.....	72·2	66·1	495	1,834	92·0	89·7	94	93
Kitchener	1924	62·0	36·28	13·9	71·1	60·0	477	1,801	91·5	89·0	96	93
"	1925	61·7	.....	.....	69·8	62·8	492	1,868	94·0	90·0	97	97
"	1926	62·2	.....	.....	72·3	71·2	519	1,841	92·0	93·0	96	97
Average	.....	62·0	.....	.....	71·1	64·7	496	1,837	92·5	91·0	96	96
Marquis O. 15	1924	62·0	35·30	15·4	70·9	61·8	462	2,184	97·5	96·5	94	96
"	1925	61·7	32·24	15·6	69·4	64·7	493	2,031	96·0	95·0	99	98
"	1926	62·2	.....	.....	73·3	68·1	512	2,001	99·0	96·0	100	100
Average	.....	62·0	.....	.....	71·2	64·9	489	2,072	97·5	95·8	98	98
Red Bobs	1924	60·5	36·16	15·3	73·5	60·3	471	1,977	93·0	91·0	95	95
"	1925	61·5	.....	.....	70·6	62·9	490	1,935	94·0	92·5	98	97
"	1926	62·7	.....	.....	73·2	71·9	523	1,824	96·0	96·0	98	98
Average	.....	61·6	.....	.....	72·4	65·0	495	1,912	94·0	93·2	97	97

Reward	1924	63·0	34·28	17·6	71·5	62·8	473	2,107	97·0	97·0	95	96
"	1925	63·8	.....	.....	69·7	64·0	481	2,072	99·0	97·0	99	96
"	1926	64·3	.....	.....	69·5	70·7	513	1,911	96·0	96·0	98	99
Average	.....	63·7	.....	.....	70·2	65·8	489	2,030	97·0	97·0	97	97
Ruby	1924	61·5	29·28	15·7	72·0	62·6	474	2,213	98·0	97·5	94	96
"	1925	61·2	.....	.....	68·6	65·6	484	2,217	97·5	97·5	99	99
"	1926	63·8	.....	.....	70·5	77·0	534	1,781	93·0	94·0	100	100
Average	.....	62·2	.....	.....	70·4	68·4	497	2,070	96·2	96·3	98	98

Corrected to 13·5 p.c. moisture basis.

WHEAT—VARIETY TEST (DRILLED PLOTS ONLY)

Variety	Days to mature			1926			Yields of Grain per acre				
	1926	Average five years 1922-26	Average seven years 1920-26	Total crop	Grain	Grain to total crop	Average five years 1922-26	Average seven years 1920-26	Average eight years 1919-26	Average nine years 1918-26	Average twelve years 1915-26
				lb.	bush. lb.	p.c.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.
Early Red Fife, O. 16	137	122·4	123·4	9,182	60 6	39·27	33 2	37 48	.....	.....	.....
Early Triumph	130	118·2	.....	8,678	68 4	47·06	34 20	.....	.....	.....	.....
Garnet, O. 652	129	116·0	.....	7,529	55 49	44·48	31 0	.....	.....	.....	.....
Huron, O. 3	138	122·5	124·2	9,580	65 49	41·22	36 41	42 31	42 59	42 39	42 33
Kitchener	139	123·2	124·7	8,994	64 7	42·77	36 40	42 51	.....	.....	.....
Marquis, O. 15	135	121·6	122·7	8,820	58 43	39·94	32 3	37 35	38 40	37 34	35 32
Red Bobs	132	119·2	120·7	8,662	66 48	46·11	32 50	39 5	39 49	.....	.....
Reward, O. 928	127	115·6	.....	9,049	62 50	41·44	31 30	.....	.....	.....	.....
Ruby O. 623	127	115·5	115·0	8,647	55 57	38·82	27 48	30 50	31 13	30 22	.....
Average nine varieties	.....	.....	.....	8,796	61 59	42·28					

NOTE.—In 1926 the Marquis used was from Herman Trelle's stock of registered Marquis, originally obtained from the University of Alberta in 1923.

WHEAT—COMPARING AND COMBINING YIELDS VARIETY TEST (DRILLED PLOTS) AND ROD ROWS (HAND-SOWN)

Variety	Variety Test (drilled plots)		Rod Rows (hand-sown)		Average Two Experiments	
	Yield per acre	Order of standing	Yield per acre	Order of standing	Yield per acre	Order of standing
	bush. lb.		bush. lb.		bush. lb.	
Early Red Fife, O. 16	60 6	6	60 15	7	60 10	7
Early Triumph	68 4	1	68 13	3	68 8	1
Garnet, O. 652	55 49	9	60 50	6	58 19	8
Huron, O. 3	65 49	3	69 55	1	67 52	2
Kitchener	64 7	4	68 31	2	66 19	4
Marquis	58 43	7	61 51	5	60 17	6
Red Bobs	66 48	2	67 33	4	67 10	3
Reward, O. 928	62 30	5	59 22	8	60 56	5
Ruby, O. 923	55 57	8	54 11	9	55 4	9
Average of 9 varieties	61 59	.....	63 24	.....	.....	.....

(Continued from page 9)

path into the Ruby plots, though these had emerged about the same time and were similarly treated as to harrowing. The contrast was observed by many visitors as well as by the staff. Good growing weather subsequently repaired the damage to quite a degree, giving the Early Triumph a sufficiently stout growth to head the list in yield, and bringing Garnet up much higher than seemed at one time possible; but even after that improvement it still, for the first time in five years, fell below Ruby and was decidedly outyielded by Reward, which it has generally surpassed.

Significant in this connection is the standing in the rod rows, where wireworms were not plentiful enough to be a noticeable factor. Here the Garnet took its accustomed place, ranking above Early Red Fife, Reward, and Ruby. In the date-of-planting test, located on uninfested land, sixteen plots of Garnet were grown in a block and sixteen plots of Marquis were in an adjoining block. Here the first four plantings of Garnet yielded 57 bushels 30 pounds per acre against 58 bushels 50 pounds for Marquis, or only 2.3 per cent less.

Reward is an acquisition not yet available to the public. At some points it has been reported a couple of days later than Ruby or Garnet, but at Beaverlodge it has been found quite as early in heading, in blossoming, and in ripening. It produces a uniform, attractive berry, ranks consistently high in the Cereal Division's milling and baking tests, stood the most upright of nine wheats in 1926, evinced no thinning by wireworms, and, as in 1925, outyielded both Ruby and Garnet in the drilled plots, although it had previously failed to equal the latter. Its excellent showing in 1925 was attributed to accident of position but no apparent explanation can be assigned for the highly creditable 1926 performance, except that this kind was perhaps riper at cutting than were certain of the later wheats. In the rod-row test, which is probably the truer index, Reward took its accustomed place between Ruby and Garnet in both 1925 and 1926. Ordinarily, we expect Ruby to be the lowest yielder of the nine wheats, with Reward a few bushels higher and Garnet, when the stand is not impaired, somewhat ahead of Reward.

In the nursery plots during the past two years have been three other wheats much in the public eye. These are Renfrew, Quality, and Red Bobs 222. Botanically, the latter is almost indistinguishable from Early Triumph and it is possibly the product of a similar natural cross. In the two years' trials it has slightly outyielded Early Triumph, has seemed, perhaps, a shade earlier, and has averaged an inch and a half taller. Quality has appeared to be no more forward

than Early Triumph, is similar to it in length and strength of straw, and has produced a little less. The white bran of Quality is against it on the market at present. Renfrew is a heavy yielder, but later than Kitchener. Its belt is farther south. As to the others, it must be recognized that a two-year comparison is inconclusive. The above data are offered as of legitimate present interest.

VARIETY AND STRAIN TESTS OF OATS

Thirty-one varieties and strains of oats were grown in the rod rows and twelve in the drilled plots. Three of the twelve have been tested consecutively since 1916. The eleven-year average for Victory is 87 bushels 25 pounds; for Ligowo 83 bushels 26 pounds; and for Daubeney, representing the very early oats, 63 bushels 9 pounds.

During the last nine years Victory has required an average of 124.1 days to mature; Ligowo 121.1; Daubeney 108.8 days. Daubeney has thus been 15.3 days earlier than Victory, but its short, fine straw, its limited yield, and unattractive, long, slim kernel discount it heavily. It is not recommended by the Station for any important part of the Peace River district. Neither is Alaska nor O.A.C. No. 3, both of which have been retired to the seclusion of the nursery department.

For general use, the Station recommends Banner and Victory—the former to those desiring a variety exclusively for home use; the latter to those growing oats for exhibition or sale, providing they find themselves reasonably safe with a late sort.

OATS—VARIETY TEST

Presenting 1926 crop data and showing comparative averages of yields over varying periods

Variety	Days to mature						1926		
	1926	Average 3 years 1924-26	Average 4 years 1923-26	Average 5 years 1922-26	Average 7 years 1920-26	Average 9 years 1918-26	Total crop	Grain	Per cent grain to total crop
							lb.	bush. lb.	p.c.
Abundance	118	109·0	114·2	113·2	115·0	119·0	8,605	116 10	45·95
Banner, O. 49	120	110·3	115·0	114·8	117·0	.....	10,615	151 24	48·59
Columbia, O. 78	122	112·0	115·7	.....	.....	.....	8,646	129 17	50·92
Daubeney, O. 47	111	101·0	108·2	107·0	106·5	108·8	6,337	95 30	51·44
Gold Rain	119	111·0	115·7	114·4	116·2	.....	10,117	136 18	45·88
Laurel, O. 477 (hulless)	118	109·8	114·6	113·1	.....	.....	9,407	114 12	41·33
Leader	121	113·1	117·1	116·9	119·2	.....	8,979	136 20	51·72
Liberty, O. 480 (hulless)	113	106·8	112·3	111·3	113·4	117·8	7,521	88 25	40·11
Ligowo	121	110·6	115·5	115·2	116·7	121·1	9,901	127 1	43·62
Prolific, O. 77	122	113·1	116·6	.....	.....	.....	8,694	117 3	45·79
Victory	123	114·1	117·8	117·5	119·6	124·1	9,793	136 31	47·53
Legacy, O. 678	115	105·3	111·5	110·6	.....	.....	8,907	126 20	48·32
Average 12 varieties	.....	.....	.....	.....	.....	.....	8,960	123 3	46·70
Average 10 hull-bearing varieties	.....	.....	.....	.....	.....	.....	9,059	127 14	47·81

Yield of grain per acre

Variety	Average 3 years 1924-26	Average 4 years 1923-26	Average 5 years 1922-26	Average 6 years 1921-26	Average 7 years 1920-26	Average 8 years 1919-26	Average 9 years 1918-26	Average 10 years 1917-26	Average 11 years 1916-26
	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.
Abundance	64 33	63 18	58 14	64 32	71 19	76 19	80 16	79 6	.....
Banner, O. 49	76 32	73 24	67 4	71 22	79 25	86 13	.....	.....	.....
Columbia, O. 78	70 3	70 12	.....	.....	.....	.....	.....	.....	.....
Daubeney, O. 47	49 6	47 5	45 21	49 29	54 0	57 31	53 25	63 7	63 9
Gold Rain	73 15	71 17	65 5	69 27	77 11	.....	.....	.....	.....
Laurel, O. 477 (hulless)	54 22	50 28	45 27	.....	.....	.....	.....	.....	.....
Leader	71 1	69 32	63 31	68 22	76 13	.....	.....	.....	.....
Liberty, O. 480 (hulless)	44 2	43 11	39 5	43 18	47 27	50 28	54 0	.....	.....
Ligowo	66 10	66 7	62 28	67 28	74 25	79 21	84 13	83 10	83 26
Prolific, O. 77	62 3	63 11	.....	.....	.....	.....	.....	.....	.....
Victory	71 32	73 28	66 5	71 24	80 22	85 18	87 9	86 21	87 25
Legacy, O. 678	.....	.....	.....	.....	.....	.....	.....	.....	.....

OATS—COMPARING AND COMBINING YIELDS OF VARIETY TEST (DRILLED PLOTS) AND ROD ROWS (HAND-SOWN)

Variety	Variety Test (drilled plots)		Rod Rows (hand-sown)		Average Two Experiments	
	Yield per acre	Order of standing	Yield per acre	Order of standing	Yield per acre	Order of standing
	bush. lb.		bush. lb.		bush. lb.	
Abundance	116 10	9	126 2	9	121 6	9
Banner, O. 49	151 24	1	137 5	5	144 14	1
Columbian, O. 78	129 17	5	141 5	3	135 11	5
Daubeney, O. 47	95 30	11	103 19	10	99 24	11
Gold Rain	136 18	4	147 17	2	142 0	3
Laurel, O. 477 (hulless)	114 12	10	98 33	11	106 22	10
Leader	136 20	3	151 17	1	144 1	2
Liberty, O. 480 (hulless)	88 25	12	90 28	12	89 26	12
Ligowo	127 1	6	131 14	8	129 7	7
Prolific, O. 77	117 3	8	131 18	7	124 10	8
Victory	136 31	2	140 33	4	138 32	4
Legacy, O. 678	126 20	7	132 0	6	129 10	6
Average 12 varieties	123 3	.....	127 24	.....	.....	.....

VARIETY TESTS OF BARLEY

Oats being on many farms a safer and more productive crop than barley, the average Peace River farmer has been disposed to avoid the beards of the latter grain and confine himself to oats for feed purposes, supplemented occasionally by a little low-grade wheat or wheat screenings.

For fattening hogs and cattle, however, barley is peculiarly valuable. Oat chop with thirty per cent of barley added is far more effective per pound than oat chop alone. As a field crop, barley is useful, and its occasional substitution for a part of the oat acreage is likely to postpone the day when multiplication of specific fungi will materially depress the yield of oats. Variety in cropping is important for this as well as other reasons. Thus barley has a place despite its faults. It is an abnoxious impurity in wheat and volunteers freely but perhaps the greatest objection is the beards.

Beardless barleys have been tried in some cases but most of them are light yielders and shatter badly. To this rule the only exception so far found at Beaverlodge is the Eureka beardless-hulless. The hulless character is not prized in a barley but the absence of awn is regarded so highly that the Superintendent would still prefer to grow this kind for feed purposes if it yielded a third less than bearded sorts. As a matter of fact it does much better than this and is the most resistant to shattering of any barley tested against it. Of course it is not without failings. Malsters do not want it. It is extremely subject to smut. The straw is not stiff enough to carry the heavy heads erect until they mature, but crinkles readily and sometimes becomes brittle, allowing a proportion of the heads to break off. It is tough to thresh. If grown mixed with other kinds it crosses more or less and thereby gradually reverts to the bearded type.

Two good malting barleys are O.A.C. No. 21 and Hannchen. The former is an early six-rowed; the latter a late two-rowed kind. On these and other acceptable kinds a premium has been offered by the malster for car lots of pure varieties in good malting condition. Samples of all the seven varieties grown in the 1926 drilled plots were sent for a malting test to the Canada Malting Company, Montreal, which is investigating thoroughly the subject of malting quality in Canadian barley.

A two-rowed barley resembling Hannchen but inclined to yield its beards rather than its kernels to the wind is Charlottetown No. 80. If it is left until ripe the ground will be fairly carpeted with awns in some seasons, though the Station has never had its crop shaved clean by the wind alone.

Trebi is a heavy yielder of grain and is medium-early, but in a dry season the heads remain too close to the ground and the awns are tenaciously held. Canadian maltsters do not favour this variety for their purposes.

Bearer is a very productive but late six-rowed barley, not yet commercially available.

Gold is a rather promising variety from Sweden, of which there was seed for but a single plot.

Bark's has been consigned to the rod rows. It is productive but late, is not desired by malsters and has a beard like a chevaux de frise.

Following is a five-year comparative record of six kinds arranged in order of yield, with Eureka ranked according to its equivalent in hull-retaining barley. It may be observed that with the principal exception of Eureka and the slight exception of Trebi, productiveness decreases with earliness.

BARLEY—FIVE YEAR COMPARATIVE RECORD, 1922-1926

Variety	Average data five years, 1922-1926		Yield 1926	
	Days to mature (estimate)	Yield of grain		
		bush. lb.	bush.	lb.
Bearer (6)	116·4	47 4	93	21
Trebi (6)	114·7	42 37	92	11
Eureka (6)	110·4	37 37	72	38
Hannchen (2)	115·9	41 44	79	1
Charlottetown No. 80 (2)	114·3	41 14	83	3
O.A.C. 21 (6)	109·4	34 42	67	25
*Gold (2)	.. ..	.. ..	90	40

*One plot only.

It will be noted that some extraordinary yields were obtained in 1926, Bearer leading the list with 93 bushels 21 pounds, closely followed by Trebi with 92 bushels 11 pounds. The lowest yield was from O.A.C. No. 21 with 67 bushels 25 pounds of clean, dry grain.

More closely than with either the oats or the wheat the 1926 standings of the barley varieties in the drilled plots and in the rod rows correspond, there being but two variations in relative positions, and those two by but a single place each. Gold puts Trebi down from second in the drilled plots to third in the rod rows, while Hannchen and Charlottetown No. 80 exchange fourth and fifth positions. This accords with their rating in the long-term averages and is more logical than the ranking in the 1926 drilled plots. It also furnishes further corroborative evidence in favour of the probable accuracy of the rod-row system of experiment.

Twenty-nine distinct varieties were tested in the rod rows, not counting a number of lots of Beaverlodge against Ottawa stocks of seed; any of the Eureka selections; nor any of several novel varieties grown for mounting to illustrate types.

BARLEY VARIETY TEST,

Presenting 1926 Crop data and showing comparative averages of yields over varying periods.

Variety		Days to mature			1926			Yield of grain per acre				
		1926	Average five years 1922-26	Average seven years 1920-26	Total crop	Grain	Per cent grain to total crop	Average five years 1922-26	Average six years 1921-26	Average seven years 1920-26	Average eight years 1919-26	Average eleven years 1916-26
					lb.	bush. lb.	p.c.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.
Bearer, O. 475	(6)	119	116·4	.....	8,830	93 21	50·79	47 4	.....	.....	.....	.....
Charlottetown 80	(2)	117	114·3	.....	10,689	83 3	37·30	41 14	.....	.....	.....	.....
Eureka	(6)	112	110·4	110·1	7,483	72 38	46·69	37 37	39 0	41 15	.....	.....
Gold	(2)	118	.....	.....	8,499	90 40	51·30	.....	.....	.....	.....	.....
Hannchen	(2)	118	115·9	115·2	8,096	79 1	46·85	41 44	44 23	46 27	.....	.....
O.A.C. No. 21	(6)	107	109·4	109·5	7,512	67 25	43·14	34 42	37 32	42 27	44 11	39 9
Trebi	(6)	116	114·7	.....	8,500	92 11	52·08	42 37	47 34	.....	.....	.....
Average 7 varieties		.....	.....	.....	8,515	82 33	46·61					
Average 6 varieties (excluding hulless)		.....	.....	.....	8,687	84 16	46·59					

BARLEY—COMPARING AND COMBINING YIELDS OF VARIETY TEST (DRILLED PLOTS) AND ROD ROWS (HAND-SOWN)

Variety	Variety Test (drilled plots)		Rod Rows (hand-sown)		Average of Two Experiments	
	Yield per acre	Order of standing	Yield per acre	Order of standing	Yield per acre	Order of standing
	bush. lb.		bush. lb.		bush. lb.	
Bearer, O. 475	93 21	1	101 31	1	97 26	1
Charlottetown No. 80	83 3	4	86 31	5	84 41	4
Eureka	72 38	6	60 33	6	66 35	6
Gold	90 40	3	96 36	2	93 38	2
Hannchen	79 1	5	86 43	4	82 46	5
O.A.C. No. 21	67 25	7	56 31	7	62 4	7
Trebi	92 11	2	93 1	3	92 30	3
Average 7 varieties	82 33	.....	83 8	.....	.....	.....

PEAS AND SPRING VETCHES

Five varieties of peas were compared in duplicated plots fourteen feet wide and 145.3 feet long, making a computable area per plot of $^{1000}/_{21414}$ of an acre. An unduplicated plot of tares or spring vetches separated the two ranges of peas.

The plots were drilled April 20, harrowed as the plants were emerging, and hand-weeded a couple of times. Peas are poor weed fighters.

A Phenomenon in Inoculation.—A noteworthy fact developed. In previous seasons, examination had failed to discover any nodules to speak of on the roots of field peas, although they had been abundant on the native wild pea, on the wild vetch, on the cultivated vetches, and on the grass pea. The contrast

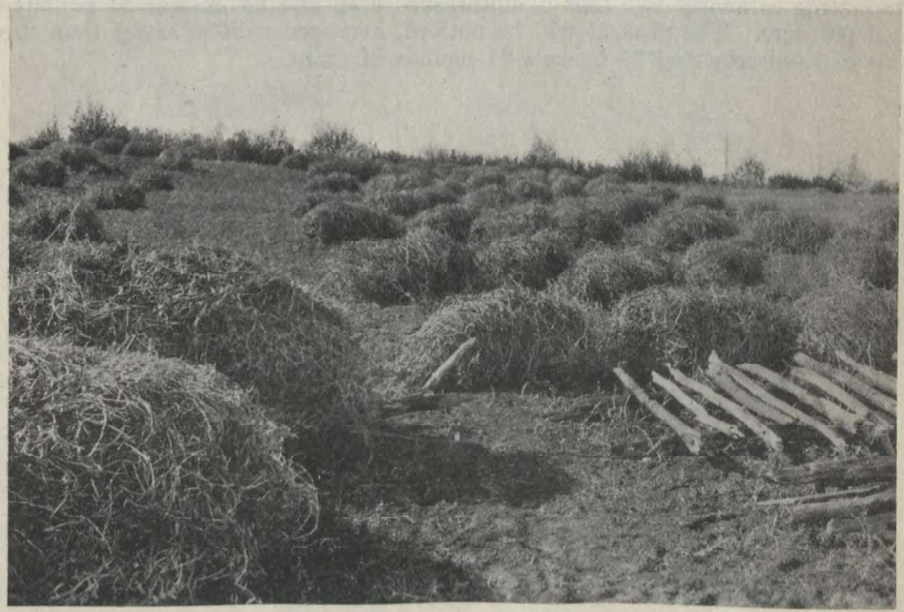


FIG. 2.—Arthur and Mackay field peas bunched on plots as pulled, ready to be piled on false bottoms of poles awaiting threshing. Yields about 50 bushels per acre.

had been especially observed in the moist summer of 1920. In certain subsequent seasons peas treated with nitro culture before sowing failed to manifest much evidence of inoculation, although it must be admitted that in these subsequent years the examinations were rather casual. The staff were inclined to wonder whether in a dry period there was not a tendency for nodule development to be restricted and for the symbiotic bacteria to slacken their activity in accord with the restricted nitrogen requirements of the plant under conditions of limited moisture supply.

That such a surmise was not out of line with the truth is apparently the opinion of Dr. A. G. Lochhead, Dominion Agricultural Bacteriologist, who points out that the greater the percentage of moisture the more abundant the nodule production, other things being equal. Several probable explanations of this fact are assigned by him. Although nitro-culture had been used on the seed in 1921, nodule development in that year was conspicuously scarce. In no other year had peas been grown in a position from which nodule bacteria might have been expected to be conveyed to the area under discussion by either wind or water, yet in 1926 all the plots gave evidence of plentiful inoculation, making a strong growth and producing heavy yields, ranging from 52 bushels 7 pounds from Mackay up to 58 bushels 4 pounds for Chancellor.

Year by year it becomes increasingly evident that duplication is inadequate to cope with soil variation.

On a four-year average the yields of the five varieties are nearly level and on the six-year average Chancellor practically ties with Arthur. All things considered, the Station decidedly prefers the early white peas, such as Chancellor.

The variety grown longest is Arthur, for which there is now a twelve-year record, covering two seasons in which the crop was a failure, the average in spite of that amounting to 22 bushels 45 pounds per acre.

Though the yield of the vetch was much below that of the peas both in weight of total crop and in threshed grain, its turnout was nevertheless good, amounting to nearly two tons of unthreshed crop and 33 bushels 54 pounds of seed per acre. The peas, it will be noticed, averaged a little better than three tons of total crop and 54 bushels 21 pounds of grain.

PEAS—VARIETY TEST

Presenting 1926 data and showing comparative averages of yields over varying periods

Variety	Days to mature					1926			Yield grain per acre			
	1926	Average three years 1922-26	Average four years 1922-26	Average five years 192'-26	Average seven years 1919-26	Total crop	Grain	Per cent. grain to total crop	Average four years 1923-26	Average five years 1922-26	Average six years 1921-26	Average twelve years 1915-26
						lb.	bush. lb.	p.c.	bush. lb.	bush. lb.	bush. lb.	bush. lb.
Arthur, O. 18	137	127·0	127·0	126·8	128·2	6,934	52 9	45·12	32 35	28 45	30 0	22 45
Chancellor, O. 26	134	116·6	118·0	118·6	.....	7,054	58 4	49·39	30 59	27 41	30 8	.....
Golden Vine Sask	134	117·0	118·2	.....	.....	7,227	54 32	45·27	31 16	.....	.....	.....
Mackay, O. 25	139	128·0	.....	.....	.....	6,487	52 7	48·20	33 36	.....	.....	.....
White Alberta	134	117·0	118·2	118·6	.....	7,081	54 57	46·56	30 45	26 25	28 58	.....
Common vetch	138	124·6	.....	.....	.....	4,411	33 54	46·11	16 59	14 15	.....	.....
Average 5 varieties peas	.....	.....	.....	.....	.....	6.956	54 21	46·88	.....	.....	.....	.....

SPRING RYE, FLAX, AND BUCKWHEAT

At the foot of the barley range was a sixteenth-acre plot of Ottawa Select spring rye. Spring rye is grown yearly to afford a comparative record of production for this class of grain, though it is not favoured by the Station for any important purpose. The 1926 crop was so heavy that it could with difficulty be handled by the binder, yet its yield was decidedly less than that of the barley, being but three and one-half tons of bundles, threshing out 3,010 pounds of grain. The six-year average is 29 bushels 28 pounds per acre. Included in this is the 1925 yield of Prolific, the only kind grown in that year. It was discontinued because of its weak straw.

Premost was the only flax grown outside the rod rows. It occurred in the date-of-planting experiment where the average yield of three dates was 16 bushels 33 pounds per acre. The second date was the one intended as a record of the production of the crop. It yielded at the rate of twenty bushels 11 pounds. Owing to rush of work and the minor importance of the two crops, border drills were not removed from the flax or buckwheat. Marginal advantage was only slight however, owing to the narrowness of the paths and the moistness of the season. Indeed, the excessively cool weather and snow of June seemed to dwarf both crops, but their yield of grain was surprisingly good, especially seeing that they were not fully ripened upon arrival of the September snow and cold spell, through which they stood. The average yield of the three dates of seeding of buckwheat was 45 bushels. The second date, intended as the variety test, was 45 bushels 28 pounds.

SPRING RYE, FLAX AND BUCKWHEAT

Variety	Days to mature					1926			Yield of grain per acre			
	1926	Average two years 1925-26	Average three years 1924-26	Average four years 1923-26	Average six years 1918-26	Total crop	Grain	Per cent grain to total crop	Average two years 1925-26	Average three years 1924-26	Average six years 1921-26	Average nine years 1918-26
						lb.	bu. lb.	p.c.	bush. lb.	bush. lb.	bush. lb.	bush. lb.
*Spring Rye:												
Ottawa Select	123	117·5	120·0	.....	122·5	7,107	53 42	42·35	37 20	27 46	29 28	.....
Flax:												
Premost (2nd Date)	124	116·0	120·3	123·5	.....	2,796	20 11	40·45	14 29	12 42	.....	12 21
Buckwheat:												
(2nd Date)	120	109·5	.....	.....	.....	3,494	45 28	62·61	33 25	.....	.....	.....

*Prolific was the only spring rye grown in 1925 and its yield for that year is included in the long-term average.

WINTER GRAINS

A 1926 yield of 54 bushels 53 pounds of Turkey Red and a nine-year average of 27 bushels 10 pounds (covering one year of almost complete failure from winter-killing) are not too bad for a latitude above fifty-five degrees. Nor need one be ashamed of a nine-year average of 38 bushels 52 pounds of winter rye. The wheat was seeded August 7, 1925, and harvested August 21, 1926; the rye was seeded August 7, 1925, and cut August 23, 1926.

WINTER GRAINS

Variety	Days to mature				Total crop	1926		Yield per acre, average nine years 1918-26
	1926	Average three years 1924-26	Average four years 1923-26	Average nine years 1918-26		Grain	Percent grain to total crop	
					lb.	bush. lb.	p.c.	bush. lb.
Winter Wheat: Turkey Red (Second date)	379	367·8	372·8	373·3	8,148	54 53	40·41	27 10
Winter Rye: (Second date)	377	370·5	373·3	371·0	7,809	45 26	32·60	38 52
Winter Vetch	368	(Two years 1924-26) 366·0	.....	.....	.....	24 21	.....	(Two years 1924-26) 15 10

THE ROD ROWS OF WINTER GRAIN

Twenty-six varieties and stocks of winter wheat were sown in triplicate ranges of rod rows on August 7 and 8, 1925. There were twenty distinct varieties or strains and in six instances seed grown at Beaverlodge was tested against seed of the same varieties or strains supplied through Ottawa. In another range were three varieties of winter rye and one of black winter oats.

The oats killed completely, as in former seasons. The wheat and rye evinced no killing whatever except a little from ice and this seemed to be governed entirely by the accident of position rather than by any variation in inherent hardiness of the respective varieties.

In the expectation that hardiness might have some relation to the degree of procumbency manifested by the autumn growth, autumn notes were taken on this point, also upon the per cent of stand shown on December 9 and again on May 1, 1926. The anticipated relationship was not evident.

One point which stands out is that in testing winter grains or perennial crops in general, more extensive replication is called for than in testing spring grains, since slight variations in contour and other conditions introduce additional and greater factors of variability.

Most of the winter wheats were rather badly lodged, and with three-drill plots one kind often tended to bear down its neighbour, so that strength of straw was not easy to judge. A five-drill plot would clearly be preferable from this standpoint.

THICKNESS OF SEEDING OF CEREALS

An acre and a half of potato ground was devoted to a thickness-of-seeding test with spring grains, duplicating four rates with each of the same two varieties of wheat, of oats, and of barley as were used in 1925. The land was surface-worked only and was quite clean, but all the grains were harrowed as they were

emerging. The straw was a good length but not excessive. It stood well, with the partial exception of Eureka, and was harvested pretty cleanly without difficulty. The plots were seeded 165 feet by 7 feet and trimmed at harvest to a width of five feet.

WHEAT

Wireworms played particular havoc with the thinner seedings of Garnet wheat and probably did a little injury to Marquis as well. Had the wheat stands escaped insect injury it is doubtful whether the thickest seeding would have given the best yield of Marquis. As it was, the eight-peck surpassed the seven-peck by less than half a bushel, even in this season of ample precipitation. In 1925 the thinnest seedings of Marquis had been progressively the best.

OATS

As in 1925, certain varietal characteristics of the oats are again brought out. First of all it should be explained that about ten or fifteen per cent of the length of all the Ligowo plots was injured by standing water, so that some allowance must be made when comparing the average yields of the two varieties. The damage was approximately equal as among the four rates of seeding of this variety, so that the primary purpose of the test was not seriously impaired.

With Ligowo the rate of seeding seemed to make little difference in the yield of grain or in the ratio of grain to total crop, which was quite consistent. With Banner, even in this moist summer, the yield dropped as the seeding was thickened, the four-bushel seeding producing 18 bushels 30 pounds less crop than the ten-peck. A corresponding disparity was seen in the average height of the standing crop which in the case of Banner fell progressively from fifty inches for the ten-peck down to 45.5 inches for the four-bushel seeding, whereas with Ligowo there was only about half an inch difference in height between the thinnest and the thickest seeding.

As the comparative yield figures of these two oats agree in their trend with the 1925 data it would seem fairly evident that Banner is a variety that may easily be handicapped by too generous seeding.

BARLEY

Whether a mere coincidence or not, the six-peck seeding of barley has in two successive seasons given slightly the largest crop with each of the two varieties. This is just a little less than the quantity usually sown in the variety-test plots, the aim there being to put in about seven pecks per acre, or between that and two bushels.

DATES OF SEEDING SPRING GRAINS

Amplified somewhat by reason of an earlier opening of spring seeding, the experiment on dates of sowing was otherwise conducted on the same lines as in 1925, so far as the wheat, oats, and barley were concerned. Peas, flax, and buckwheat were also run but in less extensive sequences. The first sowing of the staple grains was made on April 19 and the eighth on June 7. Seeding could have been commenced much earlier than it was but from previous experience this seemed inadvisable. Judging from the outcome this may have been a mistake, since most of the grains produced their largest yields from the initial seeding and it is possible that a still earlier might have been best.

The land was well-worked summerfallow which had never been manured. The plots were drilled seven feet wide, separated by twelve-inch paths, and were trimmed at harvest to a width of five feet, reducing each to an area of

one-sixtieth acre, giving a combined area of one-thirtieth acre for the pair representing each date. With one or two exceptions entailed by rain, all the plots were harrowed as the blades were emerging.

Duplication was not in all cases sufficient to counterbalance inequalities in the soil, and some inconsistencies are attributable to this factor, though the general trend is satisfactorily indicative.

Harvesting was interrupted in September by a period of snow and frost. The wheats, and to some extent the coarse grains, cut after that siege of weather had well set in, were conspicuously inferior in sample to those harvested immediately before. Naturally, with the late-seeded plots harvested in September there would be an excessive percentage of moisture in some of the grain as threshed, hence determinations were made and yields corrected to a basis of clean, dry grain with a twelve-per-cent-moisture content. Approximate corrections on a relative basis were likewise made of the weight of sheaves.

In the case of all the late seedings the estimation of number of days to mature is hypothetical. In other words, it is a guess, based upon a supposition of the period that would probably have been required by each successive date, providing the usual type of September weather had prevailed but without frost to arrest the maturity. Such an estimation may not mean very much, but it is the best that can be done with plots whose maturity is forestalled.

WINTER GRAINS

Duplicate plots of winter rye and Turkey Red winter wheat were sown in 1925 on four successive dates at weekly intervals, except that rain delayed the third sowing until eleven days after the second. The land was a good piece of summerfallowed silt-loam sloping towards the southeast.

Germination was prompt and growth rapid but grasshoppers attacked the crop, completely devouring visible top on the first date and threatening to destroy the other plots as well. Rains presently put a period to their 1925 activities and the first sowings renewed the top, all four dates going into winter in very promising condition, although polluted with Shepherd's purse, seeds of which were washed from an adjacent corral. Of the four sowings the second promised the best, entering winter in beautiful condition, although even the fourth, made on August 25, was satisfactory.

Ice did very little injury on this gently-sloping area and the plots emerged in excellent condition. On April 17 they were greening up nicely following showers. By May 16 the rye was a foot tall. The June snowstorm laid both wheat and rye, the latter never again rising. The wheat rose but was repeatedly lodged by rains later on and lay almost as flat as the rye at harvest.

Strange to say, though the second sowing looked best in the autumn and again in spring it gave the lightest yield both of wheat and rye. The most plausible explanation is that with extra favourable conditions for tillering, the August 7 sowings became too thick. The later ones had plenty of top while the first, under the exceptional circumstances, were probably benefited by the grass-hopper set-back.

A SUMMARY COMPARISON OF MARQUIS AND GARNET

In 1925 a comparison of twenty-nine plots each of Marquis and Garnet, both occurring in cultural as well as variety tests, showed that in those experiments not noticeably marred by wireworms the Marquis exceeded the Garnet in yield by only about four per cent or rather less than a bushel per acre,

although it was a season to favour later varieties. In the date-of-planting experiment, where the Garnet stands were rather badly thinned by wireworms, the spread was nearly five bushels per acre, or 28.8 per cent.

In 1926 these two varieties again occurred in four series of replicated experiments. In two of them, viz. the rod-row variety test and the date-of-planting cultural test, no wireworm injury to any variety was observed, and here the average yields of the two varieties ran very close. In the variety-test drilled plots, where some wireworm injury occurred, the spread was greater; and in the thickness-of-seeding experiment, where worm injury was extensive, the Marquis averaged eight hundred pounds per acre in excess of the Garnet, or 28.96 per cent. In this latter series location may possibly have accounted for some excessive injury to the one kind more than the other, but in the case of the variety-test drilled plots it is very difficult to make such allowance.

Taking a serial average of the four experiments, comprehending twenty-two pairs of plots of the varieties, we find the Marquis yielding 279 pounds, or 8.44 per cent more than the Garnet. Where wireworms are not troublesome the Garnet falls only about a bushel per acre short of Marquis in yield, ripens a week or ten days ahead of it, and from that cause frequently makes a better grade. The advantage of an early kind in expediting fall work and in improving the chances of the following season's crop are also very important.

COMPARING RATINGS OF MARQUIS AND GARNET IN FOUR DISTINCT EXPERIMENTS

(Comprising twenty-two plots of each variety)

Designation	Marquis yield per acre	Garnet yield per acre	Excess yield of Marquis over Garnet	
	lb.	lb.	lb.	p.c.
Rod Rows (in quadruplicate)	3,711	3,650	61	1·67
*Variety Test (in duplicate)	3,523	3,349	174	5·19
†Date of Planting (four successive dates in duplicate)	3,530	3,450	80	2·31
‡Thickness of Seeding (four rates in duplicate)	3,562	2,762	800	28·96
Serial average of four experiments	3,581	3,302	279	8·44

*Garnet in this experiment considerably injured by wireworms, though no thinning occurred in the adjacent plots of Ruby.

†As the fifth sowing of Marquis was cut after a period of frost and snow, only the first four dates of each variety are considered in this tabulation.

‡Garnet in this experiment very badly thinned by wireworms, the thinner seedings especially.

CEREAL-FLAX MIXTURES

In 1925 flax was sown mixed with certain cereals, but though the latter were sown thinly they proved too thick to permit the flax to do anything in a dry season and what with this and a light late-spring frost the quantity of flax produced was negligible.

When repeating the test in 1926 care was taken to see that some plots, at least, would be thin enough to give the flax a chance. Four combinations with Legacy oats and four with Eureka beardless-hulless barley were sown in unduplicated plots on spring-ploughed land, which had grown Eureka barley in 1925. The flax was broadcast through the grass seeder attachment, scattering in front of the grain runs.

It was intended to sow the thinnest seeding of grain at one peck per acre, but the drill would not work when set thus and the index had to be opened about a peck wider. The exact quantity of seed sown on each plot is not known, but was doubtless somewhat in excess of the stipulated rates.

It is remarkable how much the thin seedings tillered. For some time after emergence they were a sorry sight, yet the plot supposed to have been sown with one peck of barley and twenty pounds of flax yielded nearly as much barley and more than three times as much flax as the plot supposed to have been sown at four pecks of barley and fourteen pounds of flax. The lowest proportion of Legacy oats yielded almost fifty-seven per cent as much cereal and more than twice as much flax as the highest proportion. No doubt the oats in the series were sown relatively thinner than the barley, the drill having been alike in both series.

The percentage of flax to cereal in the harvest dropped progressively from 19.64 per cent down to 5.43 per cent in the case of the barley and from 28.57 per cent down to 7.31 per cent in the case of the oats.

The thinnest seeding of grain in the flax-barley series resulted in the production of about six and one-half bushels of flax per acre along with thirty-eight and a half bushels of hulless barley. The thinnest seeding of grain in the flax-oats series allowed the production of nearly eight bushels of flax per acre along with forty-five bushels of oats.

Superficially, it would seem that the lower proportions of grain to flax in the seed mixtures would be probably the more profitable. But this is where yield data require to be supplemented by field notes. All the plots required considerable hand-weeding, the thin ones more than the thicker. From the practical standpoint, therefore, the heavier seedings of grain were perhaps preferable. In fact it is doubtful whether this combination-seeding is a good way to grow flax at all, unless as a blend for sheaf feed. The greater convenience of harvesting the mixture as compared with a straight flax crop is more than counter balanced by the trouble of separting the two grains after threshing. Therefore, unless for the purpose of improving a feed mixture it seems best to select a limited area of clean land for flax, sow it alone and hand-weed as necessary.

NATURAL CROSSING OF CEREALS

During a number of years there has been observed at Beaverlodge unmistakable evidence of natural hybridization between varieties of grain grown adjacently. There has even been evidence of crossing between Marquis and Durum wheats.

In 1925, black and slate-coloured oats were for the first time observed growing in certain plots of white oats. Upon examination it was found that this occurred chiefly in the Alaska and Victory stocks of Beaverlodge propagation, and further pursuit of the records revealed that these plots had been seeded from the harvest of the 1923 variety-test drilled plots. In that year both Alaska and Victory had grown adjacent to the black winter oat, and, further it is on record that in that year, owing to early drouth followed by later wet weather, a strong suckering growth was stimulated in the early oats, so that the suckering stems of these were, if anything, later in ripening than were the average crop of such late kinds as Victory and Black Winter. Thus there was ideal opportunity for extensive crossing regardless of normal differences in time of maturity. The varieties most exposed were Victory and Alaska, with Daubeney and O.A.C. No. 3 a little farther removed but also exposed to the possibility of natural crossing through wind-borne pollen, if such is possible. Some of the heads bearing black or slate-coloured kernels were plucked to be grown out at a future date. Time did not permit in 1926.

Twenty-eight off-type heads of wheat rogued from various crops, twenty-one of them being from Garnet plots, were grown out in 1926. Most of these were either brown or black in colour. Some had long black awns; some had apical awns, and some were awnless. Those propagated represented but a very small percentage of the number observed.

SELECTIONS

Liberty Selections.—The twelve Liberty selections were seeded May 6 in quadruplicate with guard rows of spring rye. Like the rest of the rod-row plots, they were seeded without treatment for smut and in consequence developed considerable, whereas the drilled plots of Liberty, sown with carbonate-treated seed, were clean as usual. Two of the selections were noted as showing considerable smut, two were bad with it, and No. 323 was so bad that it was discarded outright. The whole twelve came up together and bloomed together but there were some interesting differences in period of maturity, some being noted as "early," some as "medium," and some as "late." There was also a variation in length of straw, ranging from 41 inches for 423 and 723 up to 45.2 inches for 823. The latter number gave the heaviest yield, 3,231 pounds, or 95 bushels per acre. Strangely enough, it was recorded as "early." It had a longer head than any other, viz., 211.2 millimetres. If it shows up as well in further tests it would appear to be an outstanding selection. It had considerable smut, but this is not necessarily an evidence of special susceptibility.

Eureka Selections.—The six 1922 selections and the twenty-three 1923 selections were sown in triplicate ranges with guard rows of spring rye. The barley lodged so early and so badly that notes on strength of straw were very difficult to take and none were recorded. A few were bad with smut, probably as the result of accidental exposure of seed to smut spores, without any fungicidal treatment to control same.

FORAGE CROPS

During the past nine years nearly twenty-four hundred meadow plots have been seeded at Beaverlodge. Fourteen hundred and sixty of them have occurred in two series of completed experiments, finally reviewed in this report.

Although systematically laid out, evenly sown, and carried through with the utmost diligence, so that a slip of any kind has rarely happened in the thousands of harvests spread over nine years, yet so elaborate have the two experiments been in respect to certain of the incidental comparisons aimed at, so trying have been several of the seasons, so irregular the effect of variations in the character of the land, and so important the consequences of grasshoppers and weeds, that interpretation of the outcome is fraught with difficulty. Lack of inoculation, too, rendered the legumes a failure in the early years, and this interferes with direct comparisons.

Nevertheless certain indications stand out quite definitely, while others, less definite, are presented with the qualification that inconclusive data demand. In some cases discerning observation is, after all, more valuable than figures. In so far as the comparison of the chief grasses is concerned the scope of the series renders the outcome quite conclusive. The same may be said of the five legumes

compared one with another. In fact, it is doubtful whether a more comprehensive trial of the leading meadow crops has been made during a like period at any Station in the West.

The land where these experiments have been conducted is a slightly undulating upland with a sharp general slope to the east and a lesser inclination to the south. The soil ranges from a fairly deep to a thin black-brown loam, broken at various times from 1915 to 1919, inclusive. On the whole, it is rather inferior to the average soil of the Grande Prairie District.

While the general aspect would strike one as fairly uniform, it has been repeatedly recorded that the slight undulations had a marked effect upon such factors as winter snow protection, spring exposure, run-off, and percolation. These influences, together with soil variation, have at times counted for several times as much as have the minor variations in experimental treatment. A fact emphasized by the work is that more extensive replication is called for in experiments with perennials than with annuals, and the more variable the lay of the land the greater is the stress upon this point.

The summer of 1926 was good for hay as well as grain, being especially suited to timothy and the common clovers. Grasshoppers, which kept hatching in prodigious numbers, wrought some damage but succumbed in mid-summer to parasites.

TECHNIQUE

Attempt has always been made to exclude border effects from the calculations. In the early years this was rather crudely accomplished by edging the plots before haying with a plough, preferably a one-horse plough. Latterly the edges were cut away with a mower and the yield obtained from the remaining area calculated by multiplying the length of each plot by its width averaged from three measurements, one across each end and one across the middle. In 1926 the plots were first trimmed to a uniform size in order to reduce the demand on arithmetic.

For the last three years, 1924 to 1926, green weights have been taken in the field and two-pound samples secured for absolute-dry-matter determination. Yields are then expressed in terms of cured hay containing twelve per cent moisture.

THE NURSE CROP TEST

For seven successive seasons, commencing in 1918, an experiment was conducted in which ten kinds of meadow crops were sown in rod-wide strips across four quarter-acre blocks of each of three kinds of cereals, the blocks of each kind of grain being subdivided into four thicknesses of nurse-crop seeding. The strips of meadow seedings extended beyond the blocks of grain into two check ranges seeded without nurse crop. In one of these check ranges (A) the meadow crops were always sown on the same day as the strips which crossed the grains. The other check range (B) was usually sown ten days or a fortnight later.

Both the check ranges ordinarily produced quite a growth of hay in the season of seeding. To determine the advisability of leaving or removing this growth, the south half of each plot in both check ranges was clipped in late summer and the clippings cured into hay. The north half was left untouched. Thereafter, yields of the north and south halves were taken separately until the sod was ploughed up. Thus there were virtually one hundred and twenty fortieth-acre plots of grasses, clovers, melilot, and alfalfa seeded with nurse crops, and forty eightieth-acre plots seeded without nurse crops—one hundred and sixty in all. In the seven years, therefore, eleven hundred and twenty plots have been seeded in this test. In fact there have been more than this, for to

the plan as outlined occasional supplements have been added. In 1919, 1920, and 1923 an extra block of oats was drilled in at a later date than the sowing of the regular nurse crops and the meadow strips were extended across this.

In 1921 and 1923 another supplement was introduced in the form of a pasturing test, but this is now being followed up in a distinct project.

In 1923 flax was tried as a nurse crop.

Inclusive of the sixty supplementary plots, the total number seeded in the experiment comes to eleven hundred and eighty.

RATES OF SEEDING

The grains used as nurse crops have been of several varieties and the rates have always been as close as practicable to the following specification:—

Barley at 4, 6, 8, and 10 pecks per acre.
Wheat at 5, 6, 7, and 8 pecks per acre.
Oats at 10, 12, 14, and 16 pecks per acre.

The ten grasses and legumes were sown in 1918 at the following rates per acre:—

Alfalfa, red, and sweet clover, 10 pounds each.
Alsike and White Dutch clover, 5 pounds each.
Timothy and Western rye grass, 6 pounds each.
Meadow fescue, Kentucky blue, and brome, 12 pounds each.

In 1919 the quantities of hay seed were increased fifty per cent practically all round. In 1920 the augmented rate was maintained for all except the timothy, which was dropped back to the original six pounds. In 1921 the rye grass was increased to twelve pounds, and the legumes reduced to the quantities sown in 1918. These various changes have been made in quest of the optimum rate of each kind. Since 1921 there has been no further alteration in the quantities of meadow-crop seeds, which have been kept at the following rates:—

Alfalfa, red clover, and sweet clover, 10 pounds each.
Alsike and White Dutch clover, 5 pounds each.
Timothy, 6 pounds.
Western rye grass, 12 pounds.
Meadow fescue, Kentucky blue, and brome, 18 pounds each.

Although eleven hundred and eighty plots have been seeded in this experiment by no means all have been cropped to hay. A good many of the nurse-crop seedings had to be ploughed up. Some were sacrificed to avoid the expense of fighting the weeds which came among them. Until 1921 the legumes were not properly inoculated and most of the nurse-crop seedings of them prior to that date were hopeless. In 1922 the sweet-clover seed failed to germinate well, presumably owing to drouth. Drouth and grasshoppers wrought such havoc in 1924 that the whole experiment—check ranges and all—was cultivated up the next spring.

When the experiment was inaugurated in 1918 it was proposed to crop the stands to hay for but two years. Afterwards it was deemed best to leave them a year longer. The sweet clover, of course, was necessarily left for but one cropping year, seeing that it is a biennial. These several irregularities have greatly complicated tabulation and explain why certain of the comparisons are limited to fewer than the number of seedings made. It has been sought to base every inference upon as broad statistics as the circumstances would allow.

The final cutting from the 1923 seeding was taken in 1926 and it is opportune to present a summary of results from the six successive seedings as well as a tabulation of the 1923 seeding, *i.e.* the part of it that was spared until 1926.

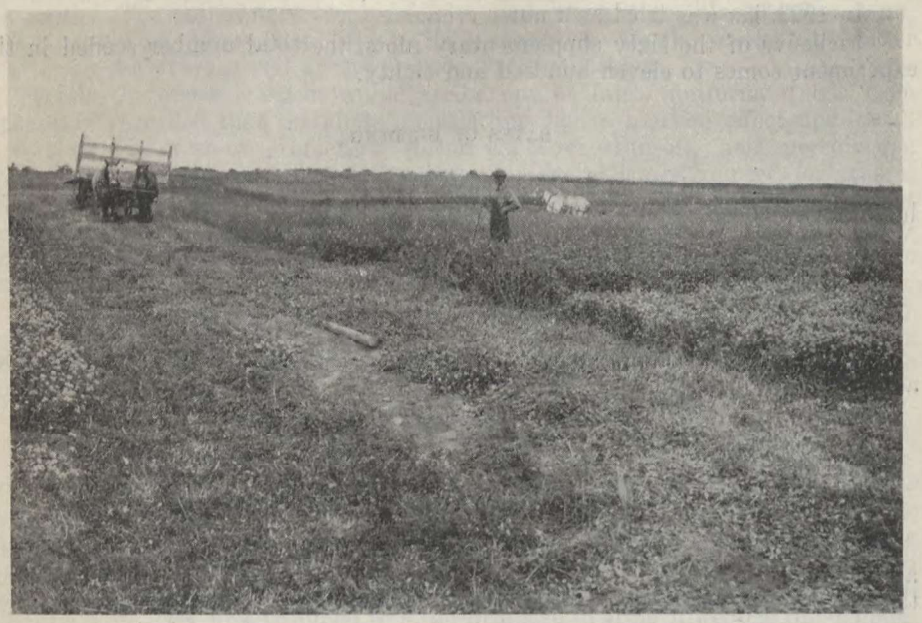


FIG. 3.—Clovers and grasses in check range B of the 1923 seeding of the nurse crop tests, with margins cut off. Right, alsike, then Common Red, then flank where sweet clover had been; then alfalfa, timothy, Western Rye, meadow fescue, Kentucky blue, and brome.

INTERPRETATION

Interpretation of this experiment is especially complicated. In the early years there was no wagon scale, hence the yields of sheaves from the quarter-acre blocks of grain were not obtained. An irregularly occurring blossom frost spoiled the 1918 yield of grain. Bad weather ruined the oat harvest of 1924. Other obstacles have been already indicated. Still, the experiment, as a whole, is highly instructive.

The objects in brief have been to compare the common meadow crops with one another and to determine the most economical ways of seeding them.

For reasons already intimated it is impracticable to tabulate the legumes with the grasses. The latter are grouped by themselves and are used exclusively for most of the cultural comparisons. The legumes are compared incidentally

PRESENTING results in pounds of hay per acre from the five grasses and five legumes seeded 1923 in the Main Nurse Crop Experiment. Three years' crop in all cases and four years' in the case o the south halves of the Check Ranges (clipped in the year of seeding). Sweet clover gave two cuttings in 1924.

Description of seeding	White Dutch at 5 pounds per acre				Alsike at 5 pounds per acre				Red clover at 10 pounds per acre				Sweet clover at 10 pounds per acre			Alfalfa at 10 pounds per acre			
	1924	1925	1926	Ag'te.	*1924	1925	1926	Ag'te.	*1924	1925	1926	Ag'te.	*1924	1925	1926	*1924	1925	1926	Ag'te.
Seeded alone. *North* half of Check Range B. (Not clipped in year of seeding)	.....	.....	2,730	2,730	1,657	1,023	3,305	5,985	2,188	1,513	4,004	7,705	3,980	.....	.....	2,419	2,851	5,043	10,313
Seeded alone. *South* half of Check Range B. (Clipped in year of seeding)	.....	.....	2,783	2,783	379 / 965	513	3,444	5,301	461 / 1,677	1,424	3,815	7,377	819 / 1,804	.....	.....	1,143 / 1,479	2,848	3,593	9,063
Seeded alone. *North* half of Check Range A. (Not clipped in year of seeding)	.....	.....	2,582	2,582	794	597	2,691	4,082	1,116	1,082	3,404	5,602	3,061	.....	.....	1,551	1,932	3,047	6,530
Seeded alone. *South* half of Check Range A. (Clipped in year of seeding)	.....	.....	2,569	2,569	221 / 325	342	2,230	3,118	192 / 336	1,366	3,051	4,945	1,296 / 2,587	.....	.....	1,363 / 789	2,471	2,827	7,450
Average of two plots not clipped in year of seeding	.....	.....	2,656	2,656	1,225	810	2,998	5,033	1,652	1,297	3,704	6,653	3,520	.....	.....	1,985	2,391	4,045	8,421
Average two plots clipped in year of seeding	.....	.....	2,676	2,676	945	427	2,837	4,209	1,333	1,395	3,433	6,161	3,253	.....	.....	2,387	2,659	3,210	8,256

*Including 1923 crop from south halves of Check Ranges.

Description of seeding	Timothy at 6 pounds per acre				Western Rye at 12 pounds per acre				Meadow fescue at 18 pounds per acre				Kentucky blue at 18 pounds per acre				Brome at 18 pounds per acre			
	*1924	1925	1926	Ag'te.	*1924	1925	1926	Ag'te.	*1924	1925	1926	Ag'te.	*1924	1925	1926	Ag'te.	*1924	1925	1926	Ag'te.
Seeded alone. *North* half of Check Range B. (Not clipped in year of seeding)	2,538	1,872	2,669	7,079	4,528	2,548	2,223	9,359	1,536	1,022	1,782	4,340	1,019	617	2,319	3,955	2,388	1,519	2,514	6,421
Seeded alone. *South* half of Check Range. B. (Clipped in year of seeding)	2,099 1,321	1,880	2,828	8,128	1,721 1,650	1,024	2,121	6,516	600 857	704	1,417	3,578	223 612	.....	1,840	2,675	1,395 1,853	1,007	2,058	6,313
Seeded alone. *North* half of Check Range A. (Not clipped in year of seeding)	752	1,940	3,762	6,454	520	1,467	2,774	4,761	205	709	2,185	3,099	286	.....	1,237	1,523	1,818	1,114	2,373	5,305
Seeded alone. *South* half of Check Range A. (Clipped in year of seeding)	916 337	2,229	2,736	6,218	1,415 456	2,413	1,915	6,199	159 165	895	1,335	2,554	0 402	711	1,105	2,218	1,220 1,854	2,107	2,245	7,426
Average of two plots not clipped in year of seeding	1,645	1,906	3,215	6,766	2,524	2,007	2,528	7,060	870	865	1,983	3,719	652	308	1,778	2,739	2,103	1,316	2,443	5,863
Average two plots clipped in year of seeding	2,336	2,054	2,782	7,173	2,621	1,718	2,018	6,357	890	799	1,376	3,066	618	355	1,472	2,446	3,161	1,557	2,151	6,869

*Including 1923 crop from south halves of Check Ranges.

Notes

(1) Seeded on undulating land that had been manured and deeply ploughed in 1922, fallowed until July and drilled to single rows of oats and barley intercultivated as a summer-fallow substitute, the half-matured growth being grazed off in autumn.

(2) The nurse crops were drilled April 30 and May 1, Ruby wheat yielding 4,586 pounds total crop and 1917 pounds grain per acre; Banner oats 6,144 pounds total crop and 2,665 pounds grain; Trebi barley 5,707 pounds total crop and 3,089 pounds grain per acre.

(3) Because of wind and delay in arrival of supplies the small seeds were not all sown immediately after the grain, but on the nurse-crop blocks and Check Range A, the timothy, rye grass and all the legumes, except the white Dutch clover, were sown May 3, the legume seeds being inoculated with nitro-culture. The white Dutch was sown May 4; the brome, Kentucky blue, and meadow fescue on May 7. Rates of seeding as in 1922.

(4) In Check Range B the legumes were sown May 18, the grasses May 19, except fescue, which could not be sown until May 28. The south halves of both check ranges were mown September 8.

(5) On May 18 an extra range was seeded south of the barley block. After the usual ten kinds of grasses and clovers had been sown, a strip of flax and one of oats for green-feed were drilled in. The remainder of the area, amounting to a square rod of each meadow crop, was left without nurse crop to be enclosed as a paddock and pastured during the summer.

(6) Germination of the nurse crops was fairly even because these were drilled deeply enough to get most of the seed into the moisture, but most of the small seeds among the early-sown grain lay inert in a dust-bed until June 10, by which time the grain had too much of a lead to give them a chance. Exceptions to this were the flax and the late-sown oats. In the latter instance the deferred seeding of the grain seemed to result in the small seeds having a better chance to take advantage of the late rains.

(7) The pasturing block, located where it received barnyard and stackyard wash, was polluted with Shepherd's purse, which got the start of the meadow seedings before the latter were considered strong enough to stand grazing. By mid-July it had formed a dense mat a foot high and was mown and hauled off ere stock were turned in. Thenceforward, milch cows kept the weed down fairly satisfactorily, and by autumn all the grasses and legumes, with the partial exception of the always slow-starting Kentucky blue, were nicely established and occupying the ground with little competition.

(8) Sweet clover plot ploughed up after cropping in 1924. Remainder of area ploughed July 26 and 27, 1926.

TABLE Summarizing Crop Data obtained down to 1926 from the grass plots in the Nurse Crop Tests. Six years' seedings (1918 to 1923, inclusive) in the case of the Check Ranges and five years seedings (1918 to 1922, inclusive) in the case of the Nurse-Crop-seeded block.

Designation	Yield in pounds per acre				
	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome
SOUTH HALVES OF CHECK RANGES (Clipped in year of seeding) Average of duplicate plots					
Aggregate yields from 3 cuttings on the 1918 seeding	8,820·0	8,380·0	5,200·0	2,840·0	7,440·0
" " 4 " " 1919 "	6,525·0	9,200·0	5,900·0	4,835·0	12,750·0
" " 4 " " 1920 "	3,350·0	7,160·0	3,140·0	1,420·0	5,000·0
" " 4 " " 1921 "	2,561·0	5,106·0	2,627·0	1,767·0	4,583·0
" " 4 " " 1922 "	3,416·0	5,216·0	1,690·0	1,928·0	4,433·0
" " 4 " " 1923 "	7,173·0	6,357·0	3,066·0	2,446·0	6,869·0
Totals of 23 cuttings as above	31,845·0	41,419·0	21,623·0	15,236·0	41,075·0
Yields per acre per annum averaging 23 cuttings representing duplicate plots on each of six successive annual seedings (46 plot harvests each)	1,384·5	1,800·8	940·1	662·4	1,785·8
Yields per acre per annum as if averaged on a basis of 17 crop years for direct comparison with the north halves, which are not clipped in year of seeding. (See below)	1,873·2	2,436·4	1,271·9	896·2	2,416·1
Percentage comparison of grasses	100·0	130·0	67·8	47·8	128·9
NORTH HALVES OF CHECK RANGES (Not clipped in year of seeding) Average of duplicate plots					
Aggregate yields from 2 cuttings on the 1918 seeding	7,160·0	7,840·0	4,600·0	2,000·0	7,640·0
" " 3 " " 1919 "	3,505·0	6,450·0	5,915·0	3,955·0	9,510·0
" " 3 " " 1920 "	2,840·0	6,760·0	3,360·0	2,280·0	7,980·0
" " 3 " " 1921 "	3,061·0	5,753·0	2,346·0	1,809·0	5,682·0
" " 3 " " 1922 "	3,646·0	5,395·0	1,695·0	1,940·0	4,804·0
" " 3 " " 1923 "	6,766·0	7,060·0	3,719·0	2,739·0	5,863·0
Totals of 17 cuttings as above	26,978·0	39,258·0	21,635·0	14,723·0	41,479·0
Yields per acre per annum averaging 17 cuttings representing duplicate plots on each of six successive annual seedings (34 plot harvests in each case)	1,586·9	2,309·2	1,272·6	866·0	2,439·9
Percentage comparison of grasses	100·0	145·5	80·1	54·5	153·7
SEEDED WITH NURSE CROPS (Some plots occasionally sacrificed, thus introducing irregular numbers of plots from year to year)					
Aggregate yields from 2 cuttings on the 1918 seeding (average 12 one-fortieth-acre plots)	3,020·0	3,659·0	2,722·0	1,443·0	3,071·0
Aggregate yields from 3 cuttings on the 1919 seeding (average 13 one-fortieth-acre plots)	2,706·0	4,190·0	2,730·0	1,598·0	4,605·0
Aggregate yields from 3 cuttings on the 1920 seeding (average 10 one-fortieth-acre plots)	1,409·0	3,936·0	1,496·0	97·0	3,126·0
Aggregate yields from 1 cutting on the 1921 seeding (average 6 one-fortieth-acre plots) (Stand then ploughed up on account of weeds.)	657·0	997·0	673·0	427·0	970·0
Aggregate yields from 3 cuttings on the 1922 seeding (average 12 one-fortieth-acre plots)	2,874·0	3,346·0	990·0	773·0	3,721·0
Totals of 12 cuttings as above (135 plot harvests)	10,666·0	16,128·0	8,611·0	4,338·0	15,493·0
Crop yields per acre per annum averaging 12 cuttings and representing in all 53 plots of each grass seeded with nurse crop during five successive annual seedings	888·8	1,344·0	717·5	361·5	1,291·0
Percentage comparison of grasses	100·0	151·2	80·7	40·6	145·2
Grand averages showing per-acre-per-annum yields of five grasses representing 215 plot harvests made from 77 plots of each grass laid down in five and six successive years, comprising 53 fortieth-acre plots seeded with nurse crops and 24 eightieth-acre plots (sub-divided) seeded without nurse crops	1,105·2	1,594·3	852·9	505·6	1,578·5
Grand average percentage comparison of grasses	100·0	144·2	77·1	45·7	142·8

TABLE Summarizing Crop Data obtained down to 1926 from legume plots (compared with timothy) in the Nurse Crop Tests. Three years' seedings (1921 to 1923, inclusive) in the case of the Check Ranges, and two years' seedings (1921 and 1922) in the case of the Nurse-Crop-seeded block.

Designation	Yield in pounds per acre					
	Timothy	Alfalfa	Sweet clover	Common red	Alsike	White Dutch
SOUTH HALVES OF CHECK RANGES (Clipped in year of seeding) Average duplicate plots						
Aggregate from 4 cuttings on 1921 seeding	2,561·0	3,909·0	.....	.....	.....	.....
" 4 " 1922 "	3,416·0	4,728·0	.....	.....	.....	.....
" 4 " 1923 "	7,173·0	8,256·0	.....	3,433·0	4,209·0	2,676·0
Total of 12 cuttings, as above.....	13,150·0	16,893·0	.....	.....	.....	.....
Yield per acre per annum averaging 12 cuttings representing duplicate plots on each of three successive annual seedings, 24 plot harvests each.....	1,095·8	1,407·7	.....	.....	.....	.....
Yields as if averaged on a basis of nine crop years for direct comparison.....	1,461·1	1,877·0	.....	.....	.....	.....
Percentage comparison with timothy 100.....	100·0	128·4	.....	.....	.....	.....
NORTH HALVES OF CHECK RANGES (Not clipped in year of seeding) Average of duplicate plots						
Aggregate from 3 cuttings on 1921 seeding	3,061·0	4,581·0	.....	.....	.....	.....
" 3 " 1922 "	3,646·0	5,766·0	.....	.....	.....	.....
" 3 " 1923 "	6,766·0	8,421·0	.....	6,653·0	5,033·0	2,656·0
Total of 9 cuttings, as above.....	13,473·0	18,768·0	.....	.....	.....	.....
Yield per acre per annum averaging 9 cuttings representing duplicate plots on each of three successive annual seedings, 18 plot harvests each.....	1,497·0	2,085·3	.....	.....	.....	.....
Percentage comparison with timothy 100.....	100·0	139·2	.....	.....	.....	.....
SEEDED WITH NURSE CROPS (Some plots occasionally sacrificed, thus introducing irregular numbers of plots from year to year)						
Aggregate yield from 1 cutting 1921 seeding (average 6 one-fortieth-acre plots).	657·0	590·0	.....	.....	.....	.....
Aggregate yield from 3 cuttings 1922 seeding (average 12 one-fortieth-acre plots)	2,874·0	4,572·0	.....	.....	.....	.....
Total of 4 cuttings, as above.....	3,531·0	5,162·0	.....	.....	.....	.....
Yield per acre per annum averaging 4 cuttings on each of two successive annual seedings, 42 plot harvests each	882·7	1,290·5	.....	.....	.....	.....
Percentage comparison with timothy 100.....	100·0	146·2	.....	.....	.....	.....
Grand Average yield per acre per annum	1,075·2	1,494·3	.....	.....	.....	.....
Percentage comparison,.....	100·0	138·9	.....	.....	.....	.....

TABLE summarizing crop data from the legume plots (compared with timothy) in the year following seeding in the Nurse Crop Tests. Three years' seedings (1921 to 1923, inclusive) in the case of the Check Ranges and two years' seedings (1921 and 1922) in the case of the Nurse-Crop-seeded block.

Designation	Yield in pounds per acre					
	Timothy	Alfalfa	Sweet clover	Common red	Alsike	White Dutch
SOUTH HALVES OF CHECK RANGES (Clipped in year of seeding). Average of duplicate plots.						
Yield one year's crop (including crop in year of seeding) 1921, seeding 1922 crop	2,320·0	2,960·0	4,860·0	1,910	1,120	0
Yield one year's crop (including crop in year of seeding) 1922 seeding, 1923 crop	800·0	1,440·0	2,500·0	.....	.....	0
Yield one year's crop (including crop in year of seeding) 1923 seeding, 1924 crop	2,336·0	2,387·0	3,253·0	1,333·0	945	0
Total of three successive crop years	5,456·0	6,787·0	10,613·0	3,243·0	2·065·0	0
Yield per acre per annum	1,818·6	2,262·3	3,537·6	.....	.....	.....
Percentage comparison (timothy 100)	100·0	124·3	194·5	.....	.....	.....
NORTH HALVES OF CHECK RANGES (not clipped in year of seeding). Average of duplicate plots.						
Yield one year's crop 1921 seeding, 1922 crop	2,060·0	2,200·0	3,800·0	280	0	0
Total one year's crop 1922 seeding, 1923 crop	940·0	1·460·0	2,800·0	.....	.....	0
Yield one year's crop 1923 seeding, 1924 crop	1,645·0	1,985·0	3,520·0	1,652·0	1,225·0	0
Total of three successive crop years	4,645·0	5,645·0	10,120·0	1,932·0	1,225·0	0
Yield per acre per annum	1,548·3	1,881·6	3,373·3	.....	.....	.....
Percentage comparison (timothy 100)	100·0	121·5	217·8	.....	.....	.....
SEEDED WITH NURSE CROP (some plots occasionally sacrificed, thus introducing irregular numbers of plots from year to year.						
Yield one year's crop 1921 seeding, 1922 crop	657·0	590·0	833·0	327	0	.....
Yield one year's crop 1922 seeding, 1923 crop	748·0	956·0	755·0	.....	.....	.....
Total of two successive crop years	1,405·0	1,546·0	1,588·0	327	0	.....
Yield per acre per annum	702·5	773·0	794·0	.....	.....	.....
Percentage comparison (timothy 100)	100·0	110·0	113·0	.....	.....	.....
Grand average yield per acre per annum	1,094·9	1,292·6	1,858·6	.....	.....	.....
Percentage comparison (timothy 100)	100·0	118·0	169·7	.....	.....	.....

HOW THE GRASSES COMPARE

Ignoring all seedings which failed outright, and omitting the occasional supplementary areas, seventy-seven plots of each of the five grasses were cropped in the course of the six years 1918 to 1923. In each case fifty-three were fortieth-acre plots seeded with nurse-crops while twenty-four were half-size plots seeded alone. Each seventy-seven plots yielded two hundred and fifteen plot harvests, or an average of nearly three crops from each plot. The cropping period extended practically from 1919 until 1926, in which latter year the check ranges of the 1923 seeding were ploughed up. The accompanying table shows that timothy yielded a little over half a ton of hay per acre per annum; Western rye grass and brome a little over three quarters of a ton; meadow fescue less than half a ton, and Kentucky blue a quarter of a ton.

SUMMARIZED COMPARISON OF FIVE GRASSES IN THE NURSE CROP TEST SEEDED DURING SIX YEARS 1918 TO 1923, INCLUSIVE

Designation	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome
Average annual yield of hay in pounds per acre...	1,105·2	1,594·3	852·9	505·6	1,578·5
Percentage comparison relative to timothy.....	100%	144·2%	77·1%	45·7%	142·8%

The averages of the two last named are depressed a little by reason of the fact that a few plots of the 1922 seeding were ploughed after only one season's crop on account of weeds infesting the extremely thin stands; and, contrary to the rule, these few plots were represented the next two years by zero yields. In one year, too, the meadow fescue seed proved mixed with an inferior grass. However, neither fescue nor Kentucky blue has recommended itself to favourable attention. The comparison of the other three grasses is fair and conclusive. Western rye and brome have both outyielded timothy by more than forty per cent and this in spite of the fact that grasshoppers were particularly hard on Western rye, reducing somewhat the sixty-two per cent lead over timothy that it had scored down to 1923.

ALFALFA AND THE CLOVERS

Commencing with the 1921 seeding—the first one for which the legumes had been promptly inoculated—we have three successive seedings affording an opportunity for comparison with the grasses. A two-section table has been prepared setting forth a comparison of them with timothy, which is the crop used as a standard for all the percentage computations.

Alfalfa.—Of the five legumes, alfalfa was the only one which regularly endured as long as the grasses. It has outyielded timothy by 38.9 per cent. It does not do its best in the year after seeding, but continues to produce well after the grasses are sod-bound, and the longer the duration of the ley the better its relative showing.

Sweet Clover.—The second section of the table is designed to compare sweet clover with the perennials. Sweet clover is cropped for but one year and then ploughed up. How does this one year's crop compare with corresponding crops of alfalfa and timothy? Assembly of data brings out the fact that in spite of sweet clover having been handicapped by a very poor catch in the droughty summer of 1922 (the year when the majority of the plots covered in the calculation were seeded) it still yielded 69.7 per cent more hay than timothy.

Making a direct comparison of sweet clover with alfalfa, we find the former exceeding the latter by forty-three per cent. Considering that alfalfa had caught much better than sweet clover in the dry years and had also proven more winter-hardy, this final result must be conceded as a signal triumph of the greater drouth resistance of sweet clover. That is to say, while it has been easier to get a stand of alfalfa and easier to carry it successfully through the winter, yet once the sweet clover is established it makes a much stronger top growth during dry weather than alfalfa does. True, the disparity in actual yield is not always so great as supposed, for sweet clover is coarse and rank-

looking, and is ordinarily weighed in a less perfectly cured condition. But in the latter years of our experiments, yields were compared on a basis of uniform moisture content. Even so, the quantitive average places sweet clover far in the lead.

This greater yield of sweet clover in the year after seeding does not necessarily establish its economic superiority as a crop, since with perennials the one seeding is good for several successive crops. Moreover, sweet clover in Alberta seems subject to a root affection called sclerotinia, which after hard winters apparently causes the root to rot off an inch and one-half or two inches below the crown. Alfalfa also suffers sometimes, but thus far to a much less extent. This at least is true of the hardy varieties of alfalfa. On the other hand, the sweet clover root dies after its second year instead of persisting stubbornly as that of alfalfa does. As a rotation crop and soil improver sweet clover is not to be despised in the West.

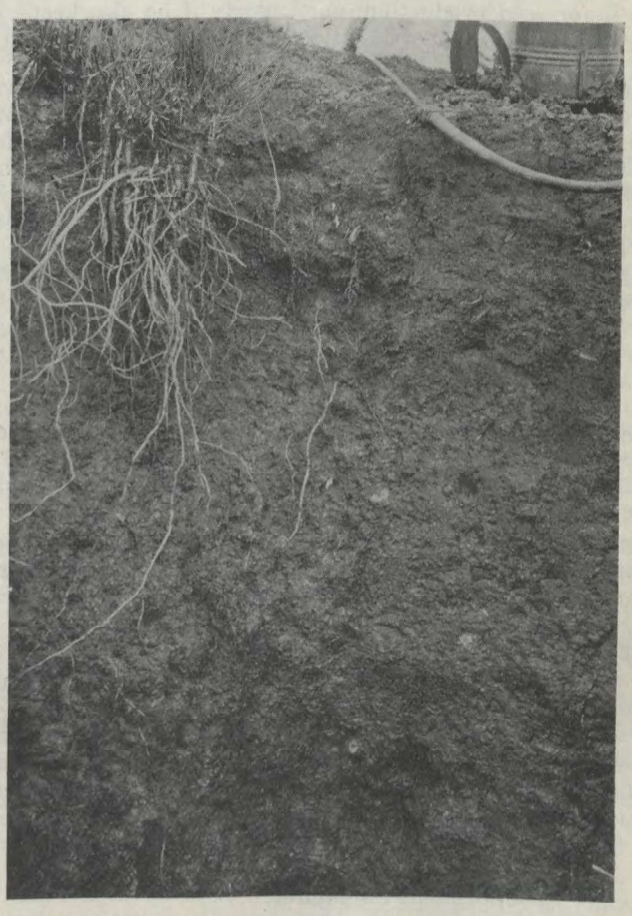


FIG. 4.—Alfalfa roots from a 1923 seeding in rows, penetrating hard clay subsoil. Maximum penetration traced to about six feet. Roots exposed by spraying the face of the trench.

Common Red.—Notwithstanding the fact that common red clover turned off nearly two tons of hay per acre from its third-year stand in 1926, it must be condemned as an unsuitable crop for general culture. It too often winter-kills, and, besides, it is too easily dwarfed by early-summer drouth. It did exceptionally well in 1926, because a wet summer followed a mild winter. The reverse frequently occurs and then red clover cuts a sorry figure. It, also, seems very prone to sclerotinia.

Alsike.—Alsike clover, when inoculated, is satisfactorily winter-hardy and is very prolific in production of high-quality seed, but alsike is even less successful than common red clover in withstanding drouth. We have often had full healthy stands commence to bloom at six inches or less in height, and when that happens the hay crop is liable to be very light. In occasional seasons alsike makes a fine growth. In 1926 its third-year stands averaged nearly a ton and a half of hay. Even with that unexpected lift, the annual average yield of the 1923 seeding was barely over three-quarters of a ton as against 2,779 pounds of alfalfa and 2,323 pounds of timothy. Alsike is recommended to the favourable attention of the occasional man who is prepared to specialize on it for seed production, particularly if he also keeps bees, but as a hay crop it seems to have a very limited sphere indeed on Grande Prairie.

White Dutch.—White Dutch clover is understood to be a lawn and pasture rather than a hay plant. It has been included in the experiment for the sake of acquiring information concerning its seeding and general adaptability. It has always caught well and proved satisfactorily winter-hardy and persistent, but until 1926 it never produced a cutting of hay. In this final year the check ranges of the 1923 seeding gave over a ton and a quarter. It is a subject of conjecture whether this extraordinary result had been augmented or diminished by a thorough ripping up with the spring-tooth cultivator in 1925. Probably the character of the season was chiefly responsible.

SEEDING WITH OR WITHOUT NURSE CROPS

The first cultural comparison suggested lies between nurse-crop and non-nurse-crop seeding. Three principal considerations enter into it, viz., the relative yields of hay; the yield of grain (or of grain and bundles) produced by the nurse crop; and the control of weeds.

It has been a vexing question whether certain plots ploughed up as failures—these occurring most often under nurse-crop seeding—should be represented by zero yields and thereby allowed to pull down the averages where they occur, or whether they should be excluded from the reckoning altogether. The latter is the course that has generally been followed, on the ground that in commercial practice one would re-seed the field. But then the omission of such plots from the computation takes no account of the loss of seed nor of the inconvenience entailed by failure to secure a catch. Again, there is danger of "loading the dice" against the more successful crops and methods, seeing that these might sometimes make passable stands in very adverse seasons and thus run through a series of poor cropping years escaped by the less successful crop or method whose plot failed outright. On the whole, however, the second alternative promises to introduce the lesser element of error. Comment is offered where deemed necessary to supplement the figures.

Comparative Yields of Hay.—Consider first a table epitomizing the reaction of each respective grass to nurse-crop versus non-nurse-crop seeding.

COMPARING YIELDS OF NURSE-CROP AND NON-NURSE-CROP SEEDINGS

AVERAGE annual yield of hay in pounds per acre from all the persisting nurse-crop seedings of grasses versus all non-nurse-crop seedings of them, representing six years' seeding, 1918 to 1923.

Designation	Timothy	Western rye	Meadow fescue*	Kentucky blue*	Brome	Average of three best grasses
	lb.	lb.	lb.	lb.	lb.	lb.
Seeded with nurse crop	888·8	1,344·0	717·5	361·5	1,291·0	1,174·6
Seeded without nurse crop	1,730·0	2,372·8	1,272·2	881·1	2,428·0	2,176·9
Excess of non-nurse crop, in pounds	841·2	1,028·8	554·7	519·6	1,137·0	1,002·3
Per cent excess of non-nurse crop	94·6%	76·5%	77·3%	143·7%	88·0%	85·3%

* In the 1922 seeding a few nurse-crop plots of these two grasses failed completely and were ploughed up, but, contrary to custom, were represented by zero yields.

For sake of ready comparison the hay obtained by clipping half the non-nurse-crop plots in the year of seeding is thrown in with the next year's crop, so that the nurse-crop and the non-nurse-crop seedings may be averaged on the same numerical basis.

It may be seen that on the average of eight and nine years' cropping off six successive annual seedings, non-nurse-crop plots have yielded 85.3 per cent more hay of the three best grasses than has been obtained by seeding with nurse crops, this after discarding the poorest nurse-crop seedings of them. Until 1924 the grasses seeded alone never failed to make a stand. Clearly the nurse crop is really a strangle crop, its claim to consideration resting upon the fact that it tends to subdue the weeds as well as the meadow seedings, while itself yielding a crop in the initial year.

YIELD OF THE NURSE CROP

Against the loss of hay it would be very desirable to set the precise weight of threshed grain and also the weight of sheaves produced by the nurse crop. Unfortunately, the data are somewhat incomplete, especially in regard to the latter point. Of recent years the weight of both grain and sheaves has been carefully kept and the percentage of grain to total crop figured out. Making allowance for the effect of frost in 1918, it is probable that the grain has constituted about forty-five per cent of the aggregate wheat crop; about fifty per cent of the oat crop, and probably about fifty per cent of the barley crop. Taking these empirical ratios as a basis and estimating as closely as possible by comparison with adjacent plots, the 1918 grain yield (which was not threshed because of wild oats introduced with the seed), the Station has worked out a tabulation that is believed to be approximately correct.

TABLE comparing the probable average annual yield of wheat, oats, and barley used as a nurse crop during six years 1918–1923, inclusive, the 1918 grain crop having been estimated by comparison with adjoining plots.

Crop	Yield of grain per acre		*Assumed percentage grain to total crop	*Estimated weight of sheaves at harvest
	lb.	bush. lb.	p.c.	lb. per acre
Wheat	2,111	35 11	45	4,691
Oats	2,787	81 33	50	5,574
Barley	2,001	41 33	50	4,002
Average	2,299			4,755

* Estimated from partial data.

Hay versus Grain.—Thus we see that, averaging the production of the three classes of cereals, the annual crop amounted to 2,299 pounds of grain and 4,755 pounds of bundles. This was produced at the expense of 841 pounds of timothy hay per cutting per acre, of 1,029 pounds of Western rye grass hay, or of 1,137 pounds of brome hay. In the majority of cases the hay yields represent three years' crop from each seeding. Assuming these averages to hold consistently for that period, we find that 4,755 pounds of grain bundles were secured at the expense of 2,523 pounds of timothy hay; of 3,087 pounds of Western rye grass hay; or of 3,411 pounds of brome hay per acre. Apparently, from the standpoint of aggregate tonnage it paid to use the nurse crop.

Moreover, with nurse-crop seeding the big return was obtained in the grain crop of the initial year, while with non-nurse-crop seeding there was little or no return until the following year.

Other Considerations.—On the other hand, it must be recognized that seeding with nurse crops resulted in one complete failure to get a catch and in several partial failures, with weedy, ragged stands that economy would dictate the prudence of ploughing up. The mathematical comparisons take no account of these factors nor of the cost of the seed grain. Still, the net difference in tonnage is so substantial, amounting to 1,748 pounds of feed per acre when the three best grasses are pitted against the three nurse crops, that nurse-crop seeding would appear to be the more profitable practice unless one needed gramineous hay so badly that a ton of it were worth considerably more to him than a ton of bundles. A certain acreage of meadow is so desirable from the dual standpoint of soil and live stock that if one could not grow it by nurse-crop seeding it would pay to seed alone, but if he can seed with a nurse crop it will likely pay to do so at the expense of a large decrease in the yield of hay. This decrease in hay production will generally be confined to the first crop following the seeding. By the next year the soil conditions will have become pretty well equalized and then the nurse-crop seeding may yield as much as the other.

Nurse-crop Seedings Yield the Most Hay in their Second Cropping Year.—The accompanying table brings out that taking an average of the three leading grasses sown in the four years for which comparisons are possible, the nurse-crop plots averaged 1,198 pounds of hay in the first year and 1,410 pounds in the second year, while for the plots seeded alone the corresponding averages were 4,179 and 1,643 pounds. The plots seeded alone nearly always produce much their heaviest cutting in the year after they are sown. Under either method, of course, seasonal peculiarities may now and then reverse the expected performance.

By the third season the yield of timothy is almost invariably low, while Western rye and even brome may show a falling off if the run of seasons has been normal.

TABLE showing how the first and second years' hay crops compare under nurse-crop and non-nurse-crop seeding. Average results from four seedings, viz. 1918, 1919, 1920 and 1922.

Designation	Timothy		Western rye		Brome		Average, three grasses	
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Seeded with nurse crop.....	1,067	979	1,502	1,543	1,026	1,710	1,198	1,410
Seeded without nurse crop.....	*3,357	1,174	*4,531	1,799	*4,650	1,957	*4,179	1,643

* In the case of the plots seeded without nurse crop the first-year yields include the yields obtained by clipping half these plots in the season of seeding.

GRASSES VARY IN RESPONSE TO NURSE CROP

Seeding.—The several grasses react somewhat differently to nurse-crop seeding. Kentucky blue is particularly tardy about establishing itself under that system and rarely or never gives a hay crop worth while in the ensuing year. Timothy and Western rye grass are more prompt. Brome is intermediate. Alfalfa and sweet clover respond fairly well. In fact in the trying summer of 1922 alfalfa made a much better stand under nurse-crop seeding than did any of the grasses, Western rye being second-best of the ten meadow crops. However, alfalfa seed is so expensive and so much is at stake in getting a catch that it is probably good business to provide it the best possible chance by seeding alone. This is particularly true while one is gaining experience with the crop and getting his land inoculated for it.

In regard to brome and Western rye grass, one practical advantage of nurse-crop seeding is that such chaffy seeds are most conveniently applied by mixing them with grain in the drill box.

WEED CONTROL.

The real crux of the problem lies in the control of weeds. Experimental plots are hand-weeded of necessity, for it would be absurd to weigh weed growth as hay or grain; but in commercial cropping hand-weeding is not feasible. Meadow crops seeded alone, even on breaking, will throw a surprising growth of native weeds, and the better the seed bed has been prepared the more weeds there appear to be. The stronger-growing grain crop restricts the weeds but they then find their chance in the comparatively weak stands of meadow that linger along the next spring. In a humid climate the grass soon makes a mat that chokes most weeds, but in the Peace River district May and early June are frequently characterized by weather unfavourable to grass or clover.

The result of it all has been to suggest a trial of other plans of seeding.

RANK NURSE CROPS COMPETE TOO STRONGLY

An important reason why nurse-crop seeding makes a relatively poorer showing in the Peace River country than in many other regions is that the grain is healthy, and when moisture is sufficient it grows remarkably rank, competing strongly with the small-seeded, slow-starting meadow plants. Moreover, the grain occupies practically the whole growing season and after its harvest there is little time for the "seeds" to make top or root as in regions with earlier harvests. It may be that in time rusts, root-rots and other affections will reduce our cereal yields. If so, the weaker growth of the nurse crops may be to the advantage of meadow plants seeded among them. At present we may console ourselves that what we lose in hay we more than make up in grain. Cereals rather than grasses are clearly the class of crop to which the Peace River country is best adapted except in so far as frost hazard affects the issue. The meadow crops will be minor and supplementary. Yet they must be grown to some extent else our agriculture will suffer.

HOW THE GRAINS COMPARE AS NURSE CROPS

Surprisingly little difference has been found among the three classes of nurse crops in their effect upon the ultimate yields of hay. By field observation wheat and barley have seemed considerably better than oats, and the tabulated results with those three seedings whose nurse-crop plots remained complete throughout the whole cropping period afford a measure of support to this conclusion, though

not so great a measure as might have been anticipated. Taking the three most suitable grasses, the seedings with wheat have yielded 6.6 per cent more hay than the seedings with oats, the relative rating being:—

Seeded with Barley	1,353	pounds per acre
" Wheat	1,322	" "
" Oats	1,240	" "

In supplementary trials flax has been found very non-restrictive, being itself sometimes partially choked by certain of the meadow crops seeded amidst it. But it is likewise very non-restrictive of the weeds, hence cannot be recommended as a successful nurse-crop.

With the supplementary block of oats sown at a later date than the main test, variable results have been obtained depending upon the season. In 1923 the deferred seeding not only produced much the rankest crop of oats but also resulted in a far better catch of grasses and clovers, which, owing to the belated June rains, had a more even start with the nurse crops than did early seedings which lay for weeks in a dust bath.

EFFECT OF VARIOUS RATES OF SOWING OF THE NURSE CROP

Disappointingly little support has been found for the expectation that thin seeding of the nurse crop would be superior to thick seeding. So far as the grain itself is concerned, tillering and ranker growth compensate largely, resulting in a cereal yield almost as great from the thinnest as from the thickest seeding employed in the nurse-crop experiment. Indeed with some varieties in some seasons the thinnest rate has produced the heaviest yield of grain. This goes to account for the fact that the different rates of sowing do not markedly differ in their effect upon the meadow-crop stands, what slight difference there was being obscured by much greater difference in natural conditions. On several occasions it was thought that the seedings looked best among the stubble of the thinner-sown nurse crops but an average of results from all the gradations of sowing with wheat, oats, and barley gives a nearly uniform result, the three leading grasses being considered.

Seeing that medium rates of sowing usually give slightly the best yields of grain and in this series of experiments have resulted in just about as good yields of hay, there would appear to be little object in sowing nurse crops so very thinly. However, this point will stand further investigation.

COMPARING hay yields of timothy, Western rye, and brome resulting from relative rates of seeding of nurse crop, averaging three years' seedings, viz. 1918, 1919, and 1922.

Kind of crop	Yield in pounds per care			
	Thinnest seeding	Second thinnest seeding	Second thickest seeding	Thickest seeding
Wheat	1,340·0	1,462·0	1,211·0	1,275·0
Barley	1,317·0	1,349·0	1,457·0	1,289·0
Oats	1,224·0	1,288·0	1,225·0	1,224·0
Grand averages	1,293·6	1,366·3	1,297·6	1,262·6

DOES IT PAY TO CLIP THE FIRST YEAR?

Does it pay to take the crop offering the first year on plots seeded alone? Seventeen hayings, representing six annual seedings of plots seeded without any nurse crop but hand-weeded to keep them clean, are available to answer the

question. To compensate for the extra labour entailed there was obtained a per-annum average of 287 pounds of timothy hay, or an aggregate of 811 pounds over the whole duration of the stand. With Western rye grass the average was 127 pounds per annum, or 360 pounds in the aggregate. An additional object in clipping is that an earlier return is thereby obtained. As much as a ton and a half of fine timothy hay and three-quarters to a ton of Western-rye hay has more than once been cut from plots sown alone in May on good summer-fallowed land. With meadow fescue and Kentucky blue the final difference either way was immaterial. With brome the effect of clipping in the initial year seemed to be to decrease by 67 pounds the amount of hay ultimately recovered. It was suggested in an earlier report that the adverse response of brome to this practice might have been due to accident of location, but such an assumption is difficult to concede to an average of six paired positions.

With alfalfa there has seemed to be a distinct disadvantage of clipping in the year of seeding. In a three-year ley the loss amounted to 624 pounds. Evidently alfalfa should go into the winter with a good top. In fact all the crops are the better for this, and it was thought that in these trials the effects of clipping were most severe when it was done the latest. As a rule it was done in the last of August or the first of September and the mower bar was always tilted as high as possible. On the sweet clover plot it was lifted somewhat as well.

In general, the stands of the small clovers appeared to be adversely affected by clipping but there was a very striking exception. In 1921 the plots grew well in the late summer and the small clovers on the unclipped areas came into full bloom. Clipping set the other halves back and the retarded state of their development may have had much to do with their more successful endurance to exposure in the winter of 1921-22. Whatever the reason the fact was unmistakable. The contrast was marked. The unclipped alsike nearly all killed out, while the other stood nearly intact. This held substantially true in both ranges. The sweet clover adjacent appeared a little the better that time in the unclipped halves, though this advantage disappeared by haying. The alfalfa in that year, as usual, was decidedly better on the unclipped halves.

Where a Field Trial Might Differ.—In connection with this matter it is probable that a smll-plot comparison does not do full justice to the unclipped areas. These hold much more snow than the clipped and it often happens that they increase the winter protection and likewise the spring saturation of part of the clipped areas alongside. It is rather probable that field trials would make out a better case for the practice of leaving the initial season's growth uncut.

COMPARISON of clipping versus not clipping on plots seeded alone and hand-weeded. Average aggregate yield per acre for six successive seedings, representing two crops from the 1918 seeding and three from each of the others. (The yield from clipping the south halves in the year of seeding has been counted in with the next year's yield in order to reduce both series to the same numerical basis.)

Designation	Yield in pounds per acre				
	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome
Clipped in year of seeding	5,307	6,903	3,604	2,539	6,846
Not clipped in year of seeding	4,496	6,543	3,606	2,454	6,913
Advantage (or disadvantage —) of clipping in initial year	811	360	—2	85	—67

TWO DATES OF SEEDING COMPARED

Rather an interesting comparison has been made between the two dates of sowing of the Check ranges. Range A has always been sown on the same day as the grasses in the nurse-crop areas were sown, or about the opening of seeding. Range B has been sown a fortnight later, more or less. Otherwise, the two ranges have been treated alike, the south half of each being clipped in the year of seeding and the north half of each left unclipped. The two ranges have always abutted each other, and it would seem that the test ought to be a fair one. The summary shows that the late-seeded range has rather outyielded the earlier with every one of the five grasses, the difference being greatest with timothy and Kentucky blue, but unimportant with Western rye grass. The table gives per-annum yields. Over the period of a three-year ley the aggregate is substantial, amounting to a mean of eight per cent.

TABLE comparing the per acre-per-annum hay yields resulting from two dates of seeding, one at the beginning of seeding and the other about a fortnight later: six successive seedings.

Designation	Yield in pounds per acre					
	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome	Average five grasses
Range A—sown early	3,216	4,730	2,434	1,587	4,731	3,340
Range B—sown later	3,704	4,761	2,655	1,938	4,981	3,608
Gain by deferred seeding	488	31	221	351	250	268
Per cent gain	15%	0·6%	9%	22%	5%	8%

The later seedings frequently seemed to get away to a more even and thriftier start, with slightly less competition from weeds. There were exceptions, of course, as in 1922, when the later-sown range did not give nearly so good a plant as the one which germinated during the only period of ample moisture. The land where range B was sown generally had an extra harrowing in the interval between dates. This killed a few weeds and probably improved seed-bed conditions. Before the legumes were inocculated they seemed to do much better on Range B, perhaps owing to a more ample accumulation of nitrates in the soil.

GRASS AND CLOVER MIXTURE EXPERIMENT

The primary purpose of this project was to compare various combinations of grasses with clover and alfalfa.

Early in June of each year forty-eight fortieth-acre plots were sown in three series, representing definite combinations of certain grasses with each of three leguminous bases, (*a*) alfalfa, (*b*) common red clover, (*c*) red clover plus alsike. In each series were two ranges: A, sown at a fairly heavy rate per acre, and B, sown at a reduced rate, usually two-thirds that of the first. Apart from providing an incidental comparison as to rate of seeding, these two ranges may be regarded as duplicates.

In each range were thus forty-eight divided by six, or eight plots, six of which, constituting a complete quota in themselves, have always been sown without any nurse crop, whilst the seventh and eighth plots of each range repeated the sixth, being usually sown, however, on a strip of grain drilled early as a nurse crop.

The principal idea of this supplementary seeding has been to compare, in a general way, the outcome of seeding down in June, by which time the nurse

crop was well up, with the results of sowing the small seeds directly after the grain was drilled, as practised in the regular Nurse-Crop Test. As the two experiments have always been laid out on adjoining land, usually quite similar in nature and preparation, this incidental comparison has been instructive, indicating very decidedly the advantage of sowing the small seeds directly after the grain is drilled rather than after it has emerged.

Apart from the twelve plots seeded each year on the nurse-crop strip along one side of the block, there were always 36 plots which lent themselves to fair averaging and computation. Hence the tables comprehend these only, with footnotes where necessary, giving the yield from such of the twelve "nursed" plots as may have been left for hay. So far as the primary objects of this experiment are concerned the thirty-six plots were complete in themselves.

Whenever there was growth enough in the initial season to be worth cutting, the plan was to clip the south half of each plot, curing and weighing the product. The north halves were never clipped the first year. In the second and third seasons the two halves were weighed separately so that in some cases the tables of yield represent virtually 72 eightieth-acre plots.

RATES OF SEEDING

In each year except 1919 the rates of seeding have been as follows:—

Taking for example the alfalfa series, we would have in range A a plot of alfalfa—only sown at 12 pounds per acre; a plot of alfalfa 10 pounds plus timothy 8; a plot of alfalfa 10 plus Western rye grass 8; of alfalfa 10 plus meadow fescue 15; of alfalfa 10 with the above three grasses combined at the rates of 5, 5, and 9, and, sixthly, alfalfa 10 plus five grasses, viz. the three named at 4, 4, and 7 as well as 4 pounds each of redtop and Kentucky blue.

Range B duplicated A but was laid out in reverse order to check up on soil variation. Except in 1919 it has been sown with two-thirds the quantity of seed used in A. In the year mentioned the quantities of legumes were the same in corresponding plots of each range but the quantities of grass seeds were reduced by one-half in Range B, the object being to give the legumes a better chance. In the absence of inoculation this amendment proved ineffectual and was discontinued.

The two clover series were laid out on the same model as the alfalfa ranges, a necessary difference being that in the case of the red-clover-and-alsike series the amounts of clover seed were 10 pounds of red and 4 of alsike for the first plot in range A, with 8 of red and 2 of alsike in those plots of that range where grasses occurred.

THE CEREALS EMPLOYED AS NURSE CROPS

For the supplementary nurse-crop strip the cereals used were Marquis wheat in 1918; Ruby wheat and Abundance oats in 1919; Liberty hulless oats in 1920; and extremely thin stand of Ruby wheat in 1921; winter rye, pastured, and oats, harvested with the binder, in 1922; and oats in 1923. In the latter year there were two varieties, a strip of Liberty-hulless being sown on April 28 and one of Banner on June 4. In spite of a much ranker growth of the later-sown oats the grass and clover seeds caught much better among them than they did among the oats that were a few inches tall when the meadow seeds were sown. While this accorded with the general experience it was especially remarkable on account of the very much heavier yield of grain obtained that time from the later seeding, and emphasizes the fact that if a nurse crop is used it should not be allowed to get any head start of the small seeds.

With one complete and another partial exception the preparation has always been breaking, summer-fallow, or hoe cropping.

PRESENTING three years' yields of hay in pounds per acre from the 1923 seeding of the Grass and Clover Mixtures Experiment.

Designation	1924 crop			1925 crop			1926 crop			Three years' crop Range A (full seeding)	Three years' crop Range B (two-thirds seeding)	Three years' crop — Average both ranges
	Range A (full seeding)	Range B (two-thirds seeding)	Average of both ranges	Range A (full seeding)	Range B (two-thirds seeding)	Average of both ranges	Range A (full seeding)	Range B (two-thirds seeding)	Average of both ranges			
ALSIKE AND RED CLOVER SERIES												
Clovers only	785·0	2,078·0	1,431·0	1,335·0	1,588·0	1,461·0	4,175·0	4,704·0	4,439·0	6,295·0	8,370·0	7,332·5
Clovers and timothy	556·0	1,263·0	909·0	809·0	1,502·0	1,155·0	2,788·0	4,160·0	3,474·0	4,153·0	6,925·0	5,539·0
Clover and Western rye grass	706·0	1,680·0	1,193·0	1,769·0	2,144·0	1,956·0	3,201·0	4,533·0	3,867·0	5,676·0	8,357·0	7,016·5
Clover and meadow fescue	418·0	1,019·0	718·0	810·0	1,145·0	977·0	1,875·0	3,314·0	2,594·0	3,103·0	5,478·0	4,290·5
Clover and three grasses	486·0	573·0	529·0	700·0	767·0	733·0	2,683·0	2,741·0	2,712·0	3,869·0	4,081·0	3,975·0
Clover and five grasses	421·0	574·0	497·0	632·0	1,028·0	830·0	2,565·0	2,580·0	2,587·0	3,648·0	4,182·0	3,915·0
Averages	562·0	1,197·8	879·5	1,009·1	1,362·3	1,185·3	2,886·1	3,672·0	3,278·8	4,457·3	6,232·1	5,344·7
RED CLOVER SERIES												
Clover only	1,537·0	3,595·0	2,566·0	2,004·0	3,797·0	2,900·0	3,659·0	4,332·0	3,995·0	7,200·0	11,724·0	9,462·0
Clover and timothy	958·0	2,194·0	1,576·0	1,602·0	3,480·0	2,541·0	4,186·0	4,760·0	4,473·0	6,746·0	10,434·0	8,590·0
Clover and Western rye grass	1,527·0	2,594·0	2,060·0	2,582·0	3,624·0	3,103·0	3,582·0	4,933·0	4,257·0	7,691·0	11,151·0	9,421·0
Clover and meadow fescue	656·0	1,697·0	1,176·0	856·0	1,862·0	1,359·0	2,040·0	4,427·0	3,233·0	3,552·0	7,986·0	5,769·0
Clover and three grasses	666·0	2,548·0	1,607·0	783·0	1,832·0	1,307·0	2,867·0	3,755·0	3,311·0	4,316·0	8,135·0	6,225·5
Clover and five grasses	1,118·0	1,455·0	1,286·0	797·0	2,486·0	1,641·0	2,854·0	5,321·0	4,087·0	4,769·0	9,262·0	7,015·5
Averages	1,077·0	2,347·1	1,711·8	1,437·3	2,846·8	2,141·8	3,198·0	4,588·0	3,892·6	5,712·3	9,782·0	7,747·1
ALFALFA SERIES												
Alfalfa only	2,201·0	2,207·0	2,204·0	2,645·0	2,152·0	2,398·0	3,052·0	3,334·0	3,193·0	7,898·0	7,693·0	7,795·5
Alfalfa and timothy	2,997·0	2,191·0	2,594·0	2,436·0	1,972·0	2,204·0	3,915·0	4,386·0	4,150·0	9,348·0	8,549·0	8,948·5
Alfalfa and Western rye	3,353·0	2,175·0	2,764·0	3,063·0	2,317·0	2,690·0	3,957·0	3,653·0	3,805·0	10,373·0	8,145·0	9,259·0
Alfalfa and meadow fescue	1,816·0	1,940·0	1,878·0	1,918·0	1,940·0	1,929·0	3,656·0	4,236·0	3,946·0	7,390·0	8,116·0	7,753·0
Alfalfa and three grasses	1,897·0	1,901·0	1,899·0	2,674·0	1,638·0	2,156·0	3,755·0	4,177·0	3,966·0	8,326·0	7,716·0	8,021·0
Alfalfa and five grasses	1,957·0	2,168·0	2,062·0	2,561·0	1,678·0	2,119·0	1,999·0	3,343·0	2,671·0	6,517·0	7,189·0	6,853·0
Averages	2,370·1	2,097·0	2,233·5	2,549·5	1,949·5	2,249·3	3,389·0	3,854·8	3,621·8	8,308·6	7,901·3	8,105·0
Grand averages (3 series)	1,336·3	1,880·6	1,608·2	1,665·3	2,052·8	1,858·8	3,157·7	4,038·2	3,597·7	6,159·4	7,971·8	7,065·6

Notes

(1) The forty-eight plots of legumes and grass-legume mixtures were seeded June 4, 1923, on a favourably-situated area of well-prepared fallow in Course 5. Rates of seeding and order of plots were essentially as in the 1922 seeding.

(2) The nurse crops in the supplement this time comprised two varieties of oats, viz., a strip of Liberty hulless (on the east), sown April 28, and a strip of Banner sown on the same day as the grass seeds. The early-sown oats were well up by that time but were run over by the single-disk drill used to cover the small seeds on the plots seeded without nurse crops. The liberty oats yielded about 5,820 pounds total crop and 2,215 pounds, or 65 bushels, of grain (hulless) per acre. The Banner oats harvested in September (without removal of marginal drills) yielded over four tons per acre of total crop and 102 bushels of grain per acre.

(3) In spite of the fact that the late-sown strip of oats was much ranker and yielded a good deal more tonnage than the early-sown, the small seeds sown among it caught very much better than those sown on the early oats, which had got a lap ahead of them, using up some of the moisture and available plant food. By autumn the meadow plants among the early-sown oats were extremely weak and thin, as usual.

(4) Excellent catches were obtained on the plots seeded without nurse crops and a fair sprinkling of grasses and alfalfa in the late strip of oats, though nothing approaching the vigour of growth obtained by seeding alone. In 1925 the following yields of hay were obtained from the strip seeded with a late-sown nurse crop of oats:

Alfalfa and five grasses (Range B)	2,223 pounds
Alfalfa only (Range A)	2,132 "
Red clover and five grasses (Range B)	3,152 "
Red clover, alsike, and five grasses (Range B)	1,696 "

The two plots of clovers only in this strip had virtually failed to make stands, and were ploughed up.

(5) It should be added that not withstanding the apparent clean tilth of the piece, quite a jungle of Lamb's quarters and some other weeds had to be pulled.

(6) By natural agency or by broadcasting of soil, or by both together, good inoculation seems to have been secured.

(7) On April 25, 1925, it was observed that in Range B of the alfalfa series the alfalfa-timothy plot had evidently received the heaviest wash, with much silt deposited. The alfalfa-rye-grasses and other plots in the same range received considerable wash at their south ends. There was extensive flow of snow water across some of the plots in the red-clover series.

(8) On July 23 and 24, 1926, these plots were ploughed.

INOCULATION

Inoculation was not practised at all the first two years. The third year the nitro culture arrived on the eve of seeding, after the grass and clover seeds had been mixed and weighed out, so that there was opportunity to treat only the seed in the plots where the legumes occurred unmixed with grasses, although in the ensuing season the legumes in the mixture plots derived some benefit from accidental inoculation due to surface wash. Since 1920 artificial inoculation has, except in 1922 when it may not have been needed, been systematically practised, with strikingly improved results from the legumes relative to the grasses. Whereas in the first two seedings the legumes were sorry failures, in the subsequent ones they occasionally compared not unfavourably in yield with the grasses.

COMPARISONS OF THE GRASSES

The most complete comparison available lies among the grasses. Timothy, Western rye, meadow fescue, a combination of these three, and a mixture in which red top and Kentucky blue were added to them were all grown under comparable conditions.

In the stands resulting from the first two seedings the alfalfa and clover elements were insignificant. Afterwards they were more important, but still the grasses remained decidedly the dominant elements in the grass-and-clover mixtures. Alfalfa held its own with them much better than did the common clovers, but for all that the experiment affords an excellent opportunity to balance the grasses one against another.

From every summary Western rye emerges well in the lead, despite grasshopper injury to the last few crops. It exceeded timothy and meadow fescue by over forty per cent and tended to raise slightly the yield of the combinations in which it occurred, although timothy had an aggressive habit of filling the turf in the three-grass and five-grass mixtures, tending thereby to depress their yields to a point near its own mediocre level in spite of the buoyant influence of the rye.

The effect of grass hopper injury on Western rye grass is revealed by the fact that its lead of 54.6 per cent over timothy in this test down to 1923 was finally reduced to 40.7 per cent. In the bad hopper years it excelled timothy very little indeed.

Meadow fescue acquitted itself rather more creditably than it did in the Nurse Crop Test. There it had been handicapped by the ploughing of a few plots. Also in that test it had to stand or fall on its own merits while in the series under present consideration it may have been helped out by the legume bases.

Besides denoting the superiority of alfalfa this would seem to indicate quite an "inferiority complex" for alsike. Here, as elsewhere, alsike has proven winter-hardy but an extremely poor cropper in times of drouth. It is just possible, too, that the yield of the alsike-plus-red-clover series was depressed by a thicker stand than obtained in the other clover series. However this may be, neither of the small clovers compares favourably with alfalfa, in cropping capacity nor in drouth resistance, although in the wet summer of 1926 certain third-year plots of red clover yielded at the rate of over two tons of hay. But two or three good crops in nine years will hardly make a farmer rich. It is the average that counts, and, other things being equal, a premium should be placed upon the crop that makes the best relative showing in the adverse years.

SUMMARY COMPARING GRASSES AND COMBINATIONS THEREOF IN THE GRASS AND CLOVER MIXTURES EXPERIMENT

In the table from which the summary is condensed, for the purpose of arriving at true averages, the fortieth acre plots are, in all cases, reduced to an eightieth-acre basis. Thus, in each of 1919, 1921, 1922, and 1923 seedings the harvest is shown as from twelve eightieth-acre plots of each grass, although yields in these four cases were originally taken as from six fortieth-acre plots. Thus the data summarized is shown as representing, in the case of each grass, seventy-two eightieth-acre plots covering (uniformly) from one to four years' harvests from six consecutive annual seedings, viz., 1918 to 1923, inclusive.

Designation	Yield in pounds per acre				
	Legumes and Timothy	Legumes and Western rye	Legumes and Meadow fescue	Legumes and 3 grasses	Legumes and 5 grasses
1922 SEEDING—					
Aggregate 3 crops, average 2 ranges	4,306·0	5,233·0	5,617·0	6,115·0	5,217·0
" 3 " " 2 "	4,674·0	5,797·0	4,974·0	5,381·0	5,812·0
" 3 " " 2 "	6,063·0	6,727·0	6,632·0	5,064·0	4,728·0
" 3 " " 2 "	4,306·0	5,233·0	5,617·0	6,115·0	5,217·0
" 3 " " 2 "	4,674·0	5,797·0	4,974·0	5,381·0	5,812·0
" 3 " " 2 "	6,063·0	6,727·0	6,632·0	5,064·0	4,728·0
Aggregate 18 crops, representing 12 one-eightieth acre plots	30,086·0	35,514·0	34,446·0	33,120·0	31,514·0
Average per acre per annum of 36 plot harvests representing 12 plots	1,671·4	1,973·0	1,913·0	1,840·0	1,750·0
1923 SEEDING—					
Aggregate 3 crops, average 2 ranges	5,538·0	7,016·0	4,289·0	3,974·0	3,914·0
" 3 " " 2 "	8,590·0	9,420·0	5,768·0	6,225·0	7,014·0
" 3 " " 2 "	8,948·0	9,259·0	7,753·0	8,021·0	6,852·0
" 3 " " 2 "	5,538·0	7,016·0	4,289·0	3,974·0	3,914·0
" 3 " " 2 "	8,590·0	9,420·0	5,768·0	6,225·0	7,014·0
" 3 " " 2 "	8,948·0	9,259·0	7,753·0	8,021·0	6,852·0
Aggregate 18 crops, representing 12 one-eightieth-acre plots	46,152·0	51,390·0	35,620·0	36,440·0	35,560·0
Average per acre per annum of 36 plot harvests representing 12 plots	2,564·0	2,855·0	1,978·0	2,024·0	1,975·0
CONDENSED SUMMARY (Averaging two ranges in each case)—					
Aggregate 15 yields, 1918 seeding	40,600·0	49,600·0	35,690·0	44,520·0	37,880·0
" 18 " 1919 "	25,360·0	38,580·0	26,460·0	28,340·0	31,580·0
" 21 " 1920 "	18,659·5	32,340·0	23,360·0	24,505·0	24,523·0
" 18 " 1921 "	7,788·0	30,000·0	13,174·0	10,720·0	16,318·0
" 18 " 1922 "	30,086·0	35,514·0	34,446·0	33,120·0	31,514·0
" 18 " 1923 "	46,152·0	51,390·0	35,620·0	36,440·0	35,560·0
Aggregate 108 crops, average 2 ranges representing 72 one-eightieth acre plots	168,645·5	237,424·0	168,750·0	177,645·0	177,375·0
Average per acre per annum of 216 plot harvests representing 72 plots	1,561·5	2,198·3	1,562·5	1,644·8	1,642·3
Percentage comparisons	100·0	140·7	100·0	105·3	105·1

—	Alsike and red clover combinations with grasses	Red clover combinations with grasses	Alfalfa combinations with grasses
Pounds of hay per acre per annum	1,376	1,586	1,797
Percentage comparisons with lowest as 100 p.c.	100%	115·3%	130·6%

THE CLOVERS AND ALFALFA

Precise appraisal of the relative influence of the three legume bases is scarcely possible from the fact that inoculation had been omitted in the case of the first two seedings and was not always complete thereafter. In its absence the legume-only plots did tolerably well in the year of seeding, but very poorly thereafter. From the plots where they were sown mixed with

grasses they almost disappeared. It is deemed best, therefore, to confine the remaining tabulations to the four years, 1920 to 1923. By one of the tables we see that the alsike-and-red-clover-series produced the lightest yield and the alfalfa series the heaviest of the three by a substantial margin. If any one series was favoured more than the others by natural conditions it was probably the first-named. The alfalfa ranges happened usually to occupy rather the highest and driest ground.

The superiority of alfalfa over the small clovers is evident from several angles. Of the three legume bases it is the only one that measured up in yield to the average of the grasses with which they were severally combined. In spite of the fact that it was not always perfectly inoculated it averaged 1,773 pounds of hay per acre through the dry years as against 1,797 pounds for the alfalfa-grass mixtures.

The alfalfa was more hardy than the clovers and its stands persisted much better, being still good at the end of the three-year cropping periods.

Finally, on comparing the averages of the several grass mixtures according to their respective legume bases we find them standing thus:—

COMPARING three leguminous bases with each other and with the grass combinations in which they severally occurred. Average yield of hay in pounds per acre per annum, representing three crops from each of four successive seedings (1920-1923).

—	Alsike and Red clover	Red clover	Alfalfa	Average of each grass with three bases
	lb.	lb.	lb.	lb.
Legume only	1,021	1,240	1,773	1,344
Legume and timothy	1,127	1,420	1,661	1,426
Legume and W. rye	1,882	2,085	2,251	2,073
Legume and meadow fescue	1,292	1,367	1,782	1,480
Legume and 3 grasses	1,306	1,406	1,654	1,455
Legume and 5 grasses	1,275	1,581	1,639	1,498
Averages all plots (including legumes only)	1,317	1,528	1,793	1,546
Average of legume-grass mixtures	1,376	1,586	1,797	1,586

THICK OR THIN SEEDING OF THE MIXTURES

A summarized comparison of Range A seeded at the full rate and Range B seeded at a two-thirds rate reveals that in the long run every grass-legume mixture did somewhat better where the lighter quantity of seed was employed. Without an epitome it would have been difficult to determine this, for in any given layout it was obscured by variation in natural conditions, but on the average of three cuttings, each from a total of four annual seedings, the point stands out plainly. On the grand average the thin seeding exceeded the thicker by eleven per cent. This agrees with the result of a thickness-of-seeding test carried on for several years with timothy and Western rye.

It must be admitted in qualification that the cropping period represented by the present figures comprehended an excessive proportion of dry summers, and this doubtless goes to account for at least some of the eleven per cent spread.

COMPARING average results in pounds of hay per acre per annum from two rates of sowing extended through four annual seedings

Designation	Range A Full seeding	Range B Two-thirds seeding
	lb.	lb.
Legume and timothy	1,370	1,502
" Western rye	2,005	2,141
" meadow fescue	1,373	1,588
" three grasses	1,381	1,529
" five grasses	1,420	1,577
Average	1,506	1,667

SUMMARY OF TWO COMPLETED EXPERIMENTS

In two important cultural experiments 1,460 meadow plots were seeded at the Beaverlodge Sub-Station during the seven years 1918-1924. Through lack of inoculation of the legumes in the first two or three seedings, through weeds, dry weather and grasshoppers, a considerable number of these were ploughed up before being cropped as intended. Those persisting were usually cut for three successive seasons, though there were certain minor exceptions. The cropping period included a run of particularly poor hay years, accounting for abnormally low yields, although a comprehensive average will show prevailing conditions better adapted to cereal production than to perennial meadow crops, save in so far as frost may hazard the issue with grain.

A most valuable comparison of the grasses is available—more especially between Western rye and timothy, both of which occurred in the two series. In the grand average representing 149 plots of each, from which were taken, in all, 431 plot harvests per grass, Western rye yielded 1,897 pounds of hay per acre per annum, being 42.2 per cent more than timothy. Down to 1923 it had been 56.3 per cent in the lead, but a succession of bad grasshopper years reduced the margin, since these insects seemed particularly partial to rye grass, almost annihilating young seedings of it at times.

Meadow fescue yielded about one-tenth less than timothy. It proved a very poor cropper in the dry years and in 1922-1923 it winter-killed considerably. On that same occasion timothy sustained lesser injury, Western rye, brome, and Kentucky blue seeming to escape. That winter was the only one ever observed to injure any of these grasses.

From the seventy-seven persisting plots of each grass in the nurse-crop test two hundred and fifteen plot harvests per grass were taken (with trifling exceptions in the case of fescue and blue grass). In this test Western rye exceeded timothy by 44.2 per cent and brome exceeded timothy by 42.8 per cent. Fescue gave 77.1 per cent as much as timothy and Kentucky blue only 45.7 per cent as much.

Of the five legumes, viz., alfalfa, sweet clover, common red, alsike and white Dutch clovers, the two first-named were the only ones justifying much consideration for hay production. Both these escaped hopper injury at times when young seedings of grasses were ruined. Alfalfa surpassed timothy by 38.9 per cent in the out-turn from three successive seedings in the nurse-crop test. In the first three attempts it was a failure through lack of inoculation.

Sweet clover seemed less winter-hardy than alfalfa, being apparently more prone to sclerotinia. It seemed also more difficult to get a catch of it in a dry year. Once established, however, it produced a much better top under

drouth. In the first year after seeding it outyielded alfalfa by 43 per cent, in spite of the fact that the stands of the latter were fuller. Inoculation proved as essential for sweet clover as for alfalfa.

Alsike, when inoculated, proved satisfactorily winter-hardy, but both it and common red withstood very poorly the recurrent dry springs and early summers. In a very occasional season they did well enough.

White Dutch was hardy but never until 1926 did it produce a cutting of hay.

In the comparison of nurse-crop and non-nurse-crop seeding it was found that after rejecting as failures nearly half the plots seeded with grain and considering only the three best grasses, the plots seeded alone still outyielded the others by 85.3 per cent. Ignoring failures to get a catch, it was estimated that 4,755 pounds of grain bundles, or 2,299 pounds of threshed grain were secured at the expense of 2,523 pounds of timothy hay, of 3,087 pounds of Western rye, or of 3,411 pounds of brome hay per acre. The reduction in hay yield resulting from nurse-crop seeding was chiefly confined to the first crop.

By and large, nurse-crop seeding is favoured above the other plan followed except in special cases, as when one is gaining experience with a dear-seeded crop like alfalfa. Nurse-crop seeding is convenient in the case of chaffy-seeded grasses like brome or Western rye, which may be mixed with the grain in the drill box. It gives a large return in the year of seeding and a greater aggregate production of feed, counting sheaves and hay together, than is obtained by seeding alone. If it fails to produce a catch there is little lost except the outlay for the grass seed.

The meadow crops vary somewhat in their response to nurse-crop seeding, Western rye, timothy, and alfalfa apparently succeeding best, although the latter when seeded in that way may yield lightly the next year. On economic grounds, considering cost of seed and all, it might prove more profitable to seed sweet clover with nurse crops and alfalfa alone—at least until its seed becomes cheaper and one's land well inoculated.

With either method of seeding, weed control is the crucial problem. Annual weeds are troublesome the initial year in plots seeded alone and intrusive the next among the weak-starting meadow plants resulting from nurse-crop seeding. Modified methods are being tried out to cope with this difficulty.

As nurse crops, wheat and barley proved rather more favourable than oats. An erect grain is desirable. There was little difference in the evident effect of thin- versus thick-seeded nurse crops.

It is very important in seeding with nurse crops to sow the meadow seeds at least as soon as the grain. The cereal is the stronger grower and if it gets a head start it competes too severely with the seeds.

With plots seeded alone and hand-weeded there was doubtful economy in taking the cut available in the first season, and on a field scale the comparison might have been more adverse to clipping, since a clipped plot was often benefited by snow held by an unclipped top adjacent. Timothy sometimes gave a ton and a half of hay in the year of seeding on fallowed land, and this might be worth taking for the sake of getting a sure and early return. With other grasses, and particularly with alfalfa, a generous top is very beneficial in holding snow.

Non-nurse-crop plots of five different grasses sown at the opening of seeding were outyielded 8 per cent by plots of the same seeded a fortnight later on land harrowed once or twice in the interval.

In the mixtures of certain grasses with three leguminous bases—namely, alfalfa, red clover, and red-plus-alsike—alfalfa was outstanding. Even when only partially inoculated the plots of alfalfa equalled the average yield of the

plots in which it occurred mixed with the grasses. This was with hand-weeded plots, however. Alfalfa is a poor weed fighter in a semi-arid climate. It dare not be sown thicker than about ten pounds per acre and in dry seasons it will not make a rank enough growth to subdue native weeds, which multiply among it. For this reason alfalfa is usually best grown in a mixture with grass if hay is the object. Western rye seems by far the best grass to combine with it. It is productive and drought-resistant and being a bunch grass does not choke the alfalfa unduly, but yet does much to keep the weeds in check. Six pounds each of Western rye grass and inoculated alfalfa would appear to be sufficient. A lesser proportion of alfalfa may be used with correspondingly beneficial results. It is rather anticipated that when the cost of alfalfa seed is reduced by local production a mixture of it with Western rye may be largely used. Sweet clover and rye or sweet clover and brome may be preferable in some cases, but were not included in the mixture trials under present discussion.

In a residual-effects test not yet completed the sod of Western rye grass has usually produced a heavier crop of barley than has the sod of timothy; and in one case at least the barley grain and straw grown after rye grass analyzed substantially higher in nitrogen.

Western rye appears to be the easiest of five grasses to break, and no grass has been easier to kill. Brome requires two ploughings and thorough cultivation between.

Alfalfa, in the earlier years a languishing failure, has reached the point where the second-greatest difficulty with it is to kill it. The greatest is to keep the stands clean. It now volunteers persistently from root and crown and a spring ploughing is very ineffective in eradication. Two ploughings or a late-fall ploughing may be more successful.

SUMMARY of cropping data down to 1926 from experiments with grasses in six successive seedings (1918 to 1923, inclusive) of two series of experiments, viz., the Nurse-Crop Experiment and the Grass and Clover Mixtures Experiment.

Designation	Yield in pounds per acre				
	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome
Aggregate of 135 plot-harvests from 53 nurse-crop-seeded plots of each crop in the Nurse-crop Experiment	119,988·0	181,440·0	96,862·0	48,802·0	174,285·0
Aggregate of 46 plot-harvests from 12 plots of each grass seeded alone and clipped in year of seeding in the Nurse-Crop Experiment	63,690	82,838	43,246·0	30,472·0	82,150·0
Aggregate of 34 plot-harvests from 12 plots of each grass seeded alone and not clipped in year of seeding in the Nurse-Crop Experiment	53,956·0	78,516·0	43,270·0	29,446·0	82,958·0
Aggregate of 215 plot-harvests from 77 plots of each grass in the Nurse-Crop Experiment	237,634·0	342,794·0	183,378·0	108,720·0	339,393·0
Average of 215 plot-harvests from 77 plots of each grass in the Nurse-Crop Experiment	1,105·2	1,594·3	852·9	505·6	1,578·5
Percentage comparisons	100%	144·2%	77·1%	45·7%	142·8%
Aggregate of 216 plot-harvests from 72 plots of each grass in the Grass and Clover Mixtures Experiment	337,291·0	474,848·0	337,500·0	.....	.....
Totals of 431 plot-harvests from 149 plots of each grass in both experiments	574,925·0	817,642·0	520,878·0	.....	.....
Grand averages of 431 plot-harvests representing 149 plots of each grass in both experiments	1,333·9	1,897·0	1,208·5	.....	.....
Percentage comparisons	100%	142·2%	90·5%		

GLEANINGS FROM OTHER EXPERIMENTS

Many other forage crop projects are in progress but space forbids more than cursory mention of a few of them in this report.

In the pasturing test fairly good stands of hay crops were obtained in 1925 and 1926 by seeding without a nurse crop and grazing closely with cows until the end of August. This kept annual weeds from seeding and yet resulted in a fairly good crop of hay in 1926 from areas thus seeded in 1925. The system appeared to work better with brome and sweet clover than with western rye and alfalfa, but further data is required.

Some very interesting work with alfalfa is under way. One test is intended to determine the effect of cutting it once versus twice per annum and likewise to compare the effect of cutting in early bloom and full bloom. Varieties are being continually tested. Everywhere on the Station alfalfa had wintered well and grew nicely but after four years' successful seed production it failed in 1926 to produce paying yields of seed. The early blossoms did not set and the pods resulting from the later bloom did not have time to ripen fully.

Altaswede red clover has exhibited a considerable degree of perennial tendency, seeds regularly, and yields well in wet seasons but is decidedly less winter-hardy than alfalfa and apparently less drouth-resistant.

BROADCAST ANNUAL FORAGE CROPS FOR HAY OR ENSILAGE

THE O. P. V. TEST

Banner oats, White Alberta peas, and common vetches were the varieties employed in this experiment. The land was partly hoe-crop land and partly summer-fallow, the plots crossing the two preparations. They were drilled seven feet wide on eight-foot centres. Border drills were excluded at harvest.

The legumes and the plots of oats alone were seeded May 14 and 15. At the same time oats at five pecks per acre were cross-drilled on half the area of the mixture plots. On the remaining halves the oats were cross-drilled ten days later, by which time the legumes were well up.

Once more oats-only have outyielded any of their combinations with vetches or peas. This has been the unvarying experience. The average of three mixtures this year is twelve per cent less than the yield of oats alone.

CEREALS FOR HAY

Three varieties of bald barley were compared with Ruby wheat and with Banner oats for the production of hay. As a matter of fact all were permitted to ripen but the comparative yields were not less valuable on that account, since all had about an equal chance. The plots were seeded seven feet wide trimmed before harvest to a width of five feet and cut with a binder. Dry-matter determinations were not made but the stooks when weighed on October 25 were well cured. They had been seeded May 15 on good land and harrowed as emerging on the twenty-seventh. Here again Banner oats proved the heaviest producer of tonnage.

VARIETY TEST OF MILLETS

Four varieties of millet were sown in duplicate ranges. They grew fairly well but not so strongly as cereals in adjacent areas and required one or two tedious hand weedings to purge them. Although cut with a mower they yielded less tonnage than did the oats-flax mixtures grown alongside and harvested with a binder. Growth was stopped on September 8.

Hog millet made the thinnest growth and again seemed the least-adapted variety.

INTERCULTIVATED ENSILAGE CROPS

The variety tests of corn and sunflowers were sown on a piece of land that had been summerfallowed to exterminate wild oats, a few of which had apparently lain in the land through three years in sod only to appear in the barley crop of 1924. The system of cultivation resorted to seems to have favoured multiplication of wire worms, which were observed to work extensively among the hoe crops, playing particular havoc with the stands of sunflowers and beets, though corn did not escape either. A certain amount of damage was also done by cutworms, for which a highly seasoned bait was spread as soon as their mischief was noticed. Extensive replanting was necessary, particularly with the sunflowers. Even then the stands were so ragged that half the area was rejected and yields taken only from limited areas representing in each case the half of the patch that was the least affected. At that they are still low enough to escape challenge.

SUNFLOWERS

Five varieties of sunflowers were seeded May 11 and harvested in September after the first breath of winter. From the halves of the plots not too seriously masticated by wireworms the yields of dry matter ranged from 2,756 pounds per acre of Mennonite up to 6,997 pounds of Mammoth Russian. Ottawa 76 did less well than usual, but the test although in duplicate was far from decisive.

CORN

Fifteen varieties and strains of corn were sown May 12 and 13. All were in duplicate save the Michigan Frost-resistant, obtained by courtesy of Dr. J. H. Gain, V.S., of Francois Lake, B.C. Seed permitted but one row of this novelty, which, by the way, did not show any special degree of resistance to the hard frost that killed all the corn. This is not to say that it might not have withstood a less-severe one. For the rest, the results show a meagre average of 9,756 pounds green weight and 1,497 pounds dry matter per acre. The four days' June snow and subsequent saturation had conferred upon the corn a cold bath to which its exotic nature reacted unfavourably. Grande Prairie is not yet a first-class corn country.

FIELD ROOTS

Four varieties of swedes, six of mangels, three of sugar beets, and one of fall turnips were sown in duplicate on May 14. September frost had ruined the mangels for keeping and about two-thirds of each root consisted of readily-available fertilizer. The sugar beets—what there were of them—were mostly sound except for crown injury. The turnips were temporarily stored for feed. The bulk of them were consumed before they were entirely spoiled, and the remainder were thrown out as manure. The proportion of the turnips for which there was cellar room kept all right, but their feeding contributed considerably, as usual, to the proprietor's wage bill without, it is feared, correspondingly augmenting his live-stock returns.

The carrots had been assigned a sector to themselves. Germination was tardy, the growth slow, and the specimens small.

MISCELLANEOUS FORAGE CROPS

Kale, curled and marcelled, green-stemmed and marrow-stemmed, thousand-headed and hydra-headed; rape dwarf and rape giant were sown May 18 and flourished exceedingly. On November 2 they were cut with a mattock, weighed and sampled. The crop was bunched by the buildings and fed to stock.

DRY MATTER COMPARISONS OF VARIOUS FORAGE CROPS

Although by no means affording a conclusive comparison, since soil conditions varied for the several crops, it is nevertheless of interest to compare the several classes of forage crops in their yield of absolute dry matter per acre. For this purpose the averages are taken of yields of varieties grown in certain variety and other experiments. In all cases, excepting the millets, the preparation was summer-fallow or part fallow and part hoe crop, but the field roots, corn, and sunflowers were grown on wire-worm-infested land.

It may be seen that oats alone have produced the heaviest yield of absolute dry matter, followed by the oat-legume mixtures. After these come (bald) barley and (Ruby) wheat. Sunflowers produced only 76.3 per cent as much dry matter as did Banner oats. Swede turnips gave 43 per cent as much dry matter as oats, and mangels 21.1 per cent, two-thirds of it rotten as the result of September frosts. Corn did a shade better than mangels with 21.9 per cent of the yield of oats. Carrots produced only 7.3 per cent as much as Banner oats.

COMPARING THE DRY-MATTER CONTENT OF VARIOUS FORAGE CROPS

Crop	Number of varieties or treatments	Yield dry matter per acre	Per cent comparison
		pounds	p.c.
Oats	2	6,814	100·0
Oats and legumes	3	5,737	84·2
Bald barley	3	5,482	80·5
Ruby wheat	1	5,482	80·5
Sunflowers	5	5,198	76·3
Rape and Kale	7	4,017	58·9
Millets	4	3,651	53·6
Swede turnips	4	2,933	43·0
Sugar beets	3	1,753	25·7
Corn	15	1,497	21·9
Mangels	6	1,436	21·1
Carrots	3	494	7·3

HORTICULTURE

The Peace River Country has had many exceptional seasons, and 1926 was one of them. It was the reverse to that of several previous years. While they were dry for the first few months and wet later, 1926 was wet in the earlier weeks and somewhat dry later. In June, beside numerous showers of rain, a heavy snowstorm occurred on June 8 and 9. While this proved such an advantage to grain crops, causing phenomenal yields, it was a detriment to the vegetables. It left the ground soggy in many places, hindering it from regaining its usual mellowness. Nineteen-twenty-six had but one month without a touch of frost and only two without snow. Spring frosts caught the early sowings and September frosts limited the season. There were no great yields in any kind of vegetable. Carrots and parsnips, which were the best, were only a good average yield. Beets had to be reseeded. Squash and pumpkins failed to germinate in the wet soil. One hotbed was sown April 9, a much earlier date than usual.

Fruit and ornamentals did remarkably well but the report on these is eliminated in order to afford space for a detailed review of the important work with potatoes, since this must now be discontinued for a year or more after having reached a point where data of substantial value has been attained.

POTATOES

The potato work has run into a snag. In 1925 the Plant Disease Inspector of the Division of Botany found considerable mosaic among the Early Bermuda, alias Bliss Triumph, variety and a lesser amount of it in a few other kinds. Mosaic being a disease of the tops that may be spread from plant to plant by potato aphids, it is possible that the whole infestation may have come from the one kind, which is notoriously subject. This and some other varieties were thereupon discarded outright. Any others which revealed even traces of it were confined in 1926 to a quarantine area far removed from the main patch.

All tubers planted in 1926 were carefully treated with hot formaldehyde solution, in order to control such affections as scab, rhizoctonia, and black-leg. So far as the two latter were concerned the treatment seemed to be remarkably efficacious, scarcely any symptoms of either being found during the 1926 inspection. Scab occurred on certain areas but quite evidently as a result of soil rather than seed infestation. Apart from scab on the tubers the growing vines and harvested crop appeared to casual observers remarkably healthy. In respect to those diseases for which seed treatment could avail, the crop was sound enough for every variety to pass a first-class inspection.

Nevertheless, close scrutiny by the official inspector, H. S. McLeod, revealed eight varieties affected with a greater or less percentage of mosaic, although every one had passed him as free of it in 1925, the disease then having been masked by dry weather. Even in 1926 the form of it was light, but this would not assure against its becoming severe another season.

It happens that several of these infested varieties had been employed in cultural as well as variety tests, consequently among the two acres of potato plots there is not a bushel of tubers that can be relied upon as free from all possibility of mosaic infection. None were sold without warning and the Station itself will endeavour to establish healthy strains of the best by means of a tuber-unit system of propagation, each potato in this special effort being planted far enough away from its nearest neighbour to prevent aphids carrying the infection, so that any healthy plants should be safe foundation stock. Until purging is accomplished the potato experimentation may as well be curtailed, since neither in variety testing nor in ordinary cultural experiments are strictly dependable results to be obtained from unhealthy stock. However, as the 1926 affection was of a mild form and the stalks apparently vigorous, the year's data will be incorporated in the tables.

SOIL AND PREPARATION

The plots crossed the original meadow strips in a block that had been seeded in 1918 to a series of grass and clover mixtures; was broken in 1920; drilled to cereal plots in 1921; laid down again in 1922 to the same meadow experiment as before; was cropped three years to hay; and finally broken on July 30, 1925. This land has never been manured. The ground was disked in the autumn, harrowed twice in April, spring-toothed on May 4, floated, and planted to potatoes at the end of May. Except in two cases specifically noted, each plot consisted of a row 165 feet long spaced on three-foot centres, thus occupying an area of 1/88th acre. The variety test was in duplicate, but extensive roguing upset comparisons in one range, so that yields are taken from the other only, though such data as percentage of scab and per cent marketable are averaged from the two ranges. Most of the cultural experiments were in quadruplicate, with four varieties employed in each of the more important of these.

VARIETIES

Simple as it might seem to be, the true appraisal of potato varieties is a perplexing problem. So many variables enter into the case. Among the more important factors to be considered are table quality, yield, earliness, colour, shape, size, and freedom from blemishes, such as scab, which may occur at times in spite of the most thorough seed treatment. In several of these respects the relative standing of varieties will vary markedly from year to year, so that only long-term averages are of much account. Take the important matter of yield. This is radically affected by at least two irregular factors, viz., the character of the successive seasons and the health or disease-resistance of the stock used in the experiments.

To illustrate the latter point: For five years after its acquisition in 1918, the Country Gentleman yielded well and was highly regarded in other respects too. In the dry early summer of 1923 it disappointed with its very irregular stands and resultant low yield. For the next couple of years it did better again and in 1925 passed inspection for certification, only to reveal in 1926 a large percentage of mosaic, which had evidently been masked in the preceding dry summer. Though the disease was not present in a severe form it probably accounted for the fact that while Country Gentleman ranks first among four varieties in the nine-year average, having led all three of its companions from 1918 to 1922, it was surpassed in 1926 by all but one of them, standing seventeenth in a list of twenty-five varieties and strains. Quite possibly if the stock were propagated longer its standing would decline still further. This brings out clearly the point that varieties cannot be truly compared unless healthy stocks of all are employed in the tests. The relative susceptibility of varieties to disease is an important point that should be otherwise determined than by hit-and-miss variety testing.

Season affects the matter vitally. In a short growing season the early varieties excel, while in long seasons the late ones pull up. Thus the long-term averages fluctuate, and it would be difficult enough to place the varieties fairly if yield were the only criterion.

It is not the only one by any means. Quality is even more important and this varies as erratically as yield, depending upon soil and season. The most consistently good yielder has been a strain of Early Ohio obtained in 1920 from the University of Alberta. Unfortunately, in some seasons it has exhibited so much red discolouration of flesh and been so dark and soggy as to be fit for scarcely anything but stock feed. In other seasons it was better. It exhibits two distinct types, and in 1926 went down with five per cent of mosaic. Discard, then, this strain of Ohio.

Except for its tendency to red discolouration of flesh one of the most satisfactory potatoes at Beaverlodge, in spite of its limited yield, has been the Early Rose locally obtained in 1914, and at least four selections of this have run free from this discolouration for several successive seasons. After being compared some years in a separate series, these four numbered strains were in 1926 included in the main variety test with varying yields, by no means agreeing in this respect with the outcome of previous trials. However, as the 1926 yields are calculated from but a single plot of each, some erraticism is to be expected. These selections are mostly of a shapely oblate-oval type with slightly russeted skin, and so far have possessed consistently good table quality.

Other good early potatoes are the Irish Cobblers and Extra Early Eureka. Their reliability, earliness, white skin, and good table quality go far to compensate for deep eyes and rather low yield.

Empire State has been a high yielder but developed mosaic and is being discarded because of this and its characteristic roughness. British Queen is a shapely late potato, and another good one is a variety designated "X", which was obtained for Burbank but proves not of Burbank type. Carman No. 1 and Gold Coin are commendable potatoes but, like some of the other whites, are rather subject to scab and both are susceptible to frost injury before digging. Morgan Seedling and Agassiz Special, although not without merit, will probably be eliminated.

Of the twenty-five varieties and strains listed in the table, three of which had revealed mosaic in 1925 were excluded from the main variety test and confined to a quarantine plot, where they were compared each with another variety of its own season. The tabulated yields of the suspects are calculated according to the ratio which the yield of their companions in this test bore to their performance in the main variety test. The three quarantines were Morgan Seedling, Bovee, and Gold Nugget.

It must not be inferred that a variety is to be condemned merely because it happens to exhibit a disease like mosaic, since this may be due to accident of exposure. Doubtless some varieties are more resistant than others but no conclusions may be drawn from a single experience. The lesson of it all is that one should be very careful when purchasing a new kind to buy only certified stock and then to grow it at least fifty yards distant from his other potatoes until it has proven itself sound.

VARIETY TEST OF POTATOES 1918-1926, INCLUSIVE

Variety	Colour (Red, white, etc.)	Field Notes, 1926							Yield per acre in bushels and pounds									
		Date of emergence	Date of blooming	Notes at digging					1926		Four-year average 1923-26		Five-year average 1922-26		Six-year average 1921-26		Nine-year average 1918-26	
				Eyes—(Shallow, medium or deep)	Shape	Size—(Small, fair or good)	Scab	Marketable										
		June	July				p.c.	p.c.	bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
Agassiz Special	White	19	16	Medium	Oblong	Good to large	3·5	96·5	300	54	286	53	251	10	..	..	..	..
‡Bovee	Red	15	16	Medium	Elliptical	Fair	2·0	90·0	296	43	322	5	279	26	269	17	..	..
†X	White	15	19	Shallow	Roundish-flat	Fair	2·5	92·0	310	20	*258	0	..	..	..	..	..	..
‡‡British Queen	White	19	20	Shallow	Elliptical	Small to fair	9·3	89·0	313	2	321	58	277	21	..	..	..	..
Carman No. 1	White	15	15	Shallow	Oblong	Good	16·0	96·0	308	15	312	54	270	26	257	8	..	..
Country Gentleman	Red	19	17	Shallow to medium	Oblong	Good	1·0	97·0	273	54	296	57	261	14	254	31	279	5
Early Hebron	Red	19	19	Medium	Oblong	Good to large	14·0	96·0	321	8	322	24	281	45	272	12	..	..
Early Ohio	Red	15	16	Shallow	Oblong	Fair	15·5	95·0	327	26	335	14	287	25	277	16	..	..
Early Rose	Red	17	14	Shallow	Elliptical	Small to fair	2·0	94·5	271	42	260	29	230	43	222	34	252	43
" B.L. 5	Red	17	15	Shallow	Elliptical	Small to fair		91·5	275	52	..	..	..	..	..	..	..	..
" B.L. 7	Red	17	15	Shallow	Elliptical	Fair	5·5	94·5	211	25	..	..	..	..	..	..	..	..
" B.L. 23	Red	15	16	Shallow	Elliptical	Fair	8·0	96·0	281	27	..	..	..	..	..	..	..	..
" B.L. 25	Red	17	15	Shallow	Elliptical	Fair	15·5	95·0	306	32	..	..	..	..	..	..	..	..
Empire State	White	17	17	Medium	Oblong	Good	15·5	97·0	313	2	317	50	277	52	276	33	..	..
Extra Early Eureka	Yellow-white	15	16	Deep	Roundish	Fair	9·5	95·0	276	36	291	10	250	16	238	23	..	..
Gold Coin	White	15	14	Shallow	Oblong	Good	13·5	95·0	302	15	302	36	259	4	256	58	276	28
‡Gold Nugget	Yellow-white	21	17	Medium	Roundish	Fair	5·1	92·5	236	31	256	17	226	21	..	..	..	..
Irish Cobbler (Estabrook)	White	25	18	Deep	Roundish	Fair	15·5	95·0	259	9	263	10	..	..	..	..	..	..
" (Fawcett)	White	22	16	Deep	Roundish	Fair	21·0	94·0	245	31	289	16	..	..	..	..	..	..
" (McGregor)	White	22	18	Deep	Roundish	Good	20·0	95·5	265	58	272	29	..	..	..	..	..	..
" (Rosthern)	White	19	14	Deep	Roundish	Fair			229	54	..	..	..	..	..	..	..	..
" (Scales)	White	22	18	Deep	Roundish	Fair	23·0	95·5	280	39	272	34	..	..	..	..	..	..
‡Morgan Seedling	White	14	17	Shallow to medium	Oblong	Good	12·2	93·5	325	9	314	30	272	49	263	46	..	..
Netted Gem	Russet-white	22	17	Shallow	Oblong	Small to fair	2·0	90·0	236	8	238	47	..	..	..	..	..	..
Wee Macgregor	White	15	14	Shallow	Oblong	Good	16·5	96·0	280	39	288	41	248	43	243	36	251	59

† Though obtained as Burbank, this stock does not run true to the recognized type. Its identity is uncertain.
‡ Grown 1926 in quarantine against Wee Macgregor, Agassis Special, and Irish Cobbler (Estabrook), respectively, and data compared on a relative basis.
* Obtained 1924, hence figures in the four-year column represent only three years (1924-26).
‡‡ Through a mischance when treating seed, about 25 per cent of Netted Gem were mixed with the British Queen at planting and probably pulled down the yield about 1,538 pounds, judging from the comparison with the one row of Netted Gem. If so, the true yield of British Queen would have been 338 bushels 40 pounds, which would have placed it in first place in the 1926 yield and also raised its four-year average to 328 bushels 22 pounds and its five-year average to 282 bushels 28 pounds.
NOTE.—In 1926 the variety test was planted on May 27.

POTATO VARIETIES, BEAVERLODGE, IN ORDER OF HIGHEST YIELDS

Variety	1926	Variety	Average 4 years 1923-26	Variety	Average 5 years 1922-26	Variety	Average 6 years 1921-26	Variety	Average 9 years 1918-26
	bu. lbs.		bu. lbs.		bu. lbs.		bu. lbs.		bu. lbs.
1. Early Ohio	327-26	1. Early Ohio	335-14	1. Early Ohio	287-25	1. Early Ohio	277-16	1. Country Gentleman	279-5
†2. Morgan Seedling	325-9	2. Early Hebron	322-24	2. Early Hebron	281-45	2. Empire State	276-33	2. Gold Coin	276-28
3. Early Hebron	321-8	3. Bovee	322-5	3. Bovee	279-26	3. Early Hebron	272-12	3. Early Rose	252-43
§4. British Queen	313-2	4. British Queen	321-58	4. Empire State	277-52	4. Bovee	269-17	4. Wee Macgregor	251-59
5. Empire State	313-2	5. Empire State	317-50	5. British Queen	277-21	5. Morgan Seedling	263-46		
†6. X	310-20	6. Morgan Seedling	314-30	6. Morgan Seedling	272-49	6. Carman No. 1	257-8		
7. Carman No. 1	308-15	7. Carman No. 1	312-54	7. Carman No. 1	270-26	7. Gold Coin	256-58		
8. Early Rose B.L. 25	306-32	8. Gold Coin	302-36	8. Country Gentleman	261-14	8. Country Gentleman	254-31		
9. Gold Coin	302-15	9. Country Gentleman	296-57	9. Gold Coin	259-4	9. Wee Macgregor	243-36		
10. Agassiz Special	300-54	10. Extra Early Eureka	291-10	10. Agassiz Special	251-10	10. Extra Early Eureka	238-23		
‡11. Bovee	296-43	11. Irish Cobbler (Fawcett).	289-16	11. Extra Early Eureka	250-16	11. Early Rose	222-34		
12. Early Rose B.L. 23	281-27	12. Wee Macgregor	288-41	12. Wee Macgregor	248-43				
13. Irish Cobbler (Scales)	280-39	13. Agassiz Special	286-53	13. Early Rose	230-43				
14. Wee Macgregor	280-39	14. Irish Cobbler (Scales),	272-34	14. Gold Nugget	226-21				
15. Extra Early Eureka	276-36	15. Irish Cobbler (McGregor).	272-29						
16. Early Rose B.L. 5	275-52	16. Irish Cobbler (Estabrook).	263-10						
17. Country Gentleman	273-54	17. Early Rose	260-29						
18. Early Rose	271-42	18. Burbank	*258-0						
19. Irish Cobbler (McGregor).	265-58	19. Gold Nugget	256-17						
20. Irish Cobbler (Estabrook).	259-9	20. Netted Gem	238-47						
21. Irish Cobbler (Fawcett).	245-31								
‡22. Gold Nugget	236-31								
23. Netted Gem	236-8								
24. Irish Cobbler (Rosthern).	229-54								
25. Early Rose B.L. 7	211-25								

†Though obtained as Burbank this variety does not run true to type and its identity is uncertain.

‡Grown in 1926 in quarantine against Wee Macgregor, Agassiz Special, and Irish Cobbler (Estabrook), respectively, and data compared on a relative basis.

*Obtained 1924, hence figures in four-year column represent only three years, viz. 1924-1926.

§Through a mischance when treating seed, about twenty-five per cent of Netted Gem were mixed with the British Queen at planting and probably pulled down the yield about 1,538 pounds, judging from the comparison with the one row of Netted Gem. If so, the true yield of British Queen would have been 338 bushels, 40 pounds, which would have placed it in first place in the 1926 yield and also raised its four-year average to 328 bushels, 22 pounds, and its five-year average to 282 bushels, 28 pounds.

PERCENTAGE SCAB IN POTATO VARIETY TESTS

Variety	1923	1924	1925	1926	Aggregate 3 years 1923–1925	Average 3 years 1923–1925	Aggregate 4 years 1923–1926	Average 4 years 1923–1926
Agassiz Special	9·0	2	6	3·5	17·0	5·6	20·5	5·1
American Wonder	0·3	14	13	.....	27·3	9·1	.....	.....
Burbank	.....	15	8	2·5	.....	.....	.....	.....
Bovee	3·3	9	10	2·0	22·3	7·4	.....	.....
British Queen	13·3	9	8	9·3	30·3	10·1	39·6	9·9
Carman No. 1	25·0	23	6	16·0	54·0	18·0	70·0	17·5
Country Gentleman	0	14	9	1·0	23·0	7·6	24·0	6·0
Cow Horn	1·3	1	.....	.....	.....	.....	.....	.....
Early Bermuda	3·3	28	2	.....	33·3	11·1	.....	.....
Early Hebron	1·3	14	8	14·0	23·3	7·7	37·3	9·3
Early Norther	0	10	1	.....	11·0	3·6	.....	.....
Early Ohio	3·3	18	9	15·5	30·3	10·1	45·8	11·4
Early Rose	0	1	1	2·0	2·0	0·6	4·0	1·0
Empire State	10·0	20	4	15·5	34·0	11·3	49·5	12·3
Epicure	3·3	9	.....	.....	.....	.....	.....	.....
Everitt Rose	0	23	1	.....	24·0	8·0	.....	.....
Extra Early Eureka	13·3	2	1	9·5	16·3	5·4	25·8	6·4
Gold Coin	9·0	27	8	13·5	44·0	14·6	57·5	14·3
Gold Nugget	4·0	22	4	5·1	30·0	10·0	.....	.....
Green Mountain	3·6	14	16	.....	33·6	11·2	.....	.....
Houlton Rose	0	24	1	.....	25·0	8·3	.....	.....
Irish Cobbler (Estabrook)	40	7	3	15·5	50·0	16·6	65·5	16·3
" (Fawcett)	10	22	6	21·0	38·0	12·6	59·0	14·7
" (Lacombe)	18·3	7	2	.....	27·3	9·1	.....	.....
" (McGregor)	20·0	6	3	20·0	29·0	9·6	49·0	12·2
" (Scales)	15·0	3	5	23·0	23·0	7·6	46·0	11·5
" (Rosthern)	.....	.....	.....	4·0	.....	.....	.....	.....
Iron Chief	21·6	4	6	.....	31·6	10·5	.....	.....
Manitoba Wonder	5·0	8	.....	.....	.....	.....	.....	.....
Morgan Seedling	20·0	15	22	12·2	57·0	19·0	.....	.....
Netted Gem	0	16	1	2·0	17·0	5·6	19·0	4·7
Red King	35·0	4	1	.....	40·0	13·3	.....	.....
Table Talk	9·0	4	.....	.....	.....	.....	.....	.....
Wee Macgregor	10·3	18	15	16·5	43·3	14·4	59·8	14·9
Early Rose B.L. 5	.....	.....	.....	.....	.....	.....	.....	.....
Early Rose B.L. 7	.....	.....	.....	5·5	.....	.....	.....	.....
Early Rose B.L. 23	.....	.....	.....	8·0	.....	.....	.....	.....
Early Rose B.L. 25	.....	.....	.....	15·5	.....	.....	.....	.....

PERCENTAGE MARKETABLE-SIZE POTATOES IN VARIETY TESTS

Variety	1923	1924	1925	1926	Aggregate 3 years 1923–1925	Average 3 years 1923–1925	Aggregate 4 years 1923–1926	Average 4 years 1923–1926
Agassiz Special	94·6	96·7	97	96·5	288·3	96·1	384·8	96·2
American Wonder	89·0	97·0	97	.....	283·0	94·3	.....	.....
Burbank	.....	94·2	89	92·0	.....	.....	.....	.....
Bluenose	.....	85·0	93	.....	.....	.....	.....	.....
Bovee	97·0	96·5	98	90·0	291·5	97·1	.....	.....
British Queen	75·0	91·0	85	89·0	251·0	83·6	340·0	85·0
Carman No. 1	92·3	96·0	97	96·0	285·3	95·1	381·3	95·3
Country Gentleman	96·3	97·5	97	97·0	290·8	96·9	387·8	96·9
Cow Horn	43·3	73·7	.....	.....	.....	.....	.....	.....
Early Bermuda	73·3	94·2	88	.....	255·5	85·1	.....	.....
Early Hebron	96·6	96·2	97	96·0	289·8	96·6	385·8	96·4
Early Norther	96·0	97·0	96	.....	289·0	96·3	.....	.....
Early Ohio	93·6	97·5	98	95·0	289·1	96·3	384·1	96·0
Early Rose	96·6	97·2	95	94·5	288·8	96·2	383·3	95·8
Empire State	95·3	96·0	97	97·0	288·3	96·1	385·3	96·3
Epicure	92·0	95·5	.....	.....	.....	.....	.....	.....
Everitt Rose	95·3	96·7	97	.....	289·0	96·3	.....	.....
Extra Early Eureka	94·3	96·0	98	95·0	288·3	96·1	383·3	95·8
Gold Coin	94·6	95·0	97	95·0	286·6	95·5	381·6	95·4
Gold Nugget	95·0	92·5	87	92·5	274·5	91·5	.....	.....
Green Mountain	95·6	96·7	95	.....	287·3	95·7	.....	.....
Houlton Rose	95·3	97·0	97	.....	289·3	96·4	.....	.....

PERCENTAGE MARKETABLE-SIZE POTATOES IN VARIETY TESTS—*Concluded*

Variety	1923	1924	1925	1926	Aggregate 3 years 1923–1925	Average 3 years 1923–1925	Aggregate 4 years 1923–1926	Average 4 years 1923–1926
Irish Cobbler (Estabrook)	96·0	95·2	93	95·0	284·2	94·7	379·2	94·8
" (Fawcett)	75·0	95·5	96	94·0	266·5	88·8	360·5	90·1
" (Lacombe)	93·6	90·7	95	.....	279·3	93·1	.....	.....
" (McGregor)	90·0	96·5	96	95·5	282·5	94·1	378·0	94·5
" (Scales)	89·5	96·7	92	95·5	278·2	92·7	373·7	93·4
" (Rosthern)	.....	.....	.....	.....	.....	.....	.....	.....
Iron Chief	83·3	90·2	92	.....	265·5	88·5	.....	.....
Manitoba Wonder	86·0	93·7	.....	.....	.....	.....	.....	.....
Morgan Seedling	94·3	96·7	98	93·5	289·0	96·3	.....	.....
Netted Gem	85·0	95·0	97	90·0	277·0	92·3	367·0	91·7
Red King	50·0	83·2	85	.....	218·2	72·7	.....	.....
Table Talk	82·0	88·0	.....	.....	.....	.....	.....	.....
Wee Macgregor	94·0	96·5	98	96·0	288·5	96·1	384·5	96·1
Early Rose B.L. 5	.....	.....	.....	91·5	.....	.....	.....	.....
Early Rose B.L. 7	.....	.....	.....	94·5	.....	.....	.....	.....
Early Rose B.L. 23	.....	.....	.....	96·0	.....	.....	.....	.....
Early Rose B.L. 25	.....	.....	.....	95·0	.....	.....	.....	.....

DATE OF PLANTING TEST

The Date-of-Planting experiment was repeated according to the plan outlined in previous reports, save that no samples were analyzed.

Although the crop appeared healthy to the casual observer and the stands complete, the official inspector found 80 per cent of the tops revealing the mottled leaf that is characteristic of mosaic. It was rather more evident among the early plantings, one row of which was 98 per cent diseased. This does not necessarily mean that the early plantings carried a larger amount of infection. It merely means that a larger percentage was evident in them at the time of inspection in August. That so general an infestation should have occurred in a variety which passed a perfect inspection in 1925 is disappointing.

With such unhealthy stock it is only to be expected that there should be some inconsistencies in the yields, which, nevertheless, conform in their general trend to the outcome of previous seasons' tests. That is to say, they indicate a decided advantage from early planting where non-sprouted tubers are used and the success of sprouting as a compensation for deferred planting, though the June 3 planting proved too late this year for best results even where sets cut from sprouted potatoes were employed.

COMPARING SUCCESSIVE DATES OF PLANTING POTATOES IN BOTH SPROUTED AND NON-SPROUTED SERIES, 1926
Variety: Country Gentleman

Date of planting	Date of blossoming		Per cent mosaic		Per cent marketable		Yield per acre—1926	
	Non-sprouted	Sprouted	Non-sprouted	Sprouted	Non-sprouted	Sprouted	Non-sprouted	Sprouted
	July	July	p.c.	p.c.	p.c.	p.c.	lb.	lb.
April 21	8·5	.....	80	.....	95·5	.....	16,815	.....
April 28	11·0	11	80	80	95·0	95·0	14,288	18,572
May 5	14·0	14	80	80	95·0	94·5	16,970	16,767
May 12	17·0	17	80	80	94·5	94·5	15,380	18,240
May 19	20·0	21	80	80	92·0	93·0	12.529	19,522
May 26	25·0	25	80	80	77·5	88·0	10,846	19,380
June 3	30·0	31	80	80	92·0	93·0	10,260	15,675

COMPARING YIELDS OF CROP PER ACRE IN THE DATE-OF-PLANTING TEST, 1926, AND ALSO OVER A PERIOD OF SIX YEARS

Order of Plantings	1926 date	Average date 6 years	Non-sprouted		Sprouted	
			Yield 1926	Average 6 years	Yield 1926	Average 6 years
			lb.	lb.	lb.	lb.
1st	April 21	April 23	16,815	21,522	.....	.....
2nd	" 28	May 1	14,288	19,380	18,572	19,775
3rd	May 5	" 8	16,970	18,988	16,767	19,949
4th	" 12	" 14	15,380	17,817	18,240	18,680
5th	" 19	" 22	12,529	15,995	19,522	19,954
6th	" 26	" 28	10,846	15,907	19,380	21,606
7th	June 3	.....	10,260	.....	15,675	.....

NOTE.—In arranging this table the hypothetical average date of the first plantings was arrived at; ditto of all the second dates, etc. Sometimes there were two plantings made in April. The final one was always made in June. Since only six plantings occurred in certain years, averages are possible for but six dates and the theoretical average date of the last one included is May 28.

BREAKING OFF VERSUS LEAVING CELLAR SPROUTS ON AT PLANTING

In 1915 and 1919 a test was conducted to determine whether it were better to break off or leave on at planting time the white sprouts that usually form in cellar storage. The plan was to plant two or more plots with sets carrying as many of these sprouts as would adhere with ordinarily careful handling, and other plots with sets from which every sprout was broken off short. In later years the plan was modified unintentionally through the zeal of helpers, who took pains to plant in the one series no sets that did not possess sprouts. Since then, the experiment has shown an exaggerated result, but it is significant that in every year there has been a decided reduction in yield from removing the sprouts. Examination has revealed that when the sprout is bruised in handling it may die, but in such case a new growth often comes from its base, so that even then there has appeared to be an advantage from leaving it attached to the set. Of recent years a row has occasionally been planted with the white sprouts removed in preparing the sets required for half the main experiment, and when weather conditions have been favourable for a prompt start so that the detached sprouts could root ere they were dried out and decayed, a partial crop was produced by them, varying greatly, however, with variety and weather conditions. The factor of disease may also in some instances bear upon the matter.

While the Station does not recommend the practice of allowing seed potatoes to develop white sprouts it advises against their removal if found at planting time.

In 1926 four varieties were employed, thus allowing virtually a quadruplicate test. In every instance the row planted with sets from which the white sprouts had been broken off was slower in emergence, later in blooming, and lower in yield than its fellow, but this was particularly the case with the Early Rose and Country Gentleman, the stands of which were very irregular in the desprouted rows. The table shows that these adverse comparisons were conspicuously evident in the yields.

COMPARING RESULTS OF BREAKING OFF VERSUS LEAVING CELLAR SPROUTS ON WHEN PLANTING

Variety	Date of emergence		Date of blooming		Yield in pounds per acre		Remarks as to disease, etc.	
	Sprouts on	Sprouts off	Sprouts on	Sprouts off	Sprouts on	Sprouts off	Sprouts on	Sprouts off
Early Rose, B.L. 7....	June 26	June 28	June 17	June 28	10,157	5,016	.....	Weaker than "on." 80 per cent stand.
Irish Cobbler (Fawcett).....	" 26	" 28	" 18	July 2	14,128	11,369·6	M. 4%	Mosaic 4%.
Country Gentleman....	" 26	" 28	" 20	" 2	14,212	3,511·2	M. 32%	Weaker than "on." 70% stand. Mosaic 32%.
British Queen.....	" 25	" 28	" 22	" 2	16,594	14,337·4	R. 1%	Weaker than "on." Mosaic 2%.
Average.....	June 25·7	June 28	June 19·2	July 1	13,773	8,558		

Per cent disadvantage in yield from breaking off white sprouts.....37·8%

Detached Sprouts.—A row divided into four equal parts was planted with detached white sprouts and alongside this a row of the same varieties was planted with cut sets having the white sprouts adhering. The latter yielded:—

—	Early Rose (B.L. 7)	Irish Cobbler (Faweett)	Country Gentleman	British Queen	Average four varieties
White sprouts only.....	7,524	8,694	13,376	10,032	9,906
Cut sets with white sprouts attached....	15,048	14,379	19,395	14,379	15,800
Advantage of ordinary sets.....	7,524	5,685	6,019	4,347	5,894

Thus the detached sprouts this year gave 62.6 per cent of a normal yield. The Chronological record of nine years' work now stands thus:—

Year	Number of tests	Number of varieties employed	Per cent disadvantage through breaking off sprouts
			p.c.
1915.....	2	1	15·0
1919.....	2	1	15·5
1920.....	2	1	33·8
1921.....	1	1	21·0
1922.....	3	1	27·8
1923.....	3	1	18·9
1924.....	3	1	22·3
1925.....	4	4	18·2
1926.....	4	4	37·8
Average nine years.....	.....	.....	23·4

GREEN SPROUTED, WHITE SPROUTED, OR DORMANT SETS

To compare dormant sets, sets with white cellar sprouts, and sets with green sprouts formed in a light, warm room, an experiment was commenced in 1920; conducted in triplicate in 1922 and 1923; in quadruplicate in 1924; in duplicate in 1925, and again in quadruplicate in 1926, four varieties being separately compared this last time.

The outcome shows a fairly consistent advantage of tray-sprouted over dormant sets, except in 1922, when it was only 1.1 per cent, and in 1924 when it was reversed. In the average of seven years' work tray-sprouted sets have outyielded dormant sets by 11.6 per cent.

The behaviour of the cellar-sprouted sets has been much more erratic. In 1921, 1924, and 1925 they seem to have outyielded the green-sprout sets, but in three successive years, notably in 1923, they fell short of the yield of dormant tubers and the average of seven years' comparisons gives them a quantitive average only 3.12 per cent in excess of the yield of dormant tubers.

The major significance of the outcome appears to lie in the fact that the development of a white sprout abstracts substance from the tuber and if some of the sprouts be then broken off, mutilated or, perchance, attacked by disease spores, the net advantage of having the white sprouts formed may not compensate for the subtraction of part of the tuber's substance. The season may also make a difference. Observation has been that the rows planted with sprouted sets are usually earlier in emerging and in blossoming than those planted with dormant sets. So far as 1926 is concerned a tabulation reveals that the white-sprout rows emerged eight days ahead of the green-sprout rows and ten days ahead of the dormant-set rows. Yet the green-sprout rows bloomed two days sooner than the white-sprout rows and six days sooner than the dormant-set rows. Much the same thing had occurred in 1925 when the white-sprout rows came up one and a half days earlier than the green-sprout, and five and a half days earlier than the dormant rows, whereas the green-sprout rows bloomed a day ahead of the white-sprout and six days ahead of the dormant-set rows.

The apparent precocity of the white-sprout over the green-sprout rows is probably due to the fact that the cellar sprout grows longer than the tray sprout in a given time. But the latter is stouter and probably more vigorous. Incidentally, it is much less likely to be broken off in ordinary handling.

That the dormant-set plots showed the lowest percentage of mosaic infection may have been due merely to their less forward state at the time of inspection.

When considered in all its aspects the outcome of the series conforms with the trend of other experiments, indicating that it is best to keep the tubers dormant until about April and then tray-sprout them in a light, warm place at least in localities where such measures are called for in order to take advantage of a short growing season. Cellar sprouts may conduce to the same end providing they are healthy, not too spindly and so handled that not too many will be broken off or bruised.

COMPARING GREEN-SPROUTED AND WHITE-SPROUTED WITH DORMANT SETS, 1926

Variety	Date of emergence			Date of blossoming			Notes on diseases, etc.			Yield in pounds per acre		
	Green-sprouted	White-sprouted	Dormant	Green-sprouted	White-sprouted	Dormant	Green-sprouted	White-sprouted	Dormant	Green-sprouted	White-sprouted	Dormant
	June	June	June	July	July	July						
Early Rose, B.L. 7	26	19	28	18	20	27	clean	clean	clean	14,713	11,829	8,401
Irish Cobbler (Fawcett)	26	19	28	18	20	22	M. 14	M. 9 S.S. 1	M. 10	15,048	13,794	13,585
Country Gentleman	26	19	28	18	20	23	M. 48	M. 52	M. 32	17,388	16,595	9,781
British Queen	26	15	28	20	23	26	M. 2	R. 1	clean	16,929	17,723	14,797
Average four varieties	26	18	28	18·5	20·7	24·5	.....	.....	.....	16,019	14,985	11,641

GREEN-SPROUTED VERSUS WHITE-SPROUTED DORMANT SETS, 1926

Designation	Yields in pounds per acre								
	1920	1921	1922	1923	1924	1925	1926	Average 7 years	Aggregate 7 years
Dormant tubers kept in cool dark, storage till planting	16,700	12,012	6,066	16,846	23,560	15,131	11,641	14,565	101,956
Sets with white sprouts formed in cellar storage	18,800	16,104	5,433	11,256	21,992	16,573	14,985	15,020	105,143
Sets with green sprouts formed in a light upstairs room	20,500	14,652	6,133	20,361	20,092	16,092	16,019	16,264	113,849
Advantage (or disadvantage) white-sprouted over dormant	2,100	4,092	−633	−5,590	−1,568	1,442	3,344	455	.....
Advantage (or disadvantage) green-sprouted over dormant	3,800	2,640	67	3,515	−3,468	961	4,378	1,699	.....
Per cent advantage (or disadvantage) white-sprouted over dormant	12·5	34·0	−10·4	−33·1	− 6·7	9·53	28·7	*3·12	.....
Per cent advantage (or disadvantage) green-sprouted over dormant)	22·7	21·9	1·1	20·8	−14·7	6·35	37·6	*11·6	.....

*Calculated on a quantitive basis.

ALL EYES VERSUS ONE EYE PER WHOLE SET

Against a thirty-per-cent increase in yield believed to have been obtained in 1919 by removing all eyes but one per set from green-sprouted potatoes planted whole against similar potatoes planted with all the sprouts left on must be set seven consecutive reversals, the chronological record standing thus:—

	p.c.	p.c.
Gain in 1919 by removing all eyes but one per potato		30·00
Loss in 1920 by removing all eyes but one per potato	14·75	
" 1921 " " " "	1·80	
" 1922 " " " "	28·60	
" 1923 " " " "	8·74	
" 1924 " " " "	9·96	
" 1925 " " " "	19·90	
" 1926 " " " "	13·33	
Net loss serial average, eight years' work	8·38	

BREAKING OFF VERSUS LEAVING CELLAR SPROUTS WHEN PUTTING UPSTAIRS TO FORM GREEN SPROUTS

Assuming that it is desired to sprout seed potatoes by exposing them in trays and that white sprouts have already formed, is it advisable to break these off or leave them to toughen and green up in the light? After running for three years (1920-1922) the experiment was interrupted by an error but resumed in 1924. The first three years' work showed a 3.7 per cent disadvantage from breaking off the cellar sprouts, but suggested that the degree of loss likely depended a good deal upon how well developed the cellar sprouts had been. The 1924 results were very erratic, perhaps owing to the abnormal season, but the average of the quadruplicate trial contradicted previous indications. The cellar sprouts that year were small. A very large gain seemed to have been accomplished by the preliminary de-sprouting in 1925 and a small one again in 1926, so that the average of six years' work shows an adverse margin of 4.9 per cent. No fully satisfactory explanation has been arrived at to explain the conflict in results from year to year. Except in the case of one variety no difference was observed in the time of emergence in 1926 as between the two treatments.

COMPARING results of breaking off versus leaving cellar sprouts on when put upstairs to sprout. Varieties used: 1920, Early Rose; 1921, Early Norther; 1922, Country Gentleman; 1924, Early Rose; 1925, Early Rose; 1926, Early Rose B.L. 7, Irish Cobbler (Fawcett), Country Gentleman and British Queen.

Designation	Yield in pounds per acre							
	1920	1921	1922	1924	1925	1926	Average 6 years	Aggregate 6 years
Cellar sprouts left on when tubers put upstairs to form green sprouts	20,375	18,040	5,540	18,287	12,924	16,061	15,204	91,227
Cellar sprouts broken off when tubers put upstairs to form green sprouts	18,900	17,864	5,540	20,710	16,295	16,396	15,950	95,705
Advantage (or disadvantage) of breaking off sprouts	−1,475	−176	0	2,423	3,371	335	746	4,478
Per cent. advantage (or disadvantage) of breaking off cellar sprouts when putting upstairs	p.c. −7·2	p.c. −1·0	p.c. 0	p.c. 13·2	p.c. 26·08	p.c. 2·08	p.c. 4·9	p.c. 4·9

TREATING WITH FUNGICIDE BEFORE VERSUS AFTER SPROUTING

The experiment to determine whether it is better to treat potatoes with formaldehyde before or after putting in trays to sprout has been conducted for seven years (1920 to 1926), but the 1923 data was rejected owing to ambiguity in the field records, so that only six years' figures are published. These show pre-treatment has resulted in a slightly larger yield than treating after sprouting. One advantage appears to be that tubers badly affected by the chemical—and there often are a few—will show the effect before planting time, becoming soft and wrinkled, so that they may be rejected.

So far as efficacy in controlling disease is concerned the stock used in these experiments has usually been so sound that there was little opportunity to judge the matter. Scab has seldom been troublesome, save on a few dry knolls, where it has occurred in spite of seed treatment. Blackleg has been almost exterminated from the Station, and until 1925 the staff were unfamiliar with rhizoctonia, which does not seem very prevalent anyway. The experiment has therefore hinged upon the respective effects of the two treatments upon seed viability.

Until 1926 the seed treatment had consisted of the ordinary formaldehyde solution used at well-water temperature. This time the hot-formaldehyde treatment was resorted to and its effect upon the sprouts was probably more severe than that of the usual cold solution. With all four varieties the rows planted with sets cut from potatoes treated before being tray-sprouted showed green leaves about four days earlier than their fellows, and their yields were consistently higher, the average being 11.33 per cent greater. In six years' work the net average increase in yield of treating before over treating after sprouting has been 4.17 per cent.

RESULTS of treating with formaldehyde before versus after sprouting. Varieties used: 1920, Early Norther; 1921, Early Rose; 1922, Country Gentleman; 1924, Empire State; 1925, Gold Coin; 1926, Early Rose B.L. 7, Country Gentleman, Irish Cobbler (Fawcett), and British Queen.

Designation	Yield in pounds per acre							
	1920	1921	1922	1924	1925	1926	Average 6 years	Aggregate 6 years
Treated before sprouting.....	22,525	13,434	4,933	22,860	19,604	16,625	16,663	99,981
Treated after sprouting.....	20,825	14,696	4,400	21,330	19,792	14,933	15,996	95,976
Advantage (or disadvantage) of treating before sprouting..	1,700	−1,262	533	1,530	−188	1,692	667	4,005
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Per cent advantage (or disadvantage) of treating before sprouting.....	8·1	−8·6	12·1	7·1	−0·95	11·33	4·17	4·17

FRESH-CUT VERSUS DRIED SETS

For six years the Station has been comparing the yield obtained from fresh-cut sets with the yield from others cut a week in advance and exposed in trays by day to the action of sun and wind, being stirred occasionally to expose all cut surfaces to the air. In this process the sets have usually lost about half their weight. In 1926 the drying was somewhat less than usual, a fresh-cut weight of 25.78 pounds of seed tubers shrinking to 18 pounds. That is to say, they lost only about thirty per cent of their weight in drying. In consequence, perhaps, the showing was less unfavourable than usual to the dried sets, amounting to 7.79 per cent of a loss from drying.

If there were anything in the reiterated theory that preliminary drying of the sets is called for in an arid climate, the season of 1924 should have been one to emphasize it. Instead, the dried sets in that year yielded 44.9 per cent less than the fresh-cut.

The six-year average loss from drying now stands at 21.6 per cent. The use of a styptic, such as land plaster, might have modified this difference by preventing the sets from drying out so much in a given length of time.

COMPARING yields of fresh-cut and sun-dried sets. Varieties used: 1920, Early Norther and American Wonder; 1921, Early Rose, Gold Coin, and Country Gentleman; 1922, Early Rose, Iron Chief, and Green Mountain; 1924, Gold Coin; 1925, Early Ohio; 1926, Early Rose B.L. 5, and Gold Coin.

Designation	Yield in pounds per acre							
	1920 (duplicate)	1921 (quintuplicate)	1922 (quadruplicate)	1924 (quadruplicate)	1925 (Single)	1926 (Duplicate)	Average 6 years	Aggregate 6 years
Fresh-cut sets	20,400	18,304	5,275	28,575	15,681	11,515	16,625	99,750
Sun-dried sets	16,500	15,840	4,175	15,750	15,285	10,617	13,027	78,167
Disadvantage of drying	3,900	2,464	1,100	12,825	396	898	3,598	21,583
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Per cent of difference (computed on a quantitive basis)	19·1	13·4	20·8	44·9	2·5	7·79	21·6	21·6

METHODS OF PLANTING

The commonest types of potato planters in the Peace River country have been the plough and the rough-locked bob-sleigh. Neither is wholly satisfactory. The latter is fast going out of fashion. A usual method is to plough the sets in, perhaps with a fourteen-inch brush breaker. This is liable to place some of them too deep, consequently emergence is irregular, with not a few misses at times. Moreover, the average ploughman does not draw his furrow straighter than the proverbial crow route and then, again, unless the children are exceptionally careful in dropping, some of the sets may wander across the bottom of the furrow, as becomes only too evident later on. This method of planting seldom makes for clean tilth, full stands, or maximum yields, although a skillful worker may plant successfully in this way if careful not to plough too deeply.

Especially in wet seasons the ground is often cold at five or six inches when it is warm enough for germination near the surface. In certain summers ploughed-in potatoes have been observed peeping through the ground when shallow-planted ones beside them were up six inches to a foot in height. A good deal depends upon the season.

With a view to convenience in experimental work the Station hit upon a simple satisfactory method which may be commended to the homesteader who has the use of a scuffler. It is really an adaptation of a standard Old-Country method. The land, after being properly worked up, is marked on three-foot centres with an ordinary sled corn marker. An old front bob of a sleigh may be improvised to make at least two fresh marks per lap.

The side arms are then removed from the scuffler leaving the centre teeth only, one front and one rear, the broader one behind. Both should be long and sharp. A team is hitched on (to permit sighting between the horses) and the scuffler run up and down the marked rows, not too far ahead of the droppers if land and weather be dry. By sighting ahead the teamster may straighten out kinks in the rows.

Pressing hard upon the handles he opens a furrow six or seven inches deep, creating room for root penetration and subsequent tuber development. Some dirt falls back but a V-shaped groove is left, into which the sets may be conveniently dropped. For the experimental work a wheelbarrow with a flanged wheel is run up and down the opened furrows to space the sets, but this, of course, is not called for in ordinary culture.

To cover the sets the side shovels are put on, arranged to throw the earth out, and driven once through each space. With the scuffler properly spread, this nicely covers the tubers, at the same time tearing up the interspace, giving an effectual set-back to grass, rose briars, or other perennials that may have eluded the preparatory cultivation. To insure that no sets remain exposed, walk up and down each half dozen rows with a hoe in hand, drawing in a bit of dirt here and there where the scuffler out-throws may have failed to connect. If there are too many exposures a harrow may be used. One or other means should be employed the evening of the day of planting lest a cold night freeze the exposed sets.

Before the leaves appear a harrow smooths down the scuffler ridges and destroys germinating weed seeds. A second and a third harrowing is often given.

Since practising this method of planting, the Station has seldom had gaps in the rows and secures pretty regular emergence when conditions are not hopelessly unfavourable. The rows are straight, the patch neat, the stands full, and at digging time one is never in doubt which row he is on.

Although the above method has proven very satisfactory, a test was undertaken in 1926 to compare it with the plough method. A one-horse plough, turning about a seven-inch furrow, was used, really making a furrow resembling that opened by the scuffler more than it did an ordinary plough furrow. Even so, the duplicate test yielded 5.67 per cent more from the scuffler than from the plough method.

COMPARING scuffler and plough methods of planting, 1926. Average of a duplicate test. Varieties: Early Rose B.L. 25 and Carman No. 1.

Scuffler method	14,421 pounds per acre
Plough method	13,647 " "
Difference in favour of scuffler method	774 " "
Per cent increase of scuffler over plough method	5·67 per cent

PLANTING IN FURROWS OPENED TO DIFFERENT DEPTHS

For this experiment the medium-shallow furrow is left about three inches deep by a single passage of the scuffler, arranged as described above, while for the deeper planting a double passage leaves the furrows opened to about five inches. The scuffler point actually cuts several inches below this but some loose earth falls back into the trench. In point of fact this experiment may be as much a test of depth of cultivation as of depth of planting. The extra depth of cultivation given the deeply-planted rows may be of advantage by opening the sub-surface soil to root penetration and by creating a more yielding tuber bed. This might in some seasons more than compensate for the lower position at which the sets are placed. At all events it has been noticed that during the past three seasons there has been a regular advantage in favour of the more deeply planted rows and on the average of six annual trials the shallow-planted ones have yielded about one per cent less than those planted in the deep-cut furrows.

COMPARING results of deep versus shallow planting. Varieties used: 1920, Early Norther; 1921, Early Norther; 1922, Green Mountain, Houlton Rose, and Iron Chief; 1923, Early Hebron; 1924, Early Hebron, Carman No. 1; 1925, Bovee and Gold Nugget; 1926, Early Rose B. L. 25, and Carman No. 1.

Designation	1920 results from an equal number hills	Yield in pounds per acre							
		1921	1922	1923	1924	1925	1926	Average 6 years	Aggregate 6 years
Shallow planting	310	17,811	4,666	14,772	23,528	11,563	14,797	14,522	87,137
Deep planting	270	15,312	4,283	14,202	25,206	13,345	15,779	14,687	88,127
Advantage or disadvantage of shallow over deep	40	2,499	383	570	−1,678	−1,782	−982	−165	−990
Per cent. advantage (or disadvantage) computed on a quantitive basis	14·8	16·3	8·9	4·0	−6·6	−13·3	−6·2	−1·12	−1·12

HILLING OR LEVEL CULTURE

Although moderate hilling is practised because it is thought rather to reduce sunburn, to protect from frost at digging time, and perhaps to improve table quality, a test has been run to determine the effect upon yield. The series was interrupted in 1920 and 1923 but five years' consistent results are available, all agreeing that under the conditions of these tests, and especially in dry seasons, hilling slightly reduces the yield. The actual reduction in production is somewhat greater than appears in the tables, since all frosted tubers are rejected at harvest and the percentage of these is frequently greater in the level than in the hilled rows. The loss by freezing prior to digging was greater than usual in 1926 and the season, too, was wet, hence the recorded yields of the hilled and level were exactly equal.

The average of six years reveals a reduction of 3.6 per cent in yield of sound tubers as a result of hilling. In spite of these adverse yield figures the Station practises moderate hilling, throwing up low, wide, flat-topped molds, which waste less moisture than sharp ridges and do not so much expose the tubers at the shoulders of the crowns.

COMPARING EFFECT ON YIELD OF HILLING VERSUS LEVEL CULTURE

Varieties used: 1919, Country Gentleman and Early Rose; 1921, Early Rose; 1922, Gold Coin and Wee Macgregor; 1924, Houlton Rose, Wee Macgregor and Irish Cobbler (McGregor); 1925, Carman No. 1, Early Rose, Irish Cobbler (Scales), and Wee Macgregor; 1926, Early Rose B. L. 25, and Carman No. 1.

Designation	Yield in pounds per acre							
	1919 (Dup.)	1921 (Single)	1922 (Trip.)	1924 (Sextup.)	1925 (Quad.)	1926 (Dup.)	Average 6 years	Aggregate 6 years
Level culture	21,746	13,596	5,516	21,210	13,647	14,818	15,088	90,533
Hilled	20,265	12,584	5,200	20,970	13,416	14,818	14,542	87,253
Loss in yield by hilling	1,481	1,012	316	240	231	0	546	3,280
Per cent. loss (on quantitive basis)	6·8	7·4	5·7	1·1	1·7	0	3·6	3·6

WIREWORM AND SCAB

On a small knoll, bare-fallowed for two years to exterminate a small patch of stink-weed, were planted three parallel rows of potatoes to compare fungicides in wire-worm control. It was anticipated that wireworms would be troublesome on this particular area. One row was planted with sets cut from

potatoes treated with formaldehyde, one with sets from potatoes treated with corrosive sublimate, and a third row with untreated potatoes. No evidence of wireworms was found at digging but, strange to say, every row was desperately scabby, the rows planted with treated seed being as bad as the check. According to the field notes every potato in these three rows was scabby. This bears out the theory that the scab spores are native to the soil, for potatoes had never been grown on this land previously, nor could it have received wash from land that ever had grown potatoes. For some years past it has been remarked at Beaverlodge that scab has occurred chiefly on the knolls, although elevation is not the only factor in the case either, for some areas will be bad with scab while others where it might as naturally be expected seem free of the trouble.

EFFECT OF SOIL UPON QUALITY OF POTATOES

An interesting test was undertaken to compare the effect of soil of varying character upon the table quality of potatoes. Unfortunately these potatoes were frosted ere they could be analyzed or sampled.

HILL SELECTION

For several years strain tests have been conducted consecutively with the produce of fifty-one original hill selections of potatoes, comprising thirty-two lots of Early Rose, eight of Early Norther, five of a supposed strain of Irish Cobbler, four of American Wonder, and two of Wee Macgregor.

Along with the desire to obtain productive shapely strains of high-yield and quality there has been a specific object in view. It is desired to learn to what extent the red discoloration of flesh, to which certain red varieties are notoriously subject, may be hereditary and to what extent due to ecological conditions. Furthermore, it is desired, if possible, to isolate strains of these which may be free from the tendency of red flesh, and otherwise desirable. Cooking trials are systematically made and estimations tabulated on a percentage basis. Annual yields and field notes are likewise recorded.

In the earlier cooking trials it was disappointing to find that a number of the Early Rose selections, which seemed freest from discoloration of flesh, were below par in texture, flavour, or yield. The work was continued, however, and it is gratifying to find, thus far, a certain few strains of Early Rose running consistently free from discoloration, besides rating well in other respects except for being rather low yielders, but quality and earliness are preferable to yield without quality.

It must be admitted that the stock of Early Rose from which the original hill selections had been made was of local propagation and of unknown source, so that its purity cannot be guaranteed, although field appearances of the commercial crop from year to year had indicated a fairly homogeneous character.

Variation was found among the stocks grown from hill selections of Early Norther obtained in 1918 from the Lacombe Experimental Station, though the selections of this variety and of American Wonder are being discarded because of the inferior table quality of these varieties in too many seasons.

The strain tests have not yet been conducted in duplicate and considerable seasonal variation in yields is to be expected.

The general results of the strain testing have been such as to offer encouragement of tangible outcome from such effort. Hill selection of seed tubers at digging time is advised, the ideals being vigour, yield, uniformity, freedom from disease, table quality, and smoothness, consistent with the variety type.

FIELD HUSBANDRY

HARROWING NEW-SEEDED MEADOW CROPS

In certain instances in previous years benefit had seemed to be derived from harrowing or even cultivating new seedings of meadow crops in the spring following the year of sowing. The object was to destroy germinating weeds without unduly disturbing the meadow plants. With timothy and Kentucky blue it had apparently worked fairly well, though no definite experiments had been made to determine the effects precisely. The season of 1926 afforded an opportunity to try the plan severely with a number of crops.

In the Pasturing Test nine meadow crops and mixtures thereof had been seeded in 1925, and on April 30, 1926, half of each plot was lightly spring-toothed, this operation being followed by harrowings on the tenth and twenty-fifth of May. The roots of sweet clover and alfalfa seemed to slip around the cultivator teeth fairly well and to be little affected by the harrow. The grasses, however, partly because of being thin and weak from grasshopper attack in their initial year, did not resist the cultivator teeth so well, and of the Western rye grass a good deal was torn out. All the crops were somewhat set back by the spring-toothing, but recovered in part and the cultivated portions had the fewer weeds at haying.

After haying, however, a considerable number of weeds appeared, being most abundant on the areas where the meadow plants were thinnest. Wherever the cultivation had impaired the stands its ultimate effect was to increase the number of intruders. Elsewhere its temporary effect and probably its final effect as well was to reduce them. It also tended to lessen the yields of hay, more with the grasses than with the legumes. On the average of the nine crops and crop mixtures cultivation lowered the first cut of hay by about fifteen per cent. It is probable that the early spring-toothing was too severe a form of tillage for weak, thin stands of grass.

Through a half-acre of Arctic sweet clover sown in rows for seed production on a compact clay knoll, strips were spring-toothed rather deeply with the teeth straddling the rows, no points having been removed. Other strips were cultivated and then subsequently harrowed. Here, as elsewhere, cultivation seemed to retard the growth, probably as a result of root-pruning. But the cultivated areas required less handweeding, and there was no conspicuous difference in the height of the crop as casually observed at harvest.

In a certain forage-crop test seven grasses and five legumious meadow crops had been sown for seed production. Three of the latter failed outright and the grasses were so badly checked by locusts in the year of seeding that on October 19 few of them were more than an inch tall, although sweet clover and alfalfa, seeded at the same time as they, had attained an average height of ten and a half inches.

On April 30, 1926, one-third of each area was spring-toothed, and on May 7 it was harrowed, another third being harrowed without having been spring-toothed.

When the spring-toothing was being done it looked as though about 15 per cent of the sweet clover and alfalfa and about 30 per cent of the grasses were being torn out.

When the plots were being weeded in August it was noticed that the spring-toothing had proven very severe upon several of the grasses, notably Western rye, red top, orchard grass, and, strange to say, brome. Kentucky blue, meadow fescue, and timothy seemed to have endured it best, in about the order of mention. Even the area that had been merely harrowed was affected somewhat in the case of most of the grasses.

As a whole, decidedly the best crops and best stands were found on the uncultivated portions, notwithstanding that rather the poorest stands had originally occurred there. Allowance must be made for the extremely scant growth with which the grasses had gone into the winter. The alfalfa and sweet clover sustained comparatively little set-back from the tillage.

Nevertheless, it was remarked in this as in the other trials that while cultivation of the new seedings destroyed many seedling weeds the final effect on this score was unfavourable in so far as it mutilated the stand of the crop, thereby creating openings in which the weeds could later germinate and establish themselves.

FIG. 5.—Cutting Arctic sweet clover for seed. Average height 5½ to 6 feet. Some stalks eight feet tall. Stubble a foot long.

DATES OF PLANTING CORN AND SUNFLOWERS

Ottawa 76 sunflowers and Quebec 28 corn were used for a date-of-planting experiment. The dry-matter production of the sunflowers tended to fall as the planting was deferred, but in the case of corn there was no regular trend. The third- and fourth-date plantings of corn were re-seeded in June.

DATE OF PLANTING CORN, 1926. VARIETY, QUEBEC 28

Presenting yields of green weight and of absolute dry matter in pounds per acre

Sequence	Date of seeding	Date of emergence	Per cent stand	Per cent dry matter	Green weight per acre	Absolute dry matter per acre
					lb.	lb.
First date	May 11	June 10	51·0	14·82	9,020	1,337
Second date	May 18	June 2	47·5	15·61	8,536	1,333
Third date	May 25	.....	40·5	14·15	8,140	1,152
Fourth date*	June 1	.....	56·0	16·10	9,724	1,566

*All re-seeded in June. Patchy.

DATE OF PLANTING SUNFLOWERS, 1926

Presenting yields of green weight and of absolute dry matter in pounds per acre. Variety—Ottawa 76

Sequence	Date of seeding	Date of emergence	Per cent stand	Height	Per cent dry matter	Absolute dry matter per acre	Green weight per acre
				in.		lb.	lb.
First date.....	May 11	May 30	55·0	61	18·55	4,687	25,256
Second date...	May 18	June 3	53·5	59	20·65	4,444	21,516
Third date....	May 25	June 11	42·5	59·5	19·45	3,793	19,492
Fourth date*..	June 1	.....	80·0	58·5	20·92	3,848	18,392

*Patchy. Fourth date just commencing to bloom.

CATCH CROPS TO HOLD SNOW

In the autumn of 1925 five rows of sunflowers were beheaded and left standing near the buildings with the object of accumulating drifts of snow there rather than allowing it to pile in closer. It was also desired to furnish snow-protection for certain nursery stock immediately east of the sunflowers. As expected, a snow bank built up here in early winter and remained until March in spite of the fact that the winter was one of only light precipitation. In December the ground underneath the bank was unfrozen and receptive to such moisture as melted from the snow lying upon it. Unless the sunflowers are beheaded they are liable to fall and thus fail largely of their purpose.

A more extensive trial of the idea is in progress.

FIG. 6.—Showing effect of fall-beheaded sunflowers in catching and holding snow. Photograph taken in early March, 1926. East of these sunflowers the snow accumulated in early winter and remained steadily, the ground underneath the snow banks being unfrozen and receptive to moisture in midwinter.

CROSS-DRILLING WINTER RYE ON SPRING GRAIN

In May, 1925, a field was drilled to Banner oats and about a month later winter rye at five pecks per acre was cross-drilled shallowly, with single-disk drills having the chains removed, the oats being then well up. The rye germinated satisfactorily but was attacked by grass-hoppers and, what with the very dry period of midsummer weather that ensued, the rye bade fair to have given up the ghost. Stock grazed the stubble in fall and early winter, cropping closely the occasional tufts of rye that greened up after the rains commenced; so that the hardy winter-annual had about as hard a rub as could well be devised. In spite of all this tribulation a surprising percentage of it wintered through. On April 30 it was lightly spring-toothed crosswise of the stubble and the next day four or five pecks of oats per acre were drilled in with the single-disk drill set rather deeply. Both oats and rye grew well, making what in an ordinary season would be counted a heavy crop, running possibly 75 bushels (34 pounds) per acre. Samples from the middle of the bin showed thirty per cent of rye by weight. That there was any rye at all after the ordeal to which the crop had been subjected in 1925 was remarkable, and goes to commend this method of seeding under ordinarily favourable conditions. In view of some unfavourable experience reported by other stations it is worth while emphasizing again that the rye should *not* be sown at the same time as the spring grain, but *about a month later.*

YIELDS ON SPRING PLOUGHING VERSUS BREAKING

A piece of well worked breaking of 1925 was drilled to Garnet wheat on April 24 and the seeding extended across a strip of spring-ploughed oat stubble. A week later a remnant of the spring ploughing was drilled to a second sowing of wheat. Thanks to an exceptionally propitious season, there was comparatively little difference between the growth on the breaking as against the ploughed stubble. Small areas pulled at harvest from representative portions threshed at the rate of 47 bushels 40 pounds from the breaking; 44 bushels from the first sowing on the spring ploughing; and 36 bushels 40 pounds from the second sowing. Replication might have altered these comparisons somewhat but they are interesting as showing the wonderful growth produced by spring ploughing on unfertilized land in a good season. The yields are in no sense exaggerations. Indeed, owing to shattering from over-ripeness, they fail to represent the full production.

A similar test was run with oats, with a like general result; but mice attacking the stored samples defeated the purpose of yield-taking.

SOIL TEMPERATURES SUMMER AND WINTER

Notwithstanding the abundant precipitation that prevailed during the summer the maximum temperatures recorded by a Friez soil and water thermograph with bulb three inches beneath the surface of summer-fallowed ground, ranged distinctly higher than during the preceding season. On 216 days the soil temperature was above freezing; on 168 it was above 40 degrees Fah.; on 70 days it rose above 60 degrees Fah.; and on 6 days it exceeded 75 degrees. The highest of the summer was 79 degrees, touched on July 5 at 5 p.m., near the conclusion of the one marked heat wave. For three days previous the maximum air temperature had exceeded 80 degrees. On the fourth it was 89 degrees and on the fifth 85 degrees.

Indirect evidence of the value of snow protection was furnished by the fact that on December 23 when the atmospheric instruments recorded a minimum of only 13 degrees below zero, following 20° below the previous night, the soil thermograph dropped to 9.5, which is lower than it went in any other month except February, 1923, when it hung at its lowest recordable level of 5 degrees during a period of cold weather with the ground bare. It was practically bare above the thermograph bulb during the latter part of December, 1926 and the graph during this time showed a succession of diurnal waves, in contrast to the almost straight line inscribed when the earth is well blanketed with snow.

SOIL THERMOGRAPH DATA, BEAVERLODGE, 1926

TABLE showing number of days in each month of 1926 that the soil temperature, as registered by a Friez thermograph, with bulb three inches beneath the ground surface of summer-fallowed ground, rose at any time above the respective degrees specified.

Month	Days above 32 degrees Fah.	Days above 40 degrees Fah.	Days above 45 degrees Fah.	Days above 50 degrees Fah.	Days above 55 degrees Fah.	Days above 60 degrees Fah.	Days above 65 degrees Fah.	Days above 70 degrees Fah.	Days above 75 degrees Fah.
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	13	0	0	0	0	0	0	0	0
April	21	16	7	4	0	0	0	0	0
May	31	31	30	21	10	3	0	0	0
June	30	28	27	23	21	9	3	0	0
July	31	31	31	31	30	29	26	13	6
August	31	31	31	31	29	26	18	3	0
September	28	23	14	12	7	3	1	0	0
October	24	8	4	0	0	0	0	0	0
November	7	0	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0	0	0
Total	216	168	144	122	97	70	48	16	6

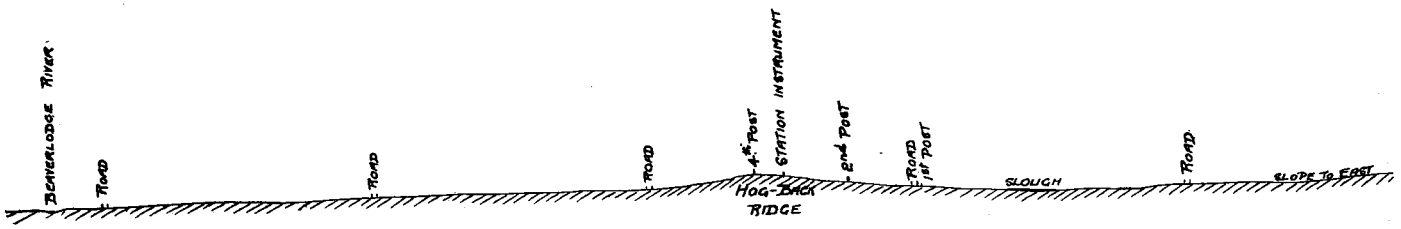
INFLUENCE OF TOPOGRAPHY UPON TEMPERATURE

The study of minimum temperature occurrence as affected by local contour was continued along the lines outlined in our 1925 report (pages 59-65) and in July was expanded by the placing of two additional self-registering minimum thermometers.

The situation is peculiarly suitable for such a study. The substation lies on the Eastern slope of a hog's back ridge dividing two valleys which converge about a mile to the south, the ridge tapering pretty steadily toward that point.

East of the farm is a slough, which, with its adjoining willow flat beyond, is nearly a mile wide. East of the willow flat is another long regular ascent of fully a mile and a half. Northeast of the slough is Saskatoon Mountain, the central and dominant topographical feature of the Grande Prairie District. It is a wooded hill with an elevation of five or six hundred feet above the surrounding region, and on its top some very interesting meteorological records have been kept. In one year potato tops remained unscathed by frost there a month after they were killed on the Experimental Station.

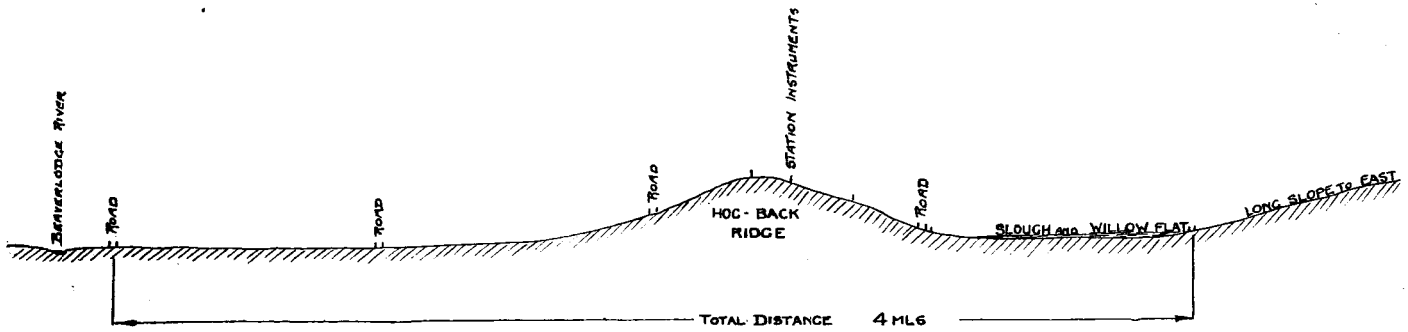
A township road allowance, maintained as a Provincial Highway, crosses the slough and traverses the ridge on which the Station is situated. The meteorological instruments are all adjacent to this east-and-west highway. Those at the slough are almost at the foot of the slope yet happen to be near the edge of about the lowest point of the slough. Thence to the building site is an all but perfectly regular half-mile grade, with a rise of 107.4′ (previously recorded as 109′) and from there to the apex of the ridge is a further climb of 26.6′ in slightly over 44 rods. Northward from the highway the ridge swells upward and widens



— CROSS SECTION - EAST TO WEST - SHEWING GENERAL FORMATION —

— DIAGRAM DRAWN TO SCALE —

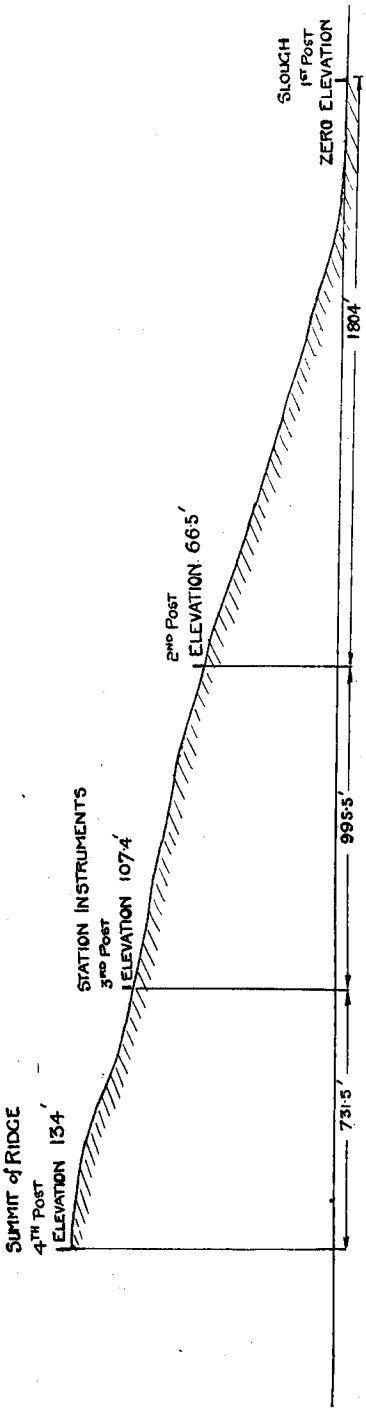
FIG. 7



— CROSS SECTION - EAST AND WEST - SHOWING GENERAL CHARACTERISTICS —
of
— ELEVATION AND SURROUNDING COUNTRY —

— DIAGRAM NOT DRAWN TO SCALE —

FIG. 8



— CROSS SECTION of SLOPE - EAST and WEST - 4 POSTS UNDER OBSERVATION —

— DIAGRAM NOT DRAWN TO SCALE —

FIG. 9

slightly, but the instruments have been purposely placed along the road. The only exception is the position of the post where the official records are kept. This is about 15 rods back from the highway on a lawn near the buildings. For purposes of charting, its position is taken as though it were placed on an equivalent altitude at a point along the highway.

From the slough to the highest point of the ridge crossed by the road the distance is 214 rods and the rise 134 feet which is at the rate of about 200 feet to the mile. The altitude of the highest post is slighly more than 2,500 feet above sea level. The official records are taken at a point practically on a level with a Topographical Survey post recorded as 2,481 feet.

The ordinary meteorological instruments are kept in the regulation latticed cage on the lawn. Outside the cage is another self-registering minimum theremometer at the same level but unprotected. At the ground level is a third, also uncaged. Three corresponding instruments were placed at the slough, where a cage was erected in 1925 to protect a soil thermograph. The six self-registering minimum thermometers have been read daily since September 6, 1925, with certain exceptions when wind or snow was found to have marred comparisons. All the days on which any such irregularities occurred have been excluded from the records of averages in order to avoid complications. During the whole of January, 1926, the ground-level instruments were so often covered with snow that they were not read at all, hence the January column in the table of averages is entirely blank. In another table comparing the extreme variations, all available records are drawn upon. This second table is really of the greater practical significance, since one killing frost is enough to destroy a wheat crop. It is the crucial rather than the average temperature that counts for most.

PROBABLE ERROR IN INSTRUMENTS

The instruments used for this study were a Negretti and Zambra minimum —65 to 110 supplied by the Meteorological Service; an Ontario Hughes-Owens N. P. L. self-registering minimum —80 to 115 and six Taylor, Rochister, self-registering minimum thermometers.

All were carefully checked before being installed and for the first few months were occasionally interchanged. Thereafter, until the end of 1926, they were assumed to be correct. After a time, however, the unscreened (Ontario Hughes-Owens) instrument at the farm was observed to act somewhat erratically and a check of it at the beginning of March, 1927, showed it half a degree low. A further precautionary check near the end of April was made by subjecting all the instruments to a uniform temperature for two days. The official minimum (Negretti and Zambra) tallied precisely with the official maximum (Casella, London No. 6199) but the Ontario Hughes-Owens read 1.9 degrees *below* these on the averages of six comparisons. The Taylor instrument from the highest elevation (Post 4) read from half to a full degree *higher* than the official thermometers. The remaining Taylors seemed correct to within an unimportant decimal. All these April tests were made at temperatures above freezing. Whether the same or any noticeable errors would have been shown by trials at lower temperatures is not known.

The determined errors of the two instruments account almost fully for certain inconsistencies which had been remarked when the data was being tabulated. It would seem probable that the unscreened instrument at the farm (Post 3) has been reading one or two degrees too low and the one on the hill (Post 4) perhaps half a degree too high.

Whilst these errors are disappointing they are not sufficient to invalidate the more important deductions drawn, since said deductions are supported directly and indirectly by many items of evidence, and agree with personal sensations and observations extending over a considerable period of time.

Certain important facts evolve. Between the two caged instruments half a mile apart a spread of 21 degrees was found to have occurred one night in February, and the average difference over the 317 days for which complete records are available was 5.33 degrees. Somewhat lesser but still very marked difference was found by comparing the readings of the uncaged instruments at the two points and also by comparing the ground-level readings.

As much as (7) seven degrees difference in reading was once found at both farm and slough between the exposed and unexposed instruments at the 3½-foot level, the exposed being the lower. There is a possibility of this having been exaggerated by jarring of the instruments, though they were supposed to be strapped securely. Surprising spreads have often been observed. At the farm the average difference for 317 days was 2.04 degrees.

Quite as significant as any of the above is the fact that the ground-level instruments have recorded as much as 8 and 10 degrees below the uncaged ones 3½ feet off the ground. The average difference in reading was 1.79 degrees in the case of the Farm instruments and 0.8 degrees in the case of those at the slough.

On July 1, the two additional instruments were installed. One was placed at what is now designated as the 2nd post, which is 1,804 feet from the slough post and 66.5 feet above it. This figure represents over 61 per cent of the rise from the slough to the farm instruments. The fourth post, placed at the summit of the ridge, is 26.6 feet higher than the farm instruments and 731.5 feet in distance from that point on the highway which would level up with the spot where the regular official records are taken. A separate table presents the six months data available from the instruments read at all four points. Comparing the mean average readings we see that as between the first and second posts, a rise of 66.5 feet in altitude was accompanied by a rise of 4.15 degrees in average minimum temperature. As between the second and third a rise of 40.9 feet effected a further moderation of only .95 degrees while from the farm to the top of the hill the final rise of 26.6 feet was accompanied by a rise of 2.10 degrees.

To put it another way:

From 1st to 2nd post—an average ascent of 10 feet raised the temperature .62 degrees.

From 1st to 3rd post—an average ascent of 10 feet raised the temperature .47 degrees.

From 1st to 4th post—an average ascent of 10 feet raised the temperature .54 degrees.

It appears from this comparison that the one post whose readings are most out of alignment with the general trend is the third. It might have been expected that the shelter of the buildings and radiation of heat therefrom would have tended to raise its readings above what they would be on a more exposed site at the same level, but it would seem as though the reverse had been the case. However, these readings must be carefully checked ere deductions are drawn as to the hypothetical effect of such shelter. The errors noted in a previous paragraph would go far to explain these inconsistencies.

PRACTICAL DEDUCTIONS

In the meantime one or two significant observations may be registered in addition to those adduced in 1925. It has been particularly noted that when a winter cold-snap was setting in, little or no difference could be found between the readings on low and high land. In fact they would all read practically alike. By the second or third day, however, an increasing spread would be manifest.

It has again been noticed that during murky weather or during the progress of a rain or snow storm little or no spread would be found between the readings of any two elevations. Such conditions evidently tended to prevent the phenomenon called by meteorologists "inversion of temperature." This term denotes a condition which frequently obtains at night, whereby, within a distance of several hundred feet above the ground surface, the colder air is found next the ground and the warmer air near the ceiling of the Zone. It is supposed to be most pronounced when the sky is clear, the air calm and dry. The Beaverlodge observations generally accord with this hypothesis, although puzzling exceptions have occasionally been noted.

Taking *particular days,* the widest spreads have occurred in the coldest weather, yet in spite of this fact a comparison of monthly averages for 1926 does *not* reveal a greater *ruling* spread during one season than another. During the year, May showed the greatest average variation (7.25 deg.) with December second (7.06 deg.).

Other observations have been made but require verification ere being published. The whole problem is complex and resembles the reading of human character by physiognomy in that any one feature must be considered in its bearing upon the tout ensemble.

These comparisons made are of first-rate importance, emphasizing the principles enunciated in the 1925 review. When we find as much as 14 degrees disparity between the June night temperatures of two points half a mile apart and 107.4 feet different in elevation; as much as eleven degrees difference on a July night; as much as twelve degrees in August and thirteen degrees in September, it leaves little doubt in any settler's mind as to where he should grow wheat, flax, potatoes, and gardens. Worked in conjunction with upland, the low land may be as profitable as the other, providing it is devoted to the production of green feed and hay. It is another matter when one has none but low land, for then he is gravely handicapped in growing seed grain and cash crops. The data does not discount the low land, but rather indicates the lines of its most advantageous use.

Because of rolling contour the Peace River region is capable of more varied and profitable production than if it were a dead-level plain, but the safer lands should be chosen for the more tender crops. These safer lands are the areas protected by air drainage and those protected by bodies of open water.

Air drainage is liable to be best on the elevated slopes, where the missionaries and early settlers learned to do their first breaking. If one can find such a slope protected by an adjacent lake or river he is doubly secure.

Other things being equal, the brow of a slope is probably a little safer than the flat top of a hill, judging from the way the fog clears on a frosty morning, but there are freakish plays of frost that result in marked variations in its incidence.

While a slope is usually much safer than level land there are conspicuous exceptions. The Waterhole district northeast of Dunvegan has long been rated exceptionally safe for wheat, although nearly level. But at Waterhole is a deep coulee leading to the Peace and doubtless sucking down the cold air that would otherwise accumulate in a disastrous layer at the ground level of the plain on a frosty night.

52433—6½

TABLE comparing extreme variations in temperature taken at two points one at the farm and one at the slough, 107·4 ft. lower and half a mile distant. Readings in each case at 3½-ft. level, screened, 3½-ft. level exposed, and ground level exposed.

——	Jan.	*Feb.	†Mar.	April	May	June	July	Aug.	Sept.	Oct.	‡Nov.	**Dec.	Average 317 days
Official minimum	18·67	15·46	27·67	29·90	36·67	41·86	47·77	43·09	32·00	28·45	14·16	6·22	.....
Degree spread between screened instrument; farm and slough	.....	4·73	2·86	4·13	7·25	4·86	5·74	5·87	5·00	5·51	5·28	7·06	5·33
Degree spread between exposed instruments, 3½ ft. level; farm and slough	.....	5·20	2·73	4·13	6·83	4·60	5·00	5·19	3·80	5·58	4·78	6·70	4·95
Degree spread between exposed ground level instruments; farm and slough	.....	5·33	2·36	2·43	4·74	3·26	4·22	4·74	2·93	4·29	4·35	5·50	3·95
Degree spread between screened and exposed instruments, at 3½ ft. level; farm	.....	0·33	1·66	1·23	1·93	1·06	2·6	2·93	3·50	1·93	2·07	2·36	2·04
Degree spread between screened and exposed instruments at 3½ ft. level; slough	.....	0·80	1·53	1·23	1·51	0·66	1·87	2·25	2·30	2·06	1·57	1·93	1·65
Degree spread between exposed instruments at 3½ ft. and ground level at farm	.....	1·80	1·76	2·93	3·45	2·40	1·09	0·77	1·16	1·96	0·71	1·66	1·79
Degree spread between exposed instruments at 3½ ft. and ground levels at slough	.....	2·06	1·40	1·23	1·35	1·06	0·32	0·32	0·30	0·61	0·28	0·53	0·80

*Average 15 days only. †Average 30 days only. ‡Average 28 days only. **Average 30 days only.

Note of Correction.—Calibration of all the instruments late in April, 1927, when the temperature was fairly high, indicated that the unscreened farm thermometer then averaged 1·9 degrees Fah. *below* the readings of the official thermometers placed in a cotton cage beside it. The instrument from the top of the hill (Post-4) seemed to be running about half a degree too *high*. The other instruments tallied rather closely with the two meteorological instruments, which agreed with each other.

TABLE comparing extreme variations in temperature taken at two points, one at the farm and one at a slough 107·4 ft. lower and half a mile distant. Readings in each case at 3½ ft. level, screened, 3½ ft. level exposed, and ground level exposed. All figures indicate spreads in degrees Fahrenheit.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	12 months
Official minimum	18·67	15·46	27·67	29·90	36·67	41·86	47·77	43·09	32·00	28·45	14·76	6·22	.....
Greatest spread between screened instruments; farm and slough	16	21	10	11	13	14	11	12	13	13	15	19	21
Greatest spread between exposed instruments and 3½ ft. level; farm and slough	13	18	10	10	14	12	10	12	10	10	16	16	18
Greatest spread between ground level instruments; farm and slough	.....	*16	6	5	13	9	8	9	8	10	13	14	16
Greatest spread between screened and exposed instruments and 3½ ft. level; farm	3	3	7	5	4	4	4	5	7	6	5	5	7
Greatest spread between exposed instruments at 3½ ft. level; slough	4	4	4	5	7	2	4	5	5	5	4	5	7
Greatest spread between exposed instruments at 3½ ft. ground level at farm	.....	*6	4	6	7	4	5	5	4	6	4	8	8
Greatest spread between exposed instruments at 3½ ft. and ground level at slough	.....	*6	4	5	5	4	2	2	2	2	2	10	10

*Covering a period of 19 days only, Feb. 10th to 28th.

Note of Correction.—Calibration of all the instruments late in April, 1927, when the temperature was fairly high, indicated that the unscreened farm thermometer then averaged 1·9 degrees Fah. *below* the readings of the official thermometers placed in a cotton cage beside it. The instrument from the top of the hill (Post-4) seemed to be running about half a degree too *high*. The other instruments tallied rather closely with the two meteorological instruments, which agreed with each other.

TABLE showing variation in temperature at different altitudes. Four points are considered—the lowest being situated on the edge of a slough, the highest 134 ft. higher, on the top of a hog's back ridge. Slope is to the east (see diagram).

Month	Average of daily minimum at lowest point	Least difference in deg. Fah. between lowest and 2nd point	Maximum difference in deg. Fah. between lowest and 2nd point	Average difference in deg. Fah. between lowest and 2nd point	Least difference in deg. Fah. between lowest and 3rd point Farm	Maximum difference in deg. Fah. between lowest and 3rd point Farm	Average difference in deg. Fah. between lowest and 3rd point	Least difference in deg. Fah. between lowest and 4th point	Maximum difference in deg. Fah. between lowest and highest (4th) pt.	Average difference in deg. Fah. between lowest and highest (4th) point
July	40·16	0	7	3·93	0	10	5·0	0	13	7·06
Aug.	34·97	−1	11	4·51	−1	12	4·87	0	14	7·45
Sept.	24·70	−2	11	3·63	−2	10	3·80	0	15	6·33
Oct.	20·87	0	10	4·58	−2	11	5·64	0	14	7·64
Nov.	7·16	0	10	4·0	−2	16	4·66	0	18	6·63
Dec.	−3·73	−2	15	4·23	−2	16	6·63	−1	21	8·10
Average	20·87	.....	.....	4·15	.....	.....	5·10	.....	.....	7·20
Averages due to successive rises in elevation				4·15			0·95			2·10
Successive rises in altitude				66·5 ft.			40·9 ft.			26·6

Note of Correction

Calibration of all the instruments late in April, 1927, when the temperature was fairly high, indicated that the unscreened farm thermometer then averaged 1·9 degrees Fah. *below* the readings of the official thermometers placed in a cotton cage beside it. The instrument from the top of the hill (Post-4) seemed to be running about half a degree too *high*. The other instruments tallied rather closely with the two meteorological instruments, which agreed with each other.

METEOROLOGICAL RECORDS AT BEAVERLODGE, 1926

Month	Temperature, degrees Fah.						Precipitation, inches					Evaporation		Sunshine		Sleighing	
	Maximum		Minimum		Mean		Rain	Snow		Total precipitation		Inches		Hours		Days	
	Highest	Mean, maximum	Lowest	Mean, minimum	1926	Average 11 years	1926	1926	Average 11 years	1926	Average 11 years	1926	Average 5 years	1926	Average 4 years	1926	Average 11 years
January	48	35·51	−8	18·67	27·09	7·18	.....	5·0	13·99	0·50	1·42	.....	.....	77·5	75·9	31	31·0
February	50	31·25	−7	15·46	23·35	13·09	0·05	4·0	7·49	0·45	0·80	.....	.....	73·7	97·5	28	28·0
March	56	44·80	18	27·67	36·23	20·70	0·03	2·5	13·42	0·28	1·38	.....	.....	162·9	138·7	4	27·4
April	76	55·80	7	29·90	42·85	37·55	0·66	.....	1·43	0·66	0·45	1·41 from 17th	0·50	226·5	228·4	.....	9·0
May	80	61·51	28	36·67	49·09	48·82	1·06	.....	1·81	1·06	1·42	3·07	3·67	276·3	291·4	.....	0·5
June	82	63·83	32	41·86	52·84	54·89	2·18	22·7	2·06	4·45	1·76	3·45	4·19	264·7	275·8	.....	.....
July	89	74·12	39	47·77	60·94	59·64	2·06	.....	.....	2·06	2·18	5·06	4·59	321·1	282·0	.....	.....
August	77	67·77	35	43·09	55·43	56·94	0·69	.....	.....	0·69	1·87	3·09	3·31	242·2	222·2	.....	.....
September	77	53·30	14	32·00	42·65	48·41	1·08	7·6	1·72	1·84	1·35	1·69	2·05	144·2	171·0	.....	.....
October	64	49·74	13	28·45	39·09	38·34	0·18	5·0	5·47	0·68	1·17	0·43 to Oct. 9	0·84	124·8	141·3	.....	1·8
November	65	28·96	−13	14·76	21·86	24·90	0·19	13·0	7·94	1·49	0·96	.....	.....	65·8	88·9	12	6·5
December	47	22·12	−20	6·22	14·17	10·98	0·72	4·5	12·79	1·17	1·35	.....	.....	77·3	66·4	31	26·6
Average, 1926	.....	49·05	.....	28·54	38·79	35·03											
Total, 1926	.....	.....	.....	.....	.....	.....	8·90	64·3	.....	15·33	.....	16·20	.....	2,057·0	.....	106	.....
Average Yearly Total	.....	.....	.....	.....	.....	.....	.....	.....	68·12	.....	16·11	.....	*19·15	.....	†2,079·5	.....	130·8

* Five-year average. † Four-year average.

TABLE presenting Comparable Meteorological Data obtained for the year 1926 from Beaverlodge, Fort St. John, B.C. (J.W. Abott) and Berwyn, Alta. (John M. Lamont)

Month	Highest temperature		Average maximum		Lowest temperature		Average minimum		Rainfall, in inches			Snowfall, in inches			Total precipitation		
	Beaverlodge	Berwyn	Beaverlodge	Berwyn	Beaverlodge	Berwyn	Beaverlodge	Berwyn	Beaverlodge	Berwyn	Fort St. John	Beaverlodge	Berwyn	Fort St. John	Beaverlodge	Berwyn	Fort St. John
January	48	43	35·51	29	−8	−20	18·67	1	.....	.....	.....	5·0	3·5	3·5	0·55	0·35	0·35
February	50	46	31·25	25	−7	−16	15·46	5	0·05	.....	.....	4·0	7·0	8·0	0·45	0·70	0·80
March	56	59	44·80	43	18	5	27·67	22	0·03	.....	.....	2·5	.....	.....	0·28	.....	.....
April	76	79	55·80	56	7	7	29·90	26	0·66	0·18	1·16	.....	.....	.....	0·66	0·18	1·16
May	80	84	61·51	62	28	27	36·67	36	1·06	1·90	1·78	.....	.....	.....	1·06	1·90	1·78
June	82	87	63·83	64	32	32	41·86	40	2·18	2·55	1·85	22·7	.....	.....	4·45	2·55	1·85
July	89	93	74·12	79	39	37	47·77	47	2·06	1·09	2·17	.....	.....	.....	2·06	1·09	2·17
August	77	82	67·77	70	35	35	43·09	43	0·69	2·35	0·36	.....	.....	.....	0·69	2·35	0·36
September	77	74	53·3	58	14	14	32·0	36	1·08	0·77	0·98	7·6	2·25	4·5	1·84	0·99	1·43
October	65	70	49·74	48	13	14	28·45	26	0·18	0·42	0·04	5·0	10·25	5·0	0·68	1·44	0·54
November	65	58	28·96	27	−13	−13	14·76	10	0·19	.....	.....	13·0	2·0	13·0	1·49	0·20	1·30
December	47	45	22·12	18	−20	−31	6·22	−3	0·72	.....	1·64	4·5	5·0	1·5	1·17	0·50	1·79
Total	.....	.....	.....	.....	.....	.....	.....	.....	8·90	9·26	9·98	64·3	30·0	35·5	15·33	12·25	13·53
Average	.....	.....	49·05	48·25	.....	.....	28·54	24·08									

DISAPPEARANCE OF SNOW FROM HIGH AND LOW LAND

Pertinent to the discussion of the influence of topography upon temperature, an interesting fact has been observed. Whereas the spring thaws invariably expose brown patches on the hills in the vicinity of the station before any appear on the intervening flat, yet whenever a May or June snow fall occurs it unfailingly disappears first from the flat and last from the hills.

This was conspicuously evident after the June snow storm of 1926, when there was as much as ten inches of soft, slushy snow lying at one time after more than that amount had melted. On the fourth day after the commencement of the storm photographs were taken showing the low land bare and the lower slopes of the hills practically so, while increasing quantities of snow were discernible as one's eye wandered up the ridges, and on the southwest brow of Saskatoon Mountain snow was noticed two days later. On the higher part of the Experimental ground, many deep banks could be seen on the fourth day. No frost occurred.

Why the winter snow should disappear first from the hills and the occasional May or June falls first from the flats is an interesting point of speculation. There may be more than one influence. It is possible that the hills receive a greater quantity of the summer falls, though this has not been determined. Again, the winter snow may lie more evenly distributed on the flat than on the bluffy, erosion-scarred slopes, though this supposition fails to meet all the peculiarities observed. Whatever the explanation, the fact is undeniable, is interesting, and may be significant.

SOIL FERTILITY

RESIDUAL EFFECTS OF VARIOUS MEADOW CROPS

In a repeat test of the residual effects of various meadow swards, two and a half acres of Eureka beardless-hulless barley were drilled May 15 on contiguous rod-wide strips of land representing the sods ploughed out of seven hay crops on August 1, 1925. The original meadow seedings consisted of brome, Kentucky blue, meadow fescue, Western rye, timothy, sweet clover, and alfalfa, as well as three clovers, each having been laid down in the 1922 seeding of a nurse-crop test. The timothy had made an extremely thin "catch" and preserved throughout three cropping seasons an open bunch growth, in marked contrast to the close sward it ordinarily forms in the Peace River District. This fact may have an important bearing upon the outcome.

The sweet clover, being a biennial, died after its 1923 crop and this strip was thereupon re-seeded to a mixture of sweet clover and grass. A true and complete comparison, therefore, remained only among the sods of four perennials, alfalfa, Western rye grass, timothy and brome.

In order to determine the bearing of the moisture factor two hundred and eighty samples were taken in 1925 and others again in 1926. Other samples were taken for nitrate determination. Half the total area under test was treated with nitrate of soda and one half left untreated.

RESULTS

All grain lodged considerably, more especially those areas which had made the best early growth.

Certain technical difficulties were also encountered. Due doubtless to these factors and to the effect of the poor catch of timothy the yield data were conflicting and erratic.

Contrary to previous experience, the heaviest yields of grain were harvested from timothy sod, the lowest from sweet clover sod, the second lowest after alfalfa and the third lowest after brome. Western rye grass sod was second best. Summer-fallow yielded scarcely so well as the average of the various sod plots. In a limited comparison in which it was possible to introduce the sods of meadow fescue and Kentucky blue the former behaved creditably, as usual, in comparison with other sods.

INTERPRETATION

Making all due allowance for experimental error and especially for the undoubted effect of lodging, it remains to be noted that the relative yields of grain off the three principal grass sods (viz., timothy, Western rye grass, and brome) accorded substantially with field observations made between seeding and harvest.

Western rye grass threw nearly ten per cent more grain than did the brome sod. This difference, although less than usual, is substantial.

There was a limited average response to nitrate fertilizing. This is not to be wondered at with a late-seeded crop in a moist, warm season, unusually favourable as it was to decay and nitrification.

It is not quite clear why timothy sod (which in 1923 was exceeded 25.1 per cent by Western Rye grass sod and in 1924, 13.9 per cent) should this year have exceeded its rival by 4.8 per cent.

Some possible explanations occur but as the precise bearing and force of each is undetermined they must be regarded as hypotheses rather than facts.

It is known that western rye and alfalfa were the two crops which established the best stands in 1922. In 1923, of the five grasses Western rye gave far the best cutting of hay. The timothy stand was so thin that only extravagant hand weeding kept it clean, and right up to the last it maintained the open bunch habit of growth instead of the tight turf which it ordinarily forms in the Peace River District. The Western rye grass, on the contrary, had a close sward for three years and produced its best yield in the initial season, the aggregate for three seasons being 3,836 pounds of hay per acre against 3,038 for timothy, 4,740 for alfalfa and 3,946 for brome. In the first cropping year timothy had yielded only 778 pounds of hay as against 1,935 from rye grass, whilst in the third year (1925) it slightly out-yielded the rye grass by producing 1,454 pounds against 1,256 pounds. This is a striking reversal of their usual behaviour and is attributed to the extremely poor catch of timothy in 1922 along with the peculiarly severe effect of grasshoppers on rye grass in 1924 and 1925.

The matter merits this detailed consideration because it seems to suggest that the usual adverse residual effect of timothy and likewise the low average production of non-leguminous perennial crops in the West may be in large part traceable to a physical factor.

In a semi-arid climate a tight sward keeps the soil so compact and at the same time so persistently drinks up the light rains which fall that the furrow slice is kept in a chronically dry, impervious condition, unfavourable alike to percolation of moisture and to vital bio-chemical processes. Thus it comes that a prairie sod producing about half a ton of native vegetation per annum may, when broken up and left in fallow for a season to accumulate moisture and soluble plant food, produce the next year three or four tons of oat bundles per acre, and this may be one reason why Western rye grass, which ordinarily maintains a more open, bunch-like habit of growth than Kentucky blue, brome, or timothy, is more friable, easier to plow, and more productive than any of these, except brome, and yet is usually followed by heavier grain crops than

any of the three named. The productiveness of brome as a hay crop in spite of this factor is probably due to certain inherent characteristics of hardiness, vigour and drouth resistance.

Again, it is quite possible that some of these grasses have a greater root volume than others and that a quota of moisture sufficient to decompose the root mass of one crop might be inadequate to rot the larger root volume of another.

Recent investigations would indicate that the chemical composition of the root and stubble were another factor of variability. A low percentage of nitrogen relative to carbon is thought to retard nitrification or at least to depress the accumulation of nitrates, and still more recently it has been suspected that the forms in which these two elements occur are possibly quite as important as their ratio, if not more so.

Timothy is a highly carbonaceous material, hence it is not surprising if in a dry year its large mass of tardily decomposable residue should tend to depress the production of an ensuing crop while in a warm, humid season and especially with a loose turf and restricted root volume, this adverse effect might not conspicuously develop.

BEES

From the standpoint of apiculture the winter of 1925-26 was one of the best on record. The only criticism would be that unusually high temperatures kept the bees too active. As a result, stores were lower in the spring than had been anticipated. Examination on March 2 revealed brood in almost every queenright colony. Spring came with the willow pollen on April 2, although brood raising had been almost continuous throughout the winter. May was very favourable and building up was rapid, but the influx of nectar was slight. The rain and snow of early June, while injurious at the time, bore fruit in a heavy honey flow throughout July and August. These latter were typical summer months, high winds and a few wet days being the only drawback to steady nectar-gathering. Frost on September 8 put a sudden stop to the 1926 bee season.

SOURCES OF NECTAR

Following the willow were the usual varieties of spring bloom, which proved of limited value this season. In three colonies spring feeding was thus necessary, and thin syrup to the extent of about ten pounds sugar was fed to these colonies. On April 25 the Manitoba maple burst into bloom, causing a great activity for the short period of its florescence. This source, though never important, was much more productive than usual. Dandelion on May 18 gave a temporary surplus. Caragana and wild-fruit bloom, together with flowering shrubs, kept the bees in food till the snowstorm of early June. After recovering from this setback the bees found the alfalfa and sweet clover ready, which plants supplied nectar right up till the end of the season. From about August 25 a slight admixture of golden-rod and aster honey was deposited in the combs. It is worthy of note that fireweed is not so reliable a source as is popularly supposed; few indeed were the spots in 1926 which would have given the surplus obtained in 1925, and what little bloom there was proved no attraction for the bees.

HISTORY OF THE APIARY

Of the eight colonies packed with pea straw in quadruple wintering cases in October, 1925, seven survived. One small nucleus succumbed to the attacks of mice, which also weakened two or three other colonies, besides damaging combs. The months of April and May were favourable for expansion, and on June 1, when the colonies were removed from winter quarters, all the queen-right colonies were ready for supering. At this date the test colony was put on scales and the others protected by false outer cases, which remained on all summer. The first part of June was trying and in some colonies feeding was resorted to. The weather, however, cleared up about the middle of the month, and on June 16 the first gain from sweet clover was registered. From this date till the end of the month a steady flow was maintained. Throughout July nectar was steadily gathered, and on six days only was the intake less than the loss by evaporation. August was the banner month, an average gain of 7.7 pounds being made daily by the test colony. The greatest gain in any one day was achieved on August 23 when a net twenty-four-hour increase of 20.5 pounds was recorded. From June 16 till September 4 was the period of sweet clover honey. In a total of eighty-three days there were only eighteen on which no gain was made.

FIG. 10.—A 550-pound colony of bees on scales. Best 24-hour net increase 20½ pounds on August 23.

PACKAGE BEES

Five two-pound packages were received from Alabama on June 10. They unfortunately arrived during a four-day snowstorm, the worst period of the entire season. This coming after a delayed journey, it seemed as though everything had combined to make the test as rigorous as possible. One was queenless, while a second queen died a few days later. As soon as possible the queenless package was united with a handful of bees which had swarmed with a mating queen. The resulting colony built up rapidly and although hived on only two drawn combs the net production of the colony was 107.5 pounds extracted honey. The other four packages were placed on two drawn combs each and fed a little sugar syrup. In spite of a poor start three of these remaining packages produced an average of 44.8 pounds. The remaining stock built up, but slowly, and was scarcely in the colony class by winter.

INCREASE

A new method of increasing the apiary was tried this summer. The colony on scales was constricted in space till swarming cells were started. All these cells, save one, were destroyed and the brood together with this cell put above the supers. The queen was confined to the brood chamber and a queen excluder placed under the super containing the queen cell. Between this excluder and the super an entrance and alighting board were arranged. In a few weeks there were thus two colonies on one stand. Unfortunately the young queen broke bounds through a defect in the excluder and was lost just after beginning to lay. This colony had a remarkable parent queen, and although several times called upon during the early summer to replenish the empty brood nest of two queenless stocks, the ultimate strength was such that after removing one half-sized colony and two nuclei there were still more bees than could be housed in the usual brood chamber and shallow super. The maximum weight of the colony on September 4 was 550.5 pounds. Its weight on June 1 was fifty-five pounds.

From May onward one small colony was kept to supply queens. When a want occurred a queen in this colony was substituted by a cell or worker brood. In this way the apiarist was able to supply his own needs and also help out more than one neighbouring bee-keeper. In late fall three nuclei were raised to take care of new queens sent by the Bee Division, Ottawa.

THE RESULTS

From eleven producing colonies, two of which were queenless for the initial part of the summer and four of which were packages, an average of 109.6 pounds was harvested. The greatest individual yield was 281.5 pounds from the colony on scales. This included a small quantity of comb honey. The sections were fairly well and uniformly filled. In calculating the figures given above, one and a half pounds of extracted honey has been allowed per section. All the honey was of good quality and well received on the local market, netting sixteen cents per pound, wholesale, less the cost of pails, this price being set by the local rate on Ontario honey.

Eleven colonies and five nuclei were placed in quadruple wintering cases on October 19 and packed with pea straw. These were fed as much heavy syrup as time would permit, consistent with their requirements. During the entire season one hundred and seventy pounds of sugar was used, the bulk of which went for fall feeding.

From a start of seven colonies, two of which were queenless, but for experimental purposes were not united, helped out by five half-dead packages, a final apiary of fifteen stocks was evolved. A surplus of 1,081.5 pounds extracted honey and eighty-three sections, or the equivalent of 1,206 pounds extracted honey, was obtained. Counting three pounds of sugar as equalling two of honey we still have a net surplus of 1,093 pounds, which, together with a net increase of five potential colonies, shows to the credit of the Station apiary for the 1926 season. In addition to evident results some twenty supers of foundation were drawn, a valuable asset for coming seasons.

EXTENSION WORK

It is safe to say that during 1926 the Station grew decidedly in sympathetic touch with the public. An experimental station can serve only through the receptiveness of its clientele. To no small extent a district builds or restricts its own institutions.

The correspondence reveals that the field is expanding. A run of inquiries now come not only from Grande Prairie but from the whole Upper Peace region extending far into northern British Columbia, as well as from the Athabasca watershed and part of the North Saskatchewan valley, reaching down to the latitude of Edmonton. Of course a certain number come from points much farther away. Letters to the number of 1,596 were received and 1,647 dispatched, besides 312 circulars and post cards. An encouraging number of inquiries come from persons who state that previous information has been satisfactory. Considering the wide diversity of conditions represented, the pioneer stage of Northern Alberta agriculture, and the complexity of individual problems presented, this is a matter of no small satisfaction.

Co-operative experiments are one of the best means found for engaging interest and carrying demonstrations afield. Seed for twenty were sent out in 1926, making a total of 167 since the plan was instituted in 1921. One of the first local co-operators in alfalfa inoculation purchased in the spring of 1926 a hundred pounds of alfalfa seed, from which he obtained an excellent catch. Alfalfa seed was sold, also, into many other localities and a rising tide of interest in this queen of forage crops is manifest as a result of demonstration on the Station, supplemented by widely-scattered co-operative tests. From far west at Hudson Hope a co-operator reported himself so well pleased with the performance of alfalfa and sweet clover in his plots that he was sending out for seed to sow an acreage.

Distribution of Garnet wheat was handled for the Cereal Division in Alberta north of Edmonton.

One hundred and eighty-seven lots of small-fruit stock, nineteen lots of ornamentals, and seventy-two lots of special seeds were placed, with varying though mainly with encouraging results. Many pleasing acknowledgements came to hand. For instance, a settler at Athabasca who received Garnet wheat and Ruby rhubarb wrote in September:

"The Garnet wheat has proved very successful. We expect it to yield one hundred bushels from less than two acres..... The rhubarb is the finest I ever saw. I have numerous requests from people who have seen it. I will give away as much as possible when I have a few more roots."

Thus in radiating waves the superior varieties bred at the Central Experimental Farm are spread out to all parts of the frontier.

An educative exhibit was well received at five Northern fairs. Another exhibit, dispatched to the Horticultural Exhibition in Calgary, did much to dispel popular misconceptions regarding the Peace River climate.

In early spring upon invitation of the Pouce Coupe Creamery Association, a series of six lantern-slide addresses, and one in another locality, were delivered, with an average attendance of fifty-two, including, in several cases, about ninety per cent of the residents in the respective vicinities.

Three press articles were issued from Ottawa and four articles prepared for "Seasonable Hints," in addition to some exclusive and special articles, interviews, etc.

Two days were spent in seed-grain inspection.

An Illustration Station at Fort St. John was supervised. While a grasshopper plague has marred the results at that point, some excellent work has been done there by the operator, J. W. Abbott, whose results in several important respects confirm those obtained on the Sub-Station.

During the mid-summer months many farmers and their families visited the Station.

On three occasions it was arranged that settlers visit the Station on days to coincide with itineraries of Divisional and Branch officers, who addressed them acceptably.

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