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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL SUB-STATION

BEAVERLODGE, ALBERTA

REPORT OF THE SUPERINTENDENT

W. D. ALBRIGHT

FOR THE YEAR 1923



Harvesting variety plots of cereals at Beaverlodge. Great care is taken in all operations to ensure accurate records.

Printed by Authority of the Hon. W. R. Motherwell, Minister of Agriculture, Ottawa, 1925

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**DOMINION EXPERIMENTAL SUB-STATION,
BEAVERLODGE, ALTA.**

REPORT OF THE SUPERINTENDENT, W. D. ALBRIGHT

INTRODUCTION

The year 1923 in the Peace River country furnished a first-class example of the fact that instead of consuming oneself with worry about markets and weather, it pays to go ahead and do one's best. Spring opened with little but snow-moisture in the soil, and that very unequally distributed. Winter-killing of perennials, biennials, and winter annuals was found to have been the most extensive within the records of the station, being attributed to dry conditions at the setting in of cold weather; a weak, late start of many 1922 seedlings; extensive consumption of top growth by hares; a rather scant snow-cover during part of the winter, and a February chinook which bared the ground completely on many areas, being followed by an intense cold snap, catching the fields unprotected. It is significant that a soil thermograph, whose bulb was buried three inches under the surface of fallow land, recorded no temperature lower than 15 degrees Fahrenheit while the ground was well covered with snow, but during the low dip, following the chinook period, it registered 5 degrees, which was the lowest its needle could show. The value of snow-protection is thus indicated; likewise the effect of its absence.

Scarcely any rain fell until June 10, and as snow moisture on the knolls had been inadequate to produce full germination or to sustain vigorous growth of plants that did start thereon, early prospects were utterly disheartening. A previous season of drouth seemed likely to be followed by one doubly severe in its effects. Cutworms, and in some localities grasshoppers as well, attacked the scanty growth. By alert settlers in the infested areas these were successfully fought with poison.

Showers commencing June 10, amounted to an inch and a tenth, affording temporary relief. Then early in July, when hope had again faded, came rains continuing at intervals throughout the midsummer month to a total of 3.65 inches.

Crop recovery was astonishing, though there was much suckering growth and uneven maturity of coarse grains. There were also many weedy fields and patches, especially after summer-fallow. Most yields were good, nevertheless, and rough feed abundant. Whilst the aggregate summer precipitation was abnormally light, the rain fell at a time to be of great advantage to growing grain, excepting the earliest varieties. Hay was the only poor crop. Timothy was almost a failure. Gardens and potatoes were good. Alfalfa, for the second consecutive season, ripened good crops of seed. To cap it all was an unusually fine, dry, harvest season, so that grain was threshed and the feed saved in excellent condition. The average grade of wheat was high—mostly No. 1 and No. 2 Northern.

Prices, to be sure, were low, but some of the more forehanded producers took occasion to carry over surplus stocks of grain and feed in the hope of striking higher market levels for part of their produce, or at least of assuring themselves feed and seed in case of a leaner harvest the next year.

GRAIN AND LIVE STOCK SHIPMENTS

To Mr. J. A. Macgregor, Manager of the Edmonton, Dunvegan, and British Columbia Railway and its McLennan-Berwyn branch called the Central Canada, we are again indebted for figures of the grain shipments to Edmonton during the period September 1, 1923, to July 31, 1924, thus representing substantially the crop year of 1923. Of wheat there were 2,760,416 bushels, and of other grains 2,067,882, making a total of 4,828,298 bushels. As this period covers only eleven months, owing to a change in the Statistical year, it is probable that a full twelve-month would aggregate about five million bushels of all cereals shipped out. Of these figures about 71 per cent of the wheat and 57 per cent of the oat shipments originated in the Peace River country, the balance from the district immediately northwest of Edmonton, extending to the watershed between the Athabasca and the Peace.

TABLE OF GRAIN SHIPMENTS BY DISTRICTS OVER THE EDMONTON, DUNVEGAN AND BRITISH COLUMBIA RAILWAY BETWEEN SEPTEMBER 1, 1923 AND JULY 31, 1924

	Wheat	Other grains	Aggregate
	bush.	bush.	bush.
From eleven points between Edmonton and the Athabasca river..	774,415	873,440	1,647,855
From four points between the Athabasca and Smoky rivers (chiefly Donnelly and Falher).....	35,788	411,564	447,352
From five points west of the Smoky river and tributary to Spirit river (the principal winter depot of Pouce Coupé).....	261,930	239,974	501,904
From three points in the Grande Prairie District.....	1,038,006	524,902	1,562,908
From six points on the Central Canada (chiefly north of the Peace)	650,277	18,002	668,279
Totals.....	2,760,416	2,067,882	4,828,298

Live stock shipments received at the Edmonton Stockyards off the above lines during 1923 totaled 808 cars, comprising 13,753 cattle, 1,515 calves, 14,877 hogs, 1,659 sheep, and 27 horses. Two-thirds of the cattle and nearly four-fifths of the calves were received in the four months of August to November, inclusive. Sixty-five per cent of the hogs, on the other hand, were marketed during the first five months of the twelve.

In addition to the above statistics of the stockyard receipts, we are advised that two hundred cars of stock were delivered direct to the packing plants, making at total of 1,008 carlots, of which a fair proportion, of course, originated along the first hundred miles out of Edmonton, the balance representing practically the output of the Peace River country.

On the provincially-operated A. and G. W. Railway, running northeastwardly from Edmonton, grain shipments for the crop year of 1923 amounted to 340,167 bushels of wheat, 272,978 bushels oats, and 119,992 bushels of barley. If to the foregoing statistics were added the shipments over the Whitecourt, Athabasca, and St. Paul de Metis branches of the Canadian National Railway, a very respectable showing would be made for the country north of the latitude of Edmonton, not long since presumed to be the ultimate limit of successful agriculture.

PRECIPITATION, TEMPERATURE, AND SUNSHINE

It is a matter of common remark among residents of the Peace River country that a surprising difference exists during low dips of temperature between the degree of cold on high and low land within the limits of prevailing altitudes. The hamlet of Beaverlodge and the adjacent Experimental Station are situated on the west and east slopes, respectively, of a hog's-back ridge with an elevation of more than a hundred feet, and during cold spells the minimum

readings are almost invariably much less extreme than those at points not many miles removed. For comparison with our own we have this year obtained from Mr. Wm. Pearson, official weather observer in the town of Grande Prairie, twenty-eight miles distant and nearly due east, a summary of his monthly readings. They reveal quite a marked disparity between the average minima, especially for the coldest months of the year. For instance, the average of Mr. Pearson's January minima is -13.45 degrees, while the corresponding average at Beaverlodge is only -3.39 , a difference of slightly over ten degrees. The mean of his twelve months' minimum is 22.16 degrees as against 26.41 degrees at the Experimental Station. The twelve months' means of the maximum temperatures at the two points are much closer, being 47.88 degrees and 48.91 degrees respectively.

The town of Grande Prairie is situated on a level tract with rising ground to the north. Beaverlodge has lower land on three sides of it. There is reason to believe that were official readings available, local contrasts as great or perhaps greater could be found in the vicinity of either place.

In presenting such comparative figures, a word of caution is in order. Differences in the hour of reading and adjusting the instruments sometimes slightly affect the average of two successive days' results, but it is not likely that any great final discrepancy is chargeable to this factor.

The lowest temperature of the year at Beaverlodge was 42 degrees below zero, occurring on February 14th. The highest was only 85 degrees Fahrenheit, occurring on September 13th. This figure is below the customary high level for the year and occurs in an unusual month. The mean temperature for the twelve-month, however, was 3.7 degrees above the average mean for the preceding seven years.

METEOROLOGICAL RECORD, EXPERIMENTAL STATION, BEAVERLODGE, 1923

Month	Average Monthly Temperatures		Precipitation			Sleighting days	Bright sunshine hours
	Maximum °F.	Minimum °F.	Rainfall ins.	Snowfall ins.	Total ins.		
January.....	13.87	-3.39		7.0	0.70	31	71.7
February.....	22.03	3.32				26	102.9
March.....	32.51	13.16		16.0	1.60	26	78.7
April.....	49.16	26.73	0.23		0.23	9	245.4
May.....	62.19	35.51	0.23		0.23		251.6
June.....	71.33	47.03	1.26		1.26		269.9
July.....	70.06	48.45	3.65		3.65		250.7
August.....	71.48	45.38	0.92		0.92		240.0
September.....	65.20	37.90	0.37		0.37		205.2
October.....	58.45	28.29	0.18		0.18		204.7
November.....	44.33	23.33	0.07	0.5	0.12		97.8
December.....	26.38	11.25		5.0	0.50	19	57.8
Totals.....			6.91	28.5	9.76	111	2,076.4
Averages.....	48.91	26.41					
Mean Annual Temp.....	37.66						

Eight-Year Average—1916 to 1923

	Mean annual tem- perature °F.	Snowfall ins.	Precipi- tation ins.	Sleighting days
Tota's, 8 years.....	275.21	500.1	124.65	1,036
Averages, 8 years.....	34.40	62.51	15.58	129

OFFICIAL METEOROLOGICAL RECORD, GRANDE PRAIRIE TOWN, 1923

Month	Average Monthly Temperatures		Precipitation		
	Maximum	Minimum	Rainfall	Snowfall	Total
	°F.	°F.	ins.	ins.	ins.
January.....	12.09	-13.45	.....	2.55	2.55
February.....	23.42	-4.57	.....	0.55	0.55
March.....	30.96	10.12	0.08	2.975	3.055
April.....	51.13	25.36	0.25	0.05	0.30
May.....	60.17	33.95	0.23	0.025	0.255
June.....	70.95	46.91	2.62	.....	2.62
July.....	70.06	47.32	4.72	.....	4.72
August.....	68.32	42.43	0.52	.....	0.52
September.....	60.54	31.60	0.75	0.055	0.805
October.....	57.93	22.93	0.29	.....	0.29
November.....	42.46	17.09	0.19	0.025	0.215
December.....	26.54	6.32	0.32	1.01	1.33
Totals.....	.....	.....	9.97	7.24	17.21
Averages.....	47.88	22.16	.....	.....	.....
Mean Annual Temperature.....	35.02		.....	.....	.....

COMPARATIVE RECORD OF SUMMER PRECIPITATION AND EVAPORATION, EXPERIMENTAL STATION, BEAVERLODGE, 1923

Month	Precipitation	Evaporation
	ins.	ins.
April 21 to 30.....	0.02	1.13
May.....	0.23	4.17
June.....	1.26	4.08
July.....	3.65	3.55
August.....	0.92	2.84
September.....	0.37	2.37
October 1 to 27.....	0.18	1.43
Totals.....	6.63	19.57

SOIL TEMPERATURES

The Friez soil or water thermograph installed in May, 1922, was continued in position as originally placed, that is with the bulb buried three inches beneath the surface of fallow ground, until a mishap near the end of the summer necessitated its despatch to the manufacturers for repairs. Two tables present a digest of the data, which affords very interesting study. July was the only month when the soil temperature exceeded 65 degrees Fahrenheit, the highest being 68 degrees on the 13th at 5 p.m., followed by 66 degrees the next day at 4 p.m. On the 13th the atmospheric instruments recorded 82 degrees, with the weather noted as "breezy." On the 14th the air temperature had risen to 83 degrees, and the notes for that day read "windy, cool towards evening." On September 13th, the warmest day of the year, the soil temperature rose to only 57 degrees at 6 p.m. This, although nearly the highest soil temperature for September, was 11 degrees below the July maximum, probably due, in part, at least, to difference in the length of the days and the angle of the sun's rays. The weather was fairly dry on both occasions.

AVERAGES OF MONTHLY SOIL THERMOGRAPH RECORDS, EXPERIMENTAL STATION, BEAVERLODGE, 1923

Month	Average monthly minimum °F.	Average monthly maximum °F.	Average monthly mean °F.	Lowest temperature for month °F.	Date and hour of lowest temperature	Highest temperature for month °F.	Date and hour of highest temperature
January.....	22.0	23.24	22.62	18.0	29-8 a.m.	29.0	16-2 p.m.
February.....	18.43	21.61	20.02	5.0	14-6 a.m.	32.0	28-2 p.m.
March.....	25.53	28.63	27.08	16.0	15-4 a.m.	31.5	20-2 p.m.
April.....	30.27	37.46	33.87	19.5	3-7 a.m.	50.5	21-2 p.m.
May.....	38.71	47.85	43.28	33.0	6-5 a.m.	59.0	24-5 p.m.
June.....	48.98	57.93	53.45	44.0	1-6 a.m.	59.0	31-2 p.m.
July.....	50.21	58.79	54.50	43.0	3-6 a.m.	63.0	24-6 p.m.
August.....	49.21	57.90	53.56	41.0	15-5 a.m.	68.0	30-6 p.m.
September.....	43.16	50.75	46.95	35.0	31-6 a.m.	62.5	13-5 p.m.
October (to 17th)....	39.35	48.68	44.01	31.0	3-6 a.m.	62.5	17-6 p.m.
					22-6 a.m.	58.5	7-4 p.m.
					12-6 a.m.	52.5	2-5 p.m.

TABLE showing number of days in each month of 1923, from April 1 to October 15 that the soil temperature, as registered by a Friez thermograph with bulb three inches beneath the ground surface, rose at any time above the respective degrees specified

Month	Days above 40° F.	Days above 45° F.	Days above 50° F.	Days above 55° F.	Days above 60° F.	Days above 65° F.	Days above 70° F.
April.....	9	5	1	0	0	0	0
May.....	31	23	5	1	0	0	0
June.....	30	30	29	25	5	0	0
July.....	31	31	30	22	12	2	0
August.....	31	31	30	26	9	0	0
September.....	30	25	18	5	0	0	0
October (1 to 15).....	15	13	7	0	0	0	0
Totals (April 1 to October 15).....	177	158	120	79	26	2	0

NOTE.—This table represents maximum readings only, not means.

CHRONOLOGICAL RECORD OF SEEDING, HARVESTING AND CESSATION OF FALL
PLOUGHING

As prospective settlers are always interested in the average dates of seeding, harvesting, and the autumn freeze-up, we present herewith a record supplied us from his diary by one of the longest-established settlers in the Beaverlodge District, Mr. Gordon Sherk. The record is complete except for the cessation of fall ploughing in three years when the diarist was absent from home in charge of a threshing outfit. In at least one of these years, 1917, fall-ploughing continued until late into November.

It must be realized that such a record as this might vary considerably in any given year as between two neighbouring farms. On the high land of the Experimental Station, for instance, the plough often runs a week or so after the ground in the surrounding valleys is crusted too hard. Indeed, there have been few years within the past ten when the Superintendent has not had his teams working on the land during some part of the first week in November.

In 1923, spring work on the Experimental Station commenced April 24 and drilling of wheat plots the next day.

MR. SHERK'S RECORD OF FARM OPERATIONS

Year	Commenced seeding	Commenced harvesting	Finished plowing
1910.....	April 10.....	Sept. 28.....	Nov. 1
1911.....	May 1.....	" 4.....	Oct. 26
1912.....	April 29.....	Aug. 15.....	" 28
1913.....	" 9.....	" 21.....	" 27
1914.....	" 27.....	" 17.....	Nov. 4
1915.....	" 5.....	" 15.....	Absentthresh.
1916.....	" 11.....	" 12.....	Oct. 25
1917.....	" 19.....	" 21.....	Absentthresh.
1918.....	" 23.....	" 21.....	"
1919.....	" 15.....	" 26.....	"
1920.....	May 18.....	" 30.....	Oct. 28
1921.....	April 18.....	" 10.....	" 28
1922.....	" 29.....	" 11.....	Nov. 25
1923.....	" 23.....	" 17.....	Oct. 28

NOTE.—In recent years we have not grown any barley, so the date of starting harvesting is later than if we had barley to cut.—G. SHERK.

ANIMAL HUSBANDRY

FINISHING CATTLE

Upon authorization received late in autumn of 1922, eleven head of cattle were purchased in November for a small-scale trial of winter feeding. Unfortunately the heavy fall liquidation forced by feed shortage had by that time cleaned up practically all the desirable animals within reach and the lot purchased was by no means uniform. A very good pair of dehorned two-year-old steers and a yearling heifer were obtained at the ruling price of two cents a pound. The latter, being liable to be in calf, was exchanged for a dehorned steer of practically the same weight. The remaining eight head were a cheap job lot of range steers and heifers with horns, comprising one animal of outstanding type and quality but half a dozen rather ordinary head. Two were heifers that turned out to have been bred early and had to be disposed of before beef prices had advanced much. Seven of the eight were yearlings, the other being a short two-year-old. The latter cost \$13.65, the seven yearlings \$75, plus delivery, or about 1½ cents a pound, delivered.

HORNED STOCK ON LOCAL MARKET.—The run of the yearlings not being of a good shipping class, it was decided to warm them up and run them off early for the local trade, which, in view of the general feed shortage, was expected to pay satisfactory prices. In expectation of but a short keep, the yearlings were not dehorned. This was a decided mistake, leaving the product at the mercy of a very disappointing local market, with the result that in the spring one splendid steer, which, as it turned out, would have commanded 7¼ cents per pound in Edmonton (the market taking a sudden jump) was disposed of at the shipping point for 5½ cents, netting over a cent less than a dehorned two-year-old of no higher finish and less perfect type. It was a conspicuous demonstration of the prudence of dehorning as a means of widening the feeder's market opportunities.

No BEDDING.—A second drawback was the lack of bedding, drouth having so shortened the crop that, ere spring arrived, straw commanded famine prices. The stock had practically no bedding except a very little horse manure. Though given the run of a corral when possible, the requirements of experimental feeding confined them much of the time in their shed, where mild weather and free

urination, due to the diuretic effect of sunflower silage, kept them often in muck half-way to their hocks. Under such circumstances they lay down but little; and in spite of considerably heavier meal feeding than was practised in 1921-22, they made decidedly lower gains than the cattle then fed, averaging only 1.4 pounds per head per day against an average gain of 1.77 pounds for twelve silage-fed cattle in a 116-day period in the previous winter. The latter were carried to a higher finish in a much shorter time.

Furthermore, two steers developed sore feet, ascribed to the lack of bedding. One finally recovered under stall treatment, but the best two-year-old, after acquiring the ailment, seemed constitutionally affected and went off his feed. He was killed in early April and sold for \$71.40, while his slightly inferior mate brought \$91.67 in May. (The locally killed steer's dressing percentage was 60 per cent and his beef was beautifully marbled).

Altogether, there is no doubt that lack of bedding militated heavily against the outcome both as to gains and average proceeds per pound.

DEAR ROUGHAGE.—While timely and careful buying had insured a supply of feed at favourable prices, considering the season, yet the average scale of roughage values was altogether abnormal. Green feed being almost impossible to procure in quantity, considerable use was made of rather trashy prairie hay at ten dollars per ton, and from data at other points it is doubtful whether hay can be advantageously supplemented for green feed save to a limited extent by way of variety.

Silage was undoubtedly the dearest ingredient of the ration, having been made from sunflowers which, owing to drouth, yielded off spring-ploughed stubble only about three tons per acre, these being mixed at the cutting box with about an equal bulk of old oat sheaves, barely enough water being added to ensure good curing. It seemed of good quality save for a very occasional spot of mould where too much straw had been bunched in the silo. The meal consisted of wheat and barley chop, oats being out of the question.

For a month after their purchase in early November the cattle received only roughage with the run of a pasture by day. Then they were started on a pound of wheat chop daily, a little barley being added in January and increased to the proportions of ten parts barley and fourteen of wheat, the total daily ration averaging four to five pounds per head, which was considerably heavier than was employed the previous winter, alike in respect to quantity, period over which fed and character of composition.

TWO-YEAR-OLD SILAGE.—It may be of interest to note that in the bottom of the stave silo were two or three feet of barley and sunflowers from 1920, being thus about two and a half years old when used up. So far as could be judged, the material had suffered little deterioration and proved a boon indeed.

BALANCE SHEET

Purchase price of 11 head.....	\$150 65	
<i>Feed—</i>		
Silage, 22,308 lbs. at \$10 per ton.....	\$111 54	
Prairie hay (and brush), 21,416 lbs. at \$10 per ton.....	107 08	
Green-feed, 15,225 lbs. at \$12 ton.....	90 35	
Barley chop, 1,823 lbs. at \$1.15 cwt.....	20 06	
Wheat chop, 4,809 lbs. at \$1.05 cwt.....	50 50	
Salt, 137 lbs. at \$2.70 cwt.....	3 69	
		384 12
Net proceeds.....	\$540 14	\$534 77
Balance.....		5 37
		\$540 14 \$540 14

NOTE.—Sheds cleaned for the use of the manure.

COMMENTS

Eleven head of mixed stock mostly yearlings, fed for an average period of 153.3 days, made average gains of 216.6 pounds or 1.4 pounds per head per day, and although marketed at a disadvantage, realized \$49.10 per head.

Whilst the return of only \$5.37 is quite inadequate to cover cost of labour, shelter, and water, it is far from justifying the statement commonly made that "cattle in the winter of 1922-1923 ate their heads off two or three times over." On the contrary, these more than paid for their feed even at the abnormal prices and adverse conditions prevailing, and the outcome points to the chance of a fair profit from winter feeding under normal conditions. The lessons of the enterprise may be thus epitomized:—1. Buy (or raise) thrifty, typey stock; 2. Dehorn everything; 3. Do not keep more stock than can be bedded comfortably; 4. Study feed costs closely; 5. Place good, well-finished stuff on the high-level markets of the year. Of late years it has usually paid to hold the cattle till May when feed and other conditions permitted, the price at this time usually running around \$7 per hundredweight for choice stock. As illustrating this point we quote the prices received for steers on the Edmonton market, during the last three years of low prices, by A. Sherk & Sons, Beaverlodge, who have for the past three years made a practice of shipping about the third week in May. In 1921 they sold six head, two at \$5.50; two at \$6, and two at \$7 per hundredweight. In 1922 their prices on steers were \$6.50 to \$7.50. In 1923, \$6.50 to \$7.25.

COST OF WINTERING BREEDING CATTLE, 1922-23

From a herd of grade range cattle of mixed Shorthorn and Hereford breeding, owned by the superintendent of the sub-station, some interesting data is available on the cost of wintering dry cows and calves under the conditions prevailing. It should be understood that these cattle were fed strictly on personal account, the only expense to the Department of Agriculture consisting in the trifling amount of time involved in keeping track of the feed. In recording the feed, the method was to weigh a daily ration weekly or fortnightly and compute from this. The work was done with substantial accuracy, though not minute to the last pound.

Cows.—An average of sixteen cows and heifers (also for part of the time a big bull which was allowed a lion's portion of the feed) were maintained. During November they ran out, receiving a small feed of threshed grain through the latter part of October and in November averaging less than a bushel of oats a day to twenty-five head. From the first to the 20th of December their fodder consisted of a stack of oat straw in a bluff, to which they repaired daily, and a very small ration of silage of the same composition as used for the experimental stock. After the straw pile was finished, a strictly limited ration of rather brushy and late-cut wild hay was allowed, for it was a case of pulling the stock through as well as might be done, rather than as well as one would like to do. Thenceforward, for a time, the average daily ration consisted of 16 or 17 pounds silage and 20 pounds hay, including brushy waste. Towards spring the quantities had to be reduced. Before the end of April the feed had run out and as none could be purchased the cows were obliged to rustle for themselves on an old pasture, receiving a trifling amount of light oat tailings, with a little chop to a few of the weaker heifers after freshening. Salt was provided but the quantity not kept track of. The cows, like the fattening stock, though to a lesser extent because less closely confined, suffered the discomfort of a mucky shed, which interfered with thrift. Nevertheless they wintered in passable condition and the thinnest two-year-old heifer dropped a 70-pound calf about the first of May,

raising it successfully. The calves practically all came big and strong and at weaning in the fall averaged 425 pounds apiece, counting in an August and one or two July calves. Out of fifteen pregnant cows only two failed to raise their calves and these were the fleshiest dams. One of these calves could not be induced to suck. The other was apparently born lusty, but may have suffered from malattention of its dam.

Quantities of feed were as follows:—

Oat straw (estimated), 12 tons at \$4.....	\$ 48 00
Prairie hay (trashy), 15½ tons at \$10.....	157 50
Silage, 17½ tons at \$10.....	175 00
Chop, salt and incidentals, also oats fed in November (estimated).....	25 00
	<hr/>
Average feed cost per head.....	\$405 50
Average daily cost per head from December 1 to April 20.....	25 34
	0 18

In a crisis when breeding stock was being thrown away for little or nothing to be rid of it, this was not such an expensive salvage as might have been expected. Of course hay and silage are too expensive feeds to use regularly as the main reliance in wintering dry cows. Live stock husbandry in the North will never be on a really thrifty basis until feed production is increased to a point where a surplus of both roughage and concentrates will be habitually carried forward to meet such a situation as faced us in the autumn of 1922.

COST OF FEEDING MILCH COWS.—The quantities of feed required for the family milch cows, equivalent to the keep of one cow for 192 days, were as follows:—

Silage, 5,348 lbs. at \$10 per ton.....	\$26 74
Hay (trashy), 2,937 lbs. at \$10 per ton.....	14 68
Green feed, 2,032 lbs. at \$12 per ton.....	12 20
	<hr/>
	\$53 62
Feed cost per head per day (excluding salt).....	0 28

COST OF WINTERING CALVES.—From the grade herd purchased early in the summer, six calves were put into a box stall on December 1st but one was disposed of for baby (or veal) beef on January 23. For the purpose of mathematical average, therefore, the number of calves wintered may be set at 5½. Quantities and values figure out thus:—

Silage, 4,669 lbs. at \$10 per ton.....	\$23 35
Hay (trashy), 5,587 lbs. at \$10 per ton.....	27 93
Green feed, 3,995 lbs. at \$12 per ton.....	23 97
	<hr/>
	\$75 25
Feed cost per head, excluding salt.....	14 00
Feed cost per head per day.....	9-9 cents

The gains cannot be given in pounds but the calves throve reasonably well. Their average weight on December 20, 1922, some time after weaning, was 430 pounds.

FIELD HUSBANDRY

THICKNESS OF SEEDING GRAINS

Commencing in 1918, this experiment has been carried through six successive seedings. Frost marred the harvest the first year and various mishaps prevented a completely satisfactory comparison in the case of the barley until the past two seasons. The plan and scope of the project have been defined in previous reports. Rates of seeding and varieties employed will be found in the accompanying table.

Variations in the lay and natural quality of the land have so affected results as to permit only irresolute deductions, though, within the limits of the test, each half bushel added to the rate of seeding of oats seems to have advanced maturity by a day or so. The effect upon yield has been inconclusive. It would appear as though the precise quantity of seed committed to the ground were much less important than many other factors in determining the bounty of the harvest. Too thick seeding fines and shortens the straw. Excessively thin stands make up largely by stooling, though meanwhile the weeds have a little better opportunity to get started, and maturity may be slightly delayed.

The land where the plots were located in 1923 was the summer-fallow of 1922 on which oats sown in rows in July were inter-cultivated as a summer-fallow substitute. While germination was reasonably prompt throughout, growth and maturity were deferred by deficiency of moisture on the knolls, the field being somewhat undulating. The oats and wheat were drilled April 30; the barley May 1. If anything, the first two grains were drilled a shade thicker and the barley a shade thinner than specified.

Harvesting the barley and wheat commenced August 21 and was completed August 24, only the ripest blocks and a few opening swaths being cut the first day. Cutting of the oats commenced in the same way on August 25, concluding August 28 and 29.

THICKNESS OF SEEDING TEST WITH CEREALS, BEAVERLODGE, 1923
All plots $\frac{1}{4}$ acre in area

DESIGNATION (Varieties used in 1923)	Weight, total crop at threshing		Threshed grain per acre			Ratio grain to total crop		
	1923	Average 3 years 1921-1923	1923	Average 3 years 1921-1923	Average 5 years 1919-1923	1923	1923	Average 3 years 1921-1923
	lbs.	lbs.	lbs.	lbs.	bush. lbs.	%	%	%
<i>Wheat</i> —Ruby.								
Seeded at 5 pecks.....	4,836	4,926	1,968	2,184	38 39	48.57	40.69	44.33
“ 6 “.....	4,400	5,046	1,832	2,288	39 0	48.42	41.63	45.33
“ 7 “.....	4,188	4,960	1,820	2,267	39 51	49.40	43.45	45.71
“ 8 “.....	4,920	4,940	2,048	2,182	40 42	49.91	41.62	44.17
Averages.....	4,586	4,968	1,917	2,230	39 33	49.05	41.80	44.89
<i>Oats</i> —Banner.								
Seeded at 10 pecks.....	5,868	5,049	2,760	2,614	79 16	55.85	47.03	51.79
“ 12 “.....	5,680	4,933	2,520	2,485	78 23	54.80	44.36	50.37
“ 14 “.....	6,428	5,222	2,980	2,652	85 3	54.22	46.35	50.77
“ 16 “.....	6,600	5,125	2,400	2,346	79 24	52.01	36.36	45.78
Averages.....	6,144	5,082	2,665	2,524	80 25	54.24	43.37	49.67
	Weight, total crop at threshing		Threshed grain per acre			Ratio grain to total crop		
	1923	Average 2 years 1922-1923	1923	Average 2 years 1922-1923	Average 2 years 1922-1923	1922	1923	Average 2 years 1922-1923
	lbs.	lbs.	lbs.	lbs.	bush. lbs.	%	%	%
<i>Barley</i> —Trebil.								
Seeded at 4 pecks.....	5,816	4,328	3,064	2,353	49 1	57.81	52.68	54.36
“ 6 “.....	5,824	4,112	3,160	2,239	46 31	54.91	54.25	54.45
“ 8 “.....	5,684	4,282	3,116	2,302	47 46	51.66	54.82	53.75
“ 10 “.....	5,504	4,004	3,016	2,151	44 39	51.35	54.70	53.72
Averages.....	5,707	4,181	3,089	2,261	47 5	53.95	54.12	54.07

NOTE.—Varieties used:—

1918-1919.....	Marquis wheat,	Victory oats,	O. A. C. No. 21 barley.
1920.....	Huron “	Ligowo “	O. A. C. No. 21 “
1921.....	Huron “	Banner “	O. A. C. No. 21 “
1922.....	Ruby “	Victory “	Trebi barley.
1923.....	Ruby “	Banner “	Trebi “

DATE OF SEEDING CEREALS

Encroach of the variety plots left room for but one very simple comparison in dates of seeding of oats. This confirmed the deductions from field practice by emphasizing that in 1923 the date of occurrence of the rainfall greatly favoured deferred seedings of any crops not too late to mature ahead of the autumn frosts.

Average two plots Banner Oats, seeded April 28, 64 bushels.

Average one plot Banner Oats, seeded May 9, 90 bushels, 18 pounds.

The straw of the second plot was much stouter and taller than that of the first sowings. Oats sown still later were in turn better than the May 9 sowing, but no precise comparisons are available.

In 1922, only the first seedings had moisture for a reasonably early and complete germination. During neither of the past two seasons has anything developed to negative the several conclusions summarized in our 1921 report. (See pages 52 and 53, Experimental Substations, 1921.)

SEEDING WINTER RYE WITH SPRING GRAIN

Success having been met with on several occasions from cross-drilling winter rye on spring grain after the latter was nicely up, or, to be more precise, about a month after the spring grain was sown, the plan was repeated in 1922. On June 10 about five pecks of winter rye per acre were cross-drilled on portions of small plots of flax, Eureka beardless-hulless barley, and Liberty hulless oats, respectively, as well as across intervening check plots of fallow. The flax and oats had been seeded May 17, the barley May 19. Under the extraordinary drouth conditions that prevailed in 1922, the rye seeded among oats and barley made a very weak showing, though most of it started. It grew very much stronger among the flax.

For purposes of comparison, a parallel strip of rye was drilled September 26 across the stubble of adjacent areas of the spring-grain plots, covering also the intervening fallow strips that divided the strips of spring grain. This seed germinated in the autumn.

It was found in the spring of 1923 that where the rye had been sown June 10 on fallow, little of it remained. Possibly it had developed too far in the first season. The rabbits ate the top to the ground, leaving no winter cover whatever, and comparatively few crowns produced a growth in 1923. Where the rye had been cross-sown on the spring grain results were much better. The latter had held back the rye to a very weak growth, which certainly did not joint during the first season, and the spring-grain stubble contributed to winter protection by holding snow. Perhaps the best areas of all were those where the rye had been drilled in September, whether among stubble or on fallow.

On June 27 the plots were first mown for hay but owing to drouth the yields were trifling, the yield per acre from the fall-sown strip amounting to only 170 pounds per acre, while that from the June seeding was even less, although the portions sown among the grain at that time yielded very nearly as well as the patches sown among the grain stubble in September. July rains brought on a fairly good second cutting, which amounted to 3,580 pounds per acre from the September seeding, with the June seeding comparing proportionately about as before.

It would appear as though, under ordinary conditions, either plan of seeding, i. e., among spring grain after it is up or among its stubble in the autumn, were worthy of a trial.

INTERCULTIVATED ENSILAGE CROPS

Experiments planned under this head comprised date-of-planting tests with corn and sunflowers, thinning tests with the later and the usual comparison of hills versus drills in the case of corn. The land was an area where experimental grasses and clovers had been seeded with nurse crops in 1921. After producing very light hay yields in the drouthy summer of 1922, it was broken up on account of certain seeds of prolific annual weeds. Before being ploughed it was rather heavily spread during winter with cattle dung containing a minimum of litter, and after spring ploughing early in May, 1921, the furrow slice was worked down promptly with float and harrow, making a nice-looking seed bed. Nevertheless the surface soil so dried out that the germination of both crops was extremely scanty and irregular. What plants did start early were so preyed upon by cutworms that the majority were hopelessly set back or killed.

The tardy germination was largely attributable to the fact that the hundredth-acre experimental plots had been seeded with the garden drill, which failed to get the seeds down to the moisture. A field sown elsewhere with a

single-disc grain drill had nearly complete germination in May, while the garden-drilled area had only a few straggling plantlets until the latter part of June. This not only reduced yields to a ridiculously low figure but sadly marred comparisons, despite the care with which the work was conducted. The thinning of the sunflowers to various spacings was not proceeded with owing to the expectation of negative results as well as to the sudden pressure of work entailed by weeding after growing weather set in.

DATES OF PLANTING OF CORN AND SUNFLOWERS

Although in the date-of-planting tests with both corn and sunflowers all the plots came on practically together, thus precluding the chance of normal comparisons, nevertheless it is deemed well to tabulate the data. The average of a duplicate trial, embracing two varieties of field corn, seems to indicate a tendency to rather fuller maturity on the part of the May 14 planting, but a slightly better average development and corresponding yield from the second planting, made on May 21. None of the crops were badly frosted when harvested for the silo—this operation commencing September 13—though growth of corn had been arrested by a light frost on the morning of the 11th. The single-plot trial with sunflowers is inconclusive. It may be noticed that while the green-weight yields of both sunflower plots are identical, the second shows a slightly greater content of dry matter. This may have been due to accidental variation in the composition of the two-pound sample taken for dry-matter determination. Obviously a good deal depends upon the proportions of stalk, leaf, ear and tassel that are obtained.

DATE-OF-PLANTING TEST, CORN

In duplicate hundredth-acre plots with two varieties, viz., Northwestern Dent and Twitchell's Pride
Date of cutting, September 13.

Designation	In tassel	In silk	Average height	Tallest stalk	Green weight per acre	Absolute dry matter per acre
	%	%	ins.	ins.	lbs.	lbs.
<i>First date (May 14)—</i>						
Northwestern Dent.....	95	2	42	55	9,000	2,009
Twitchell's Pride.....	95	3	43	62	11,400	2,321
Averages.....	95	2.5	42.5	58.5	10,200	2,165
<i>Second Date (May 21)—</i>						
Northwestern Dent.....	80	0.5	40	55	11,100	2,794
Twitchell's Pride.....	95	0.5	46	53	9,500	1,788
Averages.....	87.5	0.5	43	54	10,300	2,291

DATE-OF-PLANTING TEST, SUNFLOWERS

In single hundredth-acre plots. Variety: Early Ottawa 76
Cut September 17 and 18

Date of planting	In bud	Showing yellow	Average height	Tallest stalk	Green weight per acre	Absolute dry matter per acre
	%	%	ins.	ins.	lbs.	lbs.
First date (May 12).....	100	40	38	52	12,650	3,033
Second date (May 21).....	99	40	40	56	12,650	2,922

NOTE.—Owing to shallow seeding with garden drill both plots failed to germinate until rains of June 10.

CORN IN HILLS VERSUS DRILLS

Six varieties and strains were compared severally in hills versus drills, the hills being, through the miscalculation of an operator, spaced about four feet apart in the rows instead of three feet as intended. Rows in all cases were three feet apart.

There seems to have been a tendency at Beaverlodge for drills to outyield hills, so far as can be deduced from the limited experiments conducted. The 1923 results are in accord with this general tendency. While the average percentage figures of tasseling and silking appear to denote an advantage of the hill plots in respect to maturity and maximum height, the ampler stand of the drills gives them a great preponderance in yield of green weight, accompanied, apparently, by a higher percentage content of dry matter, the percentage figures in this regard standing as 18.70 per cent; 19.44 per cent. This latter detail is rather surprising yet difficult to account for satisfactorily on a mere hypothesis of experimental error.

TEST OF HILLS VERSUS DRILLS

Six varieties. Two one-hundredth-acre plots of each. Planted May 14, cut September 13. (Hills spaced four feet apart in the rows.)

Method of planting, and variety	In tassel	In silk	Average height	Tallest stalk	Green weight per acre	Absolute dry matter per acre	Ratio Absolute dry matter to green weight
	%	%	inch.	inch.	lbs.	lbs.	%
<i>Hills—</i>							
Yellow Dent Divers Pride (Lot 1015).	80	10.0	44	62	2,900	601	
Northwestern Red Dent (Lot AB).	5	1.0	45	67	4,300	770	
Disco Longfellow (Lot 1099).....	1	0.00	44	64	3,750	678	
Compton's Early (Duke).....	1	0.25	46	66	4,200	739	
Longfellow (Duke).....	2	0.25	44	59	4,450	794	
Northwestern Dent (McDonald) (15-772).	99	25.0	41	63	5,850	1,204	
Averages (6 plots).....	31.3	6.0	44	63.5	4,261	797	18.7
<i>Drills—</i>							
Yellow Dent Divers Pride (Lot 1015).	20.0	1	43	56	8,600	1,833	
Northwestern Red Dent (Lot AB).	10.0	1	44	66	14,500	2,884	
Disco Longfellow (Lot 1099).....	0.0	0	43	58	8,600	1,590	
Compton's Early (Duke).....	0.0	0	45	63	8,500	1,553	
Longfellow (Duke).....	0.5	0	43	61	9,300	1,594	
Northwestern Dent (McDonald) (15-772).	90.0	10	42	56	10,100	2,137	
Averages (6 plots).....	20.0	2	43.3	60	9,933	1,931	19.44

YIELDS OF CORN VERSUS SUNFLOWERS

A fairly good opportunity to compare yields and adaptability of corn and sunflowers in a general way was afforded by abutting ranges of these two crops grown under closely similar conditions of soil and preparation as described at the outset. Each range comprehended variety and cultural experiments in nearly equal proportion. The variety employed in the cultural tests with sunflowers was chiefly the Russian Giant, seed for which was obtained from a local commercial source. The cultural experiments with corn comprehended six or seven

of the better-adapted kinds. Averaging fifty-three plots of corn against fifty-four plots of sunflowers, we get this result:—

Kind of crop	Green weight per acre	Absolute dry matter per acre	Ratio dry matter to green weight
	lbs.	lbs.	%
Average 53 plots corn.....	7,718	1,559	20.19
Average 54 plots sunflowers.....	12,999	3,299	25.37

It will be noted that the ratio of dry matter to green weight stands higher in the sunflowers than in the corn. The cause of this reversal of usual experience cannot be positively explained though three or four relevant facts may be stated:—

- (1) The corn was very immature.
- (2) After the frost of September 11 the corn was more promptly cut by several days.
- (3) Being fine-stemmed and immature, the sunflowers were to an unusual degree wilted by the light frost which had stopped the growth of the corn, and having several days more in which to dry out may have lost relatively more sap than did the corn.
- (4) The field notes do not make it perfectly clear whether or not the sunflowers were as promptly weighed after cutting as was the corn, but the difference, if any, could not have been very great.

As already explained, the germination and early growth of sunflowers was much better in the field than in the one-hundredth-acre plots, the field yield averaging about eight tons per acre in spite of drouth and cutworms, with some portions much higher than this. A sample of this crop analyzed 25.84 per cent dry matter, as against 18.56 per cent from a very immature plot that had been seeded June 23.

CUTWORMS ATTACKING SUNFLOWERS

During the early-summer drouth it was noticed that the sunflowers were being eaten back by some insect. Close examination proved it to be the Black Army Cutworm. Instead of severing the stem as per usual method of cutworm attack, it gradually consumed the leaf and afterwards the bud and stem, working in from the edge of the leaf. Repeated late-evening applications of cutworm bait completely arrested the attack. A dozen plants in various stages of consumption were staked and records kept. Subsequent examination showed that all those recovered which did not have the terminal bud eaten away.

BROADCAST ANNUAL FORAGE CROPS

Both summer-fallow and stubble-ground preparation were employed in a test to compare oats alone against oats and varying combinations of peas and vetches and these against rape. On the summer-fallow area there was room also for a variety test with millet, and the average of five kinds of millet is set down for comparison with the yields of the other crops involved. The rape was not weighed. Being sown broadcast it made a rather scant growth and in the autumn prairie chickens attended all too willingly to the harvesting, assisted very capably by rabbits during the winter.

In the o. p. v. (that is, a mixture of oats, peas and vetches), combinations the plan was as follows: One plot was sown on June 3 with Banner oats at two

bushels per acre. Next this was a plot drilled to peas at $1\frac{1}{2}$ bushels, the peas being inoculated with culture, then a plot drilled to common vetches at 36 pounds per acre; and, fourth, a plot drilled to a mixture of about one bushel peas and 20 pounds vetches per acre. Across the north ends of the legume plots, oats were immediately cross-drilled at five pecks per acre. The south halves of the legume plots were left until June 19, by which time the peas and vetches were nicely up, especially on the fallow land. These areas were then cross-drilled to oats at five pecks per acre, the drill being run shallow whereas the legumes had been purposely sown somewhat deeply. Growth was very heavy on the fallow area and passable on the stubble ground as well. On August 4 the following notes were taken on the summer-fallow range:—

“Oats alone, perhaps 60 per cent in head.

“Perhaps 25 per cent of peas in bloom.

“Vetches commencing to bloom.

“Late-drilled oats (on south ends of mixed plots) not heading at all.”

In general, it seemed that where the oats and legumes had been sown synchronously, the former, as usual, largely got the better of both peas and vetches. Where the oat seeding had been deferred sixteen days, the peas rather swamped the oats, while the oat-vetch mixture appeared to work out fairly well this way. A good deal seems to depend in each case upon season and upon the promptness of germination of the grains employed. Other things being equal, the smaller-seeded vetches do not seem to compete with oats as well as do peas, when both legumes are inoculated.

After practically eliminating border effects, the crops on the summer-fallow range were cut with scythe and mower on September 11, immediately forked into coils and weighed the next day. Promptly after weighing, two-pound samples for dry-matter-determination were put in the trays, these samples being taken from composites of twelve to fifteen pounds of cut stuff representing the crop of each plot. The millets had been singed and the legumes slightly dried by the frost of the morning of September 11. On the stubble range the plots were not cut until the 12th and here the frost effect on the legumes was more noticeable than on the ranker range, cut the day immediately after the frost occurred.

In harmony with previous results, the heaviest yield is obtained from the straight oats, and if we confine attention to the column of absolute dry matter the remaining crops range in order thus: Peas and oats; o. p. v. mixture; oats and vetches; millet. It may be noticed that the average dry-matter yield of five kinds of millet was only a little more than half as much as that of oats. Millet at Beaverlodge has never been a productive crop, and although the season of 1923 was exceptionally favourable to it, the tabulated comparison brings this out, especially in the column of dry-matter contents. It is, besides, very susceptible to touches of summer frost.

TABLE COMPARING OATS AND OAT-LEGUME MIXTURES WITH MILLET, ALL AFTER SUMMER-FALLOW PREPARATION. CROP OF 1923

Crop	Green weight per acre	Absolute dry matter per acre	Ratio dry matter to green weight
	lbs.	lbs.	%
Oats only.....	17,876	8,183	45.77
Oats and peas (average 2 plots).....	14,081	6,554	44.04
Oats, peas and vetches (average 2 plots).....	15,245	6,346	41.63
Oats and vetches (average 2 plots).....	15,330	6,151	40.12
Millet (average 5 varieties).....	11,980	4,245	35.42

A further table brings together the results of the oat-only and oat-legume plots in both the summer-fallow and stubble-ground ranges. This table confirms once more the superior yielding capacity of oats under practically all conditions and goes to emphasize the difficulty of timing the seeding so as not to handicap either the oats or the pulse. It would appear that for average conditions where germination was fairly prompt, about a week's delay in seeding the oats after the peas would be likely to work out as satisfactorily as any system, and that for the vetch combinations a two-weeks' delay in drilling the oats would seem about right. However, the data as yet are insufficient to establish this inference positively.

YIELDS FROM SUMMER-FALLOW VERSUS STUBBLE GROUND

Quite an interesting comparison lies between the yields of the summer-fallow and the stubble-ground ranges. Taking the dry-matter column as the truer basis of comparison and averaging yields of all the oat and oat-legume plots, we find an average dry-matter yield of 6,808 pounds per acre from the summer-fallow as against 3,463 pounds per acre from the stubble ground, or practically twice as much.

It is planned to follow up this test in 1924 by devoting the area to a block of cereals designed to compare the residual effects of the crops now under consideration.

TABLE COMBINING THE RESULTS FROM OATS AND OAT-LEGUME MIXTURES ON BOTH SUMMER-FALLOW AND STUBBLE-GROUND RANGES

Crop	Green Weight per Acre—Pounds			Dry Matter per Acre—Pounds		
	After fallow	After stubble	Average	After fallow	After stubble	Average
Oats only.....	17,876	6,720	12,298	8,183	3,541	5,862
Oats and peas—oats sown early.....	12,558	6,720	9,639	6,222	3,548	4,885
Oats and peas—oats sown late.....	16,805	6,782	11,793	6,886	2,961	4,923
Average oats and peas plots.....	14,681	6,751	10,716	6,554	3,254	4,904
Oats and vetches—oats sown early.....	11,427	8,960	10,193	5,477	4,418	4,947
Oats and vetches—oats sown late.....	19,233	5,724	12,478	6,826	2,588	4,707
Average oats and vetches plots.....	15,330	7,342	11,336	6,151	3,503	4,827
Oats, peas and vetches—oats sown early.....	11,427	6,658	9,042	5,760	3,343	4,551
Oats, peas and vetches—oats sown late.....	19,064	9,209	14,136	6,933	3,765	5,349
Average oats, peas and vetches plots.....	15,245	7,933	11,589	6,346	3,554	4,950

HORTICULTURE

While it must be admitted that many of the most desirable plants are not hardy enough to flourish in the North without some fostering care, it is gratifying to find that with reasonable attention practically all Grandmother's favourite flowers, grown in an early day in Eastern Canada, are available to embellish Peace River gardens. Where the dahlia, paeony, rose, and gladiolus will bloom, who need lack an attractive home? Various species of trees, shrubs and vines may complete the setting. These with small fruits and a wealth of the choicest vegetables are to be had by nearly everyone who will comply with the conditions; and the watering-can is not one of these. Too often its puny contribution is relied upon where a little forethought, decomposed manure and a muscular application of the hoe would be much more to the purpose.

It is gratifying to record that for the second successive season seedling apples have been matured by Mrs. Mary Thompson on Bear Lake, Grande Prairie, in defiance of cold winters, dry summers and rabbits. It is true the apples were small and inferior, as seedlings so often are, but the fact that they have ripened is rich with promise of better things to follow.

The Beaverlodge Station is pleased to have been the means of starting many settlers in small fruits at widely-scattered points throughout the Upper Peace River country. Typical of the appreciation manifested is this report of a soldier settler:—

“From a dozen strawberry plants we got from you in 1919 we now have a good-sized plot and sold two hundred pounds of fruit last year, after having all we wanted for our own use. The raspberries and currant cuttings have also done well.”

The work in the garden is under the charge of Mr. P. Flint, the gardener, who has prepared several sections of the Horticultural Report.

POTATOES

Three hundred plots of potatoes were grown on the Beaverlodge Station in 1923. Some of the experimental work is along original lines, while all is directed to the solution of important problems in Northern culture. Comparison of varieties and selected strains thereof; of dates of planting, size of sets, and treatment of seed as to sprouting, and so forth, comprehend the major efforts.

In the case of variety and strain tests, the field data are followed up by cooking trials, all made, by preference, with snow-water, because it is more uniform in composition and effect upon vegetables than well-water, the latter carrying a small percentage of soda compounds, which darkens vegetables. As snow-water was not available until well on in the winter, the cooking trials are not complete as this report is written.

By reason of early drouth and deferred autumn frosts, cropping results were in some cases very erratic, and call for careful interpretation. Fortunately the field notes were more than usually full. In many patches the soil was so dry in May and early June that the seed tubers lay long before vegetating. In the main experimental potato area, where May 1 ploughing spelled dearth of moisture, there was little growth until July. In the garden, where earlier ploughing and tillage had conserved the scanty moisture supply, some growth occurred in June and the yields of plots here entirely eclipsed those in the main field, though the latter were grown under conditions, which, with a more favourable season, should have resulted in large yields also. Careful analysis seems to warrant the deduction that, while in a district where maturity is often forestalled by fall frosts, the choice of early varieties and methods of advancing maturity by sprouting, or otherwise, generally increases the yield, yet exceptions

occur when periods of unfavourable weather intervene to restrict development at critical stages. A vigorous top growth is necessary for a full yield of potatoes, but it must be attained in time to allow several weeks of tuber expansion between blossoming and autumn frosts.

UNSATISFACTORY EXPERIMENTAL CONDITIONS IN 1923

The land where the variety test and all the cultural experiments but one were located had been under grain in 1921, seeded down to hay plots. On account of weeds most of these plots were ploughed up in 1922 and the land fallowed, though a part of the area occupied by the third range remained in grass and clover plots until the spring of 1923. As the sod was a light one and as topography favoured this portion, the delay in ploughing did not seem to affect the potato crop so very seriously. Indeed the third range, taken as a whole, had a better growth than the first two, thanks to several factors.

A heavy coat of fresh cattle-dung, containing very little litter, was spread on the snow during the winter, except on part of ranges 1 and 2, which was covered in the spring after the ground had firmed up sufficiently to carry a wagon. The manure was all ploughed under about the first of May, the land being well floated, disked and harrowed. Owing to variations in contour and dates of applying the manure, there was a marked difference in the amount of subsoil moisture from point to point, but as most of the tests were in triplicate and very carefully planned to minify the factors of variability in conditions, it is felt that the best possible has been done in the circumstances.

In view of the ploughing under of a very heavy coat of fresh manure, a few words about scab may be in order here. On the whole, there was very little of it, but certain restricted areas showed rather pronounced affection. It was common to find a variety perfectly clean in two ranges and in part of the third plot, while the remainder of said plot turned out a more or less scabby crop. As the seed in each instance had all been of the one run, treated, and uniformly handled, no factor but soil conditions could account for the contrasts. No variety was scabby throughout, but in those areas where scab occurred some kinds were much worse affected than others. No specific generalization can be attempted as to the favouring or adverse conditions. The land varied a good deal in nature and quality, while slight undulations accounted for a great fluctuation in the percolation of snow-moisture.

The seed for the different tests was soaked in formaldehyde at different dates, some late in April, others early in May, and put to sprout for a short time before planting. The tubers were then cut mostly to two-eye sets (except in the size-of-set experiment) and covered as promptly as possible. In each case the weight of seed used was recorded. It varied slightly, however, according to the time elapsing between cutting and planting, as well as other factors. The sets were usually dropped about fifteen inches apart in furrows opened three feet apart and three inches deep, with a scuffler having the side shovels removed. Planting of the variety plots commenced on May 14 and concluded the next day, save for one new strain of Irish Cobbler, seed for which was late in arriving. The cultural experiments, other than the date of planting test, were completed immediately afterwards. All the potatoes were dry and free of dirt at gathering, but nevertheless a uniform deduction of five per cent for tare was made from all that were weighed. Marble-sized tubers and those noticeably affected by frost were not picked up, but certain varieties had a good many tubers that softened after weighing, and these, unfortunately, had been counted in the yield. Whilst the tare deduction would likely cover these, yet it is hardly fair to make a uniform deduction for a loss that was not uniform. It is, however, impossible now to revise the figures accurately.

VARIETY TESTS

Contradiction ran rampant through the variety tests. Several of the best proven kinds dropped to a low level in the yield table, while others did uncommonly well. Among the latter were both extra-early and extra-late varieties, some of which had previously yielded poorly.

Conspicuous among the 1923 disappointments was Country Gentleman, which had won a favoured position on the Station because of high yield, comparative earliness and excellent quality, not to mention minor attributes. Why this and certain other kinds should have fallen down in 1923 while less esteemed sorts rose to the top is a question that suggests various hypotheses without fully satisfying any.

Soil variation is the first to be considered; but though there was much variation, yet the layout largely equalized matters as among varieties, and in the cases under discussion the reasonable consistency of the comparisons throughout three ranges indicates that the chief cause of the reversals must be sought in some other factor than soil variation.

Field notes throw some light on the matter. They show that the stand of the Country Gentleman in particular was very imperfect and the top growth relatively poor, especially in the first and second ranges, where the vines of all varieties were inferior to those in the third. Furthermore, a noticeable amount of an affection, taken to be black leg, developed in this variety, particularly in the first range. This is a disease that used to be present on the Station, but of late years had been pretty well controlled by formaldehyde treatment of the seed. Why not more perfectly in 1923?

This leads back to inquiry into the conditions of seed storage. Experience appears to suggest that storage conditions may be an important factor affecting the behaviour of varieties from season to season.

By way of emphasizing the vagaries of variety testing and the need for great circumspection in drawing conclusions, attention is directed to the results of the supplementary variety test of early potatoes, where the Country Gentleman showed up among the best in yield—much better, relatively, than in the main variety test. It may be of significance that this supplementary test was planted five days ahead of the other and with much better-sprouted seed, the tubers for it having been brought out of the cellar in April.

FROST INJURY IN THE GROUND.—Another disconcerting fact developed by the 1923 harvest was the special susceptibility to autumn frost-injury revealed by several of the favourite white potatoes, notably Carman No. 1, Gold Coin and Empire State, with lesser degrees exhibited by some other kinds.

On the night of September 21, following a light fall of snow which moistened the surface of the ground, a temperature of 24° Fah. was recorded. As the potato drills had been lightly moulded no particular injury to the tubers was anticipated, yet at digging it was discovered that 14 or 15 per cent of the Carman No. 1 were affected, including a large per cent of the biggest and best-formed tubers. In Gold Coin the loss was estimated at 10 per cent and in Empire State fully 8 per cent. About half the loss was not apparent and therefore not allowed for when weighing but was noticed later when dumping the sacks, the soft ones being then, of course, thrown out. Curiously enough, the red potatoes, most of which cluster about the base of the vines, escaped with a trifling percentage of loss.

DIVERSE STRAINS OF IRISH COBBLER.—Through the offices of the Potato Inspection Service of the Division of Botany, four certified Maritime Province strains of Irish Cobblers were tested against the strain obtained in 1918 from Lacombe and since propagated at Beaverlodge. As received, these were all fine clean potatoes but resembled the Lacombe strain in type about

as much as Wee McGregor resembles Table Talk. The purple blossom was the chief feature in common. The Lacombe strain is very shapely, smooth, and shallow-eyed but is rather late, and prone to produce an overly-large number of small specimens. The new strains are much deeper-eyed, rougher and earlier. Though they were planted with less fully sprouted seed and did not commence to bloom much earlier than the Lacombe strain, an autumn photograph shows their tops ripe and recumbent when the tops of the old strain were as rank and green as those of the Table Talk near by. As to yield, the figures are quite inconclusive, since the quantity of seed of the new strains did not in many cases permit even a duplication. A fairer comparison should be possible in 1924.

FAVOURITE EARLY POTATOES.—As an early potato the old reliable Early Rose continues to give a first-class account of itself, rather excelling Early Ohio in yield, size and edible quality. Other good early kinds are Houlton and Everitt Rose, Early Hebron, Extra Early Eureka, and Bovee. Even Country Gentleman may be catalogued in this group, although not so early as some others. Bovee and Country Gentleman, by the way, resemble each other closely in the bin. Perhaps the earliest on the list is Extra Early Eureka, which has the advantage, from a market standpoint, of being white. In point of cooking quality, however, the Station staff and employees prefer the Rose, notwithstanding the occasional red discoloration of its flesh. This variety has long been grown in the North with excellent satisfaction as a main cropper and is still to be recommended as such in districts where early fall frosts are troublesome.

To test some of these potatoes as early croppers a supplementary variety test was run, but for various reasons most of these did not get dug until mature.

For three years past an interesting comparison has lain between two strains of Empire State obtained originally from the Experimental Stations at Lacombe, Alberta, and Scott, Saskatchewan, respectively. Though essentially similar, chance accounted for some little fluctuation from year to year, but it will be noticed that on the average of three years' work there is only one pound difference in the per acre yield.

From the standpoint of table quality, nothing at Beaverlodge has yet surpassed Wee McGregor. Unfortunately, it does not stand high in the yield column.

Iron Chief and Table Talk are two late varieties which, for some reason, did exceptionally well in 1923. They are not recommended for the North as reliable main croppers, however, unless in exceptionally favoured districts. Of the remainder of the thirty-three varieties and recognized strains it may be wise to reserve comment.

POTATO TABLE No. 1—VARIETY TEST, BEAVERLODGE, 1923

Variety	1923 Data										3-year average yield per acre, 1921-23 bush. lbs.	6-year average yield per acre, 1918-23 bush. lbs.
	Colour (White, red)	Eyes (shallow, medium, deep)	Shape	Size (small, fair, good, large)	Scab %	Marketable %	Frosted %	Seed planted per acre lbs.	Yield per acre bush. lbs.			
Agassiz Special.....	W.	m. to s.	good and uniform.	f. to g.	9	94.6	3	600	204.46	187.17	..	
American Wonder.....	W.	shallow	good and uniform.	f. to g.	0-3	89.0	5	766	206.21	197.27	..	
Boves.....	R.	medium	good and uniform.	large	3-3	97.0	..	816	264.56	..	..
British Queen.....	W.	shallow	good	small	13-3	75.0	..	733	209.0	..	..
Carman No. 1.....	W.	shallow	good	s. to g.	25-0	92.3	14	718	217.58	169.43	..	
Country Gentleman.....	R.	s. to m.	good	s. to l.	0	96.3	2	766	177.20	172.12	250.13	
Cowhorn.....	Y/W.	shallow	curved	very s.	1-3	43.3	..	600	121.23	..	..
Bliss Triumph (Early Bermuda)	R.	deep	rounded	f. to s.	3-3	73.3	..	566	197.55	145.49	..	
Early Hebron.....	R.	m. to s.	f. to g.	f. to g.	1-3	96.6	..	783	238.1	193.51	..	
Early Northern.....	R.	medium	fair to rough	f. to l.	0	98.0	..	616	210.35	192.29	274.13	
Early Ohio.....	R.	s. to m.	good	f. to g.	3-3	93.6	..	733	256.30	193.4	..	
Early Rose.....	R.	medium	good	good	0	96.6	..	633	239.5	177.32	245.16	
Empire State (Scott)	W.	shallow	good	good	16-6	94.0	8	600	216.23	200.7	..	
Empire State (Lacombe)	W.	m. to s.	good	f. to l.	3-0	96.6	8	700	208.28	200.8	..	
Epicure.....	Y/W.	m. to d.	good, roundish	f. to g.	3-3	92.0	..	683	242.46	174.38	..	
Everitt Rose.....	R.	s. to d.	good	f. to l.	0	95.3	..	583	270.45	199.34	..	
Extra Early Eureka.....	Y/W.	m. to d.	rough and roundish	fair	13-3	94.2	3	816	268.6	177.54	..	
Gold Coin.....	W.	shallow	good	s. to g.	9-0	94.6	10	783	217.58	183.7	249.18	
Green Mountain.....	Y/W.	deep	rough and roundish	f. to g.	4-0	95.0	2	750	269.10	..	..
Houlton Rose.....	W.	shallow	good and uniform	f. to l.	3-6	95.6	2	616	214.48	178.3	..	
Irish Cobbler (Estabrook)	W.	deep	good	good	0	96.0	..	616	242.46	210.5	..	
" (Fawcett)	W.	deep	uniformly rough	fair	40-0	96.0	..	258.5	258.5	..	..
" (Lacombe)	W.	m. to s.	good and smooth	f. to g.	10-0	75.0	..	221.40	221.40	..	..
" (McGregor)	W.	deep	uniformly rough	f. to g.	18-3	93.6	2	682	241.11	201.58	240.16	
" (Scates)	W.	deep	uniformly rough	f. to g.	20-0	90.0	..	725	238.17	..	..
Iron Chief.....	W.	shallow	good and uniform	small	15-0	89.5	..	575	218.30	..	..
Manitoba Wonder.....	W.	shallow	good and uniform	good	21-6	83.3	2	750	242.46	..	..
Morgan Seedling.....	R.	m. to d.	good, rather rough	good	5-0	86.0	..	766	225.21	..	..
Netted Gem.....	W.	m. to s.	good and uniform	good	20-0	94.3	3	616	221.8	181.55	..	
Red King.....	Russet W.	m. to s.	oblate oval	fair	0	85.0	..	600	153.35	..	..
Table Talk.....	R.	shallow	good	small	35-0	50.0	..	900	118.45	..	..
Wee McGregor.....	W.	shallow	good	s. to g.	9-0	82.0	2	666	260.11	214.30	238.7	
	W.	shallow	good	f. to g.	10-3	94.0	5	683	185.46	164.13	216.29	

Note.—The Estabrook, Fawcett, McGregor, and Scates strains of Irish Cobbler, as well as the Red King and Netted Gem, were not tested in triplicate, and yield comparisons of these are inadmissible.

POTATO TABLE NO. 2—BEAVERLODGE, 1923

Supplementary Variety Test to compare varieties from an early-market standpoint. Planted May 9th with well-sprouted seed on high unmanured land. Not dug until matured. Average yield per acre of duplicate plots, each 1/141 acre.

Variety	bush.	lb.
Bovee.....	224	22
Country Gentleman.....	251	10
Bliss Triumph.....	225	29
Early Hebron.....	232	11
Early Ohio.....	224	22
Early Rose.....	192	0
Epicure.....	265	40
Everitt Rose.....	253	24
Extra Early Eureka.....	266	47
Houlton Rose.....	224	22
Manitoba Wonder.....	218	47

DATE-OF-PLANTING TEST

In 1918 a date-of-planting test was undertaken to compare the results from weekly plantings of potatoes, commencing as soon as the land was fit



A row of Country Gentleman potatoes in the "Date-of-Planting" test. Planted June 1 with seed that had been sprouting for six weeks. Yield of dry matter per acre 6,145 pounds as against 3,765 pounds from the adjoining row planted with non-sprouted seed.

to work in the spring and continuing until the first week in June. The average results decidedly favoured early planting.

In 1921 the scope was expanded by introducing a sprouting test in this wise: Upon the date of the initial planting, a sufficient quantity of seed was "pickled" and set aside to complete the series. Half the tubers were put to sprout in trays in a light upstairs room, the balance being returned to the cool, dark root cellar where they would remain dormant, or nearly so, until planted. Thence forward one row per week would be planted with non-sprouted seed from the root cellar and an adjoining row with sets cut from

potatoes which had been sprouting in the interval. It was especially desired to learn whether in the case of unfavourable May weather more might not be gained by delaying planting and sprouting the seed tubers meanwhile in a light, warm place. Three years' data now available indicate that such may sometimes be the case. Furthermore, analyses systematically made by the Division of Chemistry, Central Experimental Farm, Ottawa, indicate that the percentage of dry matter usually varies substantially according to yield, so that, multiplying yield and percentage together, we find that the weights of dry matter produced per acre confirm emphatically the deductions from the field data.

GAPS IN EARLY-PLANTED ROWS.—The 1923 experiment was conducted on garden land into which a dressing of well-rotted manure was ploughed as early as possible in the spring, the land having grown vegetables in 1922. A fair amount of moisture was available, but growth was inconsiderable during May and the forepart of June, and there were a few misses in all the earlier-planted rows, a condition quite unusual in this experiment. The variety used was Country Gentleman. Yields were calculated upon the harvested weight of 1/88th-acre row-plots, after rejecting frosted tubers (which, by reason of protruding size, were rather numerous) and making a further general reduction for tare. Remembering these facts and the very limited amount of total summer precipitation, the yields must be considered very good indeed.

DR. SHUTT'S COMMENTS.—Reporting to the Station the chemical determinations upon the 1923 crop, Dr. Frank T. Shutt, Dominion Chemist, observes:

“This work, carried on in three successive seasons, gives ample and satisfactory proof that in respect to non-sprouted sets larger amounts of dry matter per acre are obtained from the earlier-planted crops. The reverse appears to be the case in the ‘sprouted’ series, the weight of dry matter per acre in 1923 increasing with the advance in date of planting from April 28 to June 1, the results more or less closely following the yield-per-acre data.”

As covering the whole six years' work, it may be said that the average of all the results to date signifies the importance of taking rather full advantage of a somewhat reluctant growing season, either by early planting or by sprouting or by both, although bearing in mind that in certain peculiar seasons the too early planting of strongly sprouted sets may partially defeat its object by securing too large a proportion of the vine growth in a period of unfavourable weather.

PRESENTING TOTAL YIELDS AND WEIGHT OF DRY MATTER PER ACRE FROM THE DATE-OF-PLANTING TEST.
VARIETY COUNTRY GENTLEMAN

Date of Planting	Condition of Seed	Yield	Yield	Per cent dry matter	Pounds dry matter per acre
		per acre	per acre		
		lb.	bush. lb.		
1st—April 20.....	Not sprouted.....	26,166	436 6	23.96	6,267
2nd—April 28.....	Not sprouted.....	27,671	461 11	21.89	6,057
2nd—April 28.....	Sprouted, 1 week.....	19,896	331 36	22.81	4,539
3rd—May 4.....	Not sprouted.....	25,080	418 0	20.77	5,210
3rd—May 4.....	Sprouted, 2 weeks.....	22,739	378 59	23.15	5,264
4th—May 10.....	Not sprouted.....	22,906	381 46	20.41	4,676
4th—May 10.....	Sprouted, 3 weeks.....	23,408	390 8	22.47	5,260
5th—May 19.....	Not sprouted.....	19,144	319 4	19.88	3,806
5th—May 19.....	Sprouted, 4 weeks.....	25,247	420 47	21.73	5,488
6th—May 25.....	Not sprouted.....	19,478	324 38	21.39	4,167
6th—May 25.....	Sprouted, 5 weeks.....	28,173	469 33	20.05	5,648
7th—June 1.....	Not sprouted.....	18,308	305 8	20.56	3,765
7th—June 1.....	Sprouted 6 weeks.....	27,838	463 58	22.08	6,145

COMPARING YIELDS OF TOTAL CROP PER ACRE AND ALSO YIELDS OF DRY MATTER PER ACRE FROM NON-SPROUTED AS AGAINST SPROUTED SETS, DATE-OF-PLANTING TEST

Date of Planting	Yield per Acre		Yields of Dry Matter per Acre	
	Non-Sprouted	Sprouted	Non-Sprouted	Sprouted
	lb.	lb.	lb.	lb.
April 20.....	26,166	.....	6,267	.....
April 28.....	27,671	19,896	6,057	4,539
May 4.....	25,080	22,739	5,210	5,264
May 10.....	22,906	23,408	4,676	5,260
May 19.....	19,144	25,247	3,806	5,488
May 25.....	19,478	28,173	4,167	5,648
June 1.....	18,308	27,838	3,765	6,145

POTATO SPROUTS

Antedating and usefully supplementing the incidental sprouting comparison included in the Date-of-Planting Experiment, there are several interesting tests relating to various phases of the sprouting question.

BREAKING OFF CELLAR SPROUTS AT PLANTING.—A triplicate test under this head yielded results consistent with five previous findings. Early Northern potatoes, bearing fairly long white sprouts were taken from the house cellar and cut to sets averaging two or three eyes apiece. From half these sets the cellar sprouts were broken off close to the tuber. These were saved to plant a row by themselves. The other half of the tubers were planted with the white sprouts attached, or as many of them as would remain with reasonably careful handling. In the comparison of sets, with versus without white sprouts, the gains from leaving the latter on were, respectively, 42 bushels 45 pounds; 55 bushels 25 pounds; and 79 bushels 10 pounds, the average being 59 bushels 7 pounds per acre, or 18.9 per cent.

As for the white sprouts broken off and planted by themselves, evidently these perished before conditions were favourable for them to take root. In the wet summer of 1920 such sprouts had given from one-half to two-thirds of a crop. In 1922 when there was moisture enough to start the crop but a dearth of it soon afterwards, the sprout row produced one-sixth of a crop. In 1923, only two or three weak tops appeared in the whole row and not a single marketable tuber was produced. Evidently it is better to leave the cellar sprouts on the seed sets, for in six years' trial the average disadvantage of breaking them off has amounted to 22.4 per cent.

BREAKING OFF VERSUS LEAVING CELLAR SPROUTS ON WHEN PLANTING. AVERAGE RESULTS OF A TRIPPLICATE TEST. VARIETY EARLY NORTHERN

Designation	Yield per acre lb.
White sprouts left on at planting.....	18,715
White sprouts rubbed off at planting.....	15,168
White sprouts only, no flesh attached.....	0
Advantage of leaving white sprouts on over rubbing off.....	3,547
Per cent disadvantage of breaking off white sprouts.....	18.9%
Percentage of a full crop produced by white sprouts only, no flesh attached.....	0

Chronologically, the record now stands:—

LOSS IN YIELD FROM BREAKING OFF WHITE SPROUTS AT PLANTING	
	p.c.
1915.....	15.0
1919.....	18.0
1920.....	33.8
1921.....	21.0
1922.....	27.8
1923.....	18.9
Average loss in six years' results.....	22.4

GREEN VERSUS WHITE VERSUS NO SPROUTS.—To compare green-sprouted seed potatoes, cellar-sprouted ones, and dormant tubers taken direct from the cool, dark, root cellar, a very interesting experiment was started in 1920. During the past two years it has been conducted in triplicate, using the Country Gentleman variety. A couple of rather pronounced inconsistencies now mar the tenor of the earlier results and point a suggestive finger of inquiry back to seed-storage conditions.

In 1921, one of the plots planted with white-sprouted sets produced an unaccountably large yield, throwing the balance of advantage that time in favour of white as against green sprouts. A correspondingly abnormal out-turn of one 1922 plot planted with dormant seed introduced a contradiction, causing the non-sprouted tubers that year to surpass the cellar-sprouted ones in average yield. These two abnormal yields, rather counter-balancing each other, left the average of three years' work showing a decided benefit from sprouting and an appreciable degree of advantage in favour of green as against white sprouts.

Come, now, the 1923 returns, showing still a large advantage of green sprouts over dormant sets, but a very inferior result from white sprouts, the rows representing these being in every one of the three comparisons more or less ragged in stand and low in yield, the average of the three being 33.1 per cent below the average of three parallel rows planted with dormant tubers. In view of the data conveyed in the preceding table, this is a rather puzzling result. One ray of light upon it seems to be shed by the failure of detached white sprouts to produce any crop in 1923. Possibly in a good many cases the white sprouts, even when attached to sections of potato, decayed before growth took place, and it is understandable that such a set, having given part of its substance to produce a sprout which in the end availed it nothing, would be at a disadvantage in comparison to one whose whole energy had been conserved until conditions were favourable to sustained growth.

So far as the Beaverlodge experiments have gone they seem to point to the prudence of keeping the seed tubers dormant until, say, April in a cool, dark root cellar and then bringing up, treating with fungicide and allowing the potatoes to form green sprouts in a light, frost-free room.

NO SPROUTS VERSUS WHITE SPROUTS VERSUS GREEN SPROUTS. VARIETIES USED: 1920 EARLY NORTHERN 1921 EARLY ROSE; 1922 COUNTRY GENTLEMAN; 1923 COUNTRY GENTLEMAN

Designation	Yield in Pounds per Acre				Average four years
	1920 Crop	1921 Crop	1922 Crop	1923 Crop	
No sprouts, tubers kept in cool dark storage till planting.....	16,700	12,012	6,066	16,846	12,906
Sets with white sprouts formed in cellar storage....	18,800	16,104	5,433	11,256	12,898
Sets with green sprouts formed in a light upstairs room.....	20,500	14,652	6,133	20,361	15,411
Advantage white sprouts over no sprouts.....	2,100	4,092	-633	-5,590	-8
Advantage green sprouts over no sprouts.....	3,800	2,640	67	3,515	2,505
Per cent advantage white sprouts over no sprouts..	12.5%	34.0%	-10.4%	-33.1%	0.06%
Per cent advantage green over no sprouts.....	22.7%	21.9%	1.1%	20.8%	19.4%

BREAKING OFF EYES.—Against a thirty per cent increase of yield obtained in 1919 by removing all eyes but one per set from green-sprouted potatoes planted whole against similar potatoes planted with all sprouts left must now be set four consecutive reversals of this result.

Gain in 1919 by removing all eyes but one.....	p.c.
Loss in 1920 " ".....	30.0
" 1921 " ".....	14.75
" 1922 " ".....	1.80
" 1923 " ".....	28.60
Average net loss five years work.....	8.74
	4.77

STEM-END VERSUS SEED-END EYES

A single test in 1923 supported the results of two previous years in slightly favouring sets cut from the seed ends over those cut from the stem ends of potatoes. Contrary to expectations, the cutting appears to have been accomplished in such a way as to make the seed-end eyes rather the heavier, the respective weights planted being 800 and 750 pounds sets per acre. The net increase in 1923 was exceedingly slight and even when not deducting the seed the average weight of crop from seed-end over stem-end sets showed an advantage in 1923 of only six-tenths of one per cent. The average of three years, however, shows a betterment of 7.1 per cent in favour of sets cut from the seed-end.

STEM-END VS. SEED-END EYES—VARIETY USED: EARLY ROSE

Designation	Yield in Pounds per Acre				Seed per acre	Increase yield over seed
	1921 crop	1922 crop	1923 crop	Average three crops		
Seed-end eyes.....	17,424	4,150	15,675	12,416	800	14,875
Stem-end eyes.....	15,576	3,600	15,580	11,585	750	14,830
Difference in favour of seed-end eyes....	1,848	550	95	831		45
Per cent difference.....	11.8	15.2	0.6	7.1		0.03

DEEP VERSUS SHALLOW PLANTING

Deep versus medium-shallow planting was again compared, the furrows in each case being made with a sharp-pointed scuffler having its side arms removed. The medium-shallow furrow was left about three inches deep by a single passage while a return passage opened the "deep" furrows to about five inches. Rather, it left them about that depth. It actually cut three or four inches deeper but some loose dirt always falls back into the trench. Four years' work has invariably shown an increase in yield of medium-shallow over deep planting, even in the past two seasons when drouth might have prepared one to expect a reversal. The matter of soil warmth probably enters in largely to explain the outcome, the shallow plantings coming up sooner. However, sunburn, autumn frost injury to exposed tubers and other factors warn against too shallow planting, and it is probable that those who will forward maturity by sprouting their seed potatoes or those who have an exceptionally long growing season may, with advantage, plant somewhat more deeply than would be otherwise expedient.

COMPARING DEEP VERSUS SHALLOW PLANTING—VARIETIES USED: 1920, EARLY NORTHERN; 1921, EARLY NORTHERN; 1922, GREEN MOUNTAIN, HOULTON ROSE, AND IRON CHIEF; 1923, EARLY HEBRON

Designation	Yield per acre, 1921	Yield per acre, 1922	Yield per acre, 1923	Average three years
	lb.	lb.	lb.	lb.
Shallow planting.....	17,811	4,666	14,772	12,416
Deep planting.....	15,312	4,283	14,202	11,265
Advantage shallow over deep.....	2,499	383	570	1,151
Per cent advantage.....	16.3	8.9	4.0	10.2

VARIETIES OF VEGETABLES

From lack of moisture most seeds did not germinate till after June 12. With some plants well advanced from early germination and most of them coming up late, the plots presented a ragged appearance. Work on the land began on April 20 and sowing in the hotbed on April 21 with its soil at the ideal temperature of 85° Fahr. Having a sufficient supply of water, the hotbed was kept well moistened and so was never better. July brought a period of wet weather, so that many crops were the best yet, for instance the flowers and tomatoes. After July there was not enough rain to settle the dust, but considerable wind.

ARTICHOKE.—The yield was fair but checked for want of moisture in the latter part of the season.

ASPARAGUS.—Work with this desirable vegetable proves its possibilities in the locality to be good.

BEANS.—Three varieties were sown on May 11 on heavy clay soil which was not the richest. None came up till after the rain. The yields were not large. Round Pod Kidney Wax proved superior, with Stringless Green Pod a close second. Refugee gave little fruit, being late.

BEEF.—Seven varieties were sown on May 7 and taken up on October 11. As only a few germinated at first it looked for some time as if there would be no crop, but after the rain they made a good showing. In some of the varieties many beets appeared not true to type. The following are the results from a forty-four-foot row:—

Variety	Plot yield	Yield per acre	
	lb.	tons	lb.
Early Model, Graham.....	88	14	1,040
Cardinal Globe, Rennie.....	82	13	1,060
Early Wonder D. & F.....	79	13	70
Detroit Dark Red, McDonald.....	78	12	1,740
Model Crimson Globe, Graham.....	76	12	1,080
Black Red Ball, Burpee.....	69	11	770
Crosby Egyptian, D. & F.....	64	10	1,120

In Early Model the tap roots were long. On Black Red Ball were many rootlets, making them not so easy to clean. All the other varieties were fine, clean specimens.

BORECOLE OR KALE.—All splendid plants.

BRUSSELS SPROUTS.—In the three varieties planted, none really matured. It remains to be seen what earlier planting may do.

CABBAGE.—Thirteen varieties were sown in the hotbed April 23 and transplanted to the open June 5. The transplanting was delayed awaiting showers. The ground was very dry but a good supply of water was given at the time. None after. However, they came on well and the rain of the 12th fully established their growth. The whole cabbage plot presented a gratifying picture, though larger heads have been produced in previous years. There was little trouble with root maggots. Two applications of corrosive sublimate were given at the rate of one ounce to eight gallons of water—one application at the time of planting and one about a week later. The evidence so far goes to prove this treatment superior to the use of tar-paper discs. The cabbage first ready for use was Copenhagen Market on August 11. The yields are as follows for eight heads each:—

Enkuhizen Glory.....	lb.
Copenhagen Market.....	104
Jersey Wakefield.....	92
Danish Roundhead.....	71
Flat Swedish.....	65
Danish Ballhead Intermediate.....	54
Marblehead Mammoth.....	53
Danish Ballhead Select Emperor.....	44
Early Winnigstadt.....	44
Early Amager Ballhead.....	41
Danish Ballhead Short Stem.....	40½
Paris Market.....	37
Succession.....	35½
	13½

It will be seen that Enkuhizen Glory and Copenhagen Market are again at the head of the list, as they have been for six years. Copenhagen Market was first, four out of the six years. Jersey Wakefield stands well, and Danish Roundhead, a variety not recently included in the tests at this Station, has a high yield of the finest quality. Every variety produced good firm heads.

CAULIFLOWER.—Three varieties were sown and transplanted at the same time as the cabbage. The following are the yields for eight heads:—

Veitch Autumn Giant.....	lb.
Early Dwarf Erfurt.....	35½
Early Snowball.....	34½
	35½

Thus in yield they are fairly even. Early Dwarf Erfurt was the earliest, being ready for use July 25.

CARROTS.—Five varieties were sown on May 7 and dug on October 15. Rows three feet apart and 170 feet long. The carrots were the nearest to failure of all the hardy vegetables owing to early drouth. None of the rows had a complete stand. However, they proved of excellent flavour.

CELERY.—For lack of an adequate supply of suitable water this important vegetable made a very poor showing. Trench versus level-cultural tests were attempted without success. In varieties, French Success and Rose Ribbed Paris proved better than any others. Gardeners living near the river produced some fine marketable celery. It is merely a question of sufficient moisture.

CITRON AND CUCUMBER were a failure on account of the drouth, yet in one special hill of the latter a few good specimens were gathered, the largest being eight inches in length, two inches in diameter, of Improved Long Green variety.

CORN.—Ten varieties were sown on May 9. The soil was rather dry and loose. Rows three feet apart and forty-four feet long. The stand was very uneven and the appearance ragged. The seasons are almost invariably too

short for maturing corn. Another ten days would have given a large supply of usable ears. Some particulars are here given:—

Variety	In Tassel	In Silk	Average Height	Highest	Usable Ears.
	p.c.	p.c.	inch	inch	
Assiniboine.....	100	96	45	58	2
Malakoff.....	100	90	43	61	..
Early Dakota.....	100	95	39	57	3
Early Malcolm.....	100	96	43	66	..
Pocahontas.....	98	96	46	65	..
Improved Squaw.....	100	60	42	49	..
Golden Bantam.....	70	10	41	51	..
Bantam Evergreen.....	10	0	32	44	(Very poor stand)
Select Golden Bantam.....	70	0	32	39	..

It will be seen that most of the varieties were well out in tassel and in silk and yet only two ears of Assiniboine and three of Early Dakota were usable. However, in a flank row of Assiniboine, extending double the length, there were thirty-three fine ears. The Pickaninny, not in this list but used in date-of-planting test, had 289 usable ears of good quality. This variety gives good results each year.

HORSE RADISH continues to thrive.

KOHL-RABI.—Only one variety was sown and the results were good.

LETTUCE.—Twelve strains were sown of Cos, leaf and cabbage lettuce and all were good.

MELON were attempted again in special hills but without success. The plants were small and failed to bloom.

ONION.—On April 24 thirteen varieties were sown in good, well-firmed soil. These came up but in the early drouth disappeared. A few of the varieties were re-seeded after the rain in June. Then the whole lot came and made a good stand throughout, the re-seeded rows no better than the others. A query arises as to whether all the seed germinated at first or whether some did and some did not, the latter germinating after the rain. Or did those plants from seed which germinated early and then disappeared merely die down leaving their roots, and with moisture become resuscitated? However, the whole plot presented a good healthy appearance. Yet on account of the dry weather recurring after July they failed to attain the size of previous years. They did not average more than two inches in diameter but were matured fairly well, which is not always possible in the locality. Rows 18 inches apart and 44 feet in length.

Variety		lb.	oz.
Giant Prizetaker.....	Graham.....	12	15
Danvers Yellow Globe.....	S-B.....	12	12
Yellow Globe Danvers.....	O. 2003.....	11	8
Ailsa Craig.....	Graham.....	11	0
Yellow Globe.....	Lethbridge.....	10	12
Extra Early Flat Red.....	McDonald.....	10	3
Giant Prizetaker.....	S-B.....	9	4
Australian Brown.....	McDonald.....	8	2
Southport White Globe.....	S-B.....	6	15
Red Wethersfield.....	O. 1930.....	6	9
Southport Red Globe.....	S-B.....	5	2
Yellow Globe Danvers.....	Graham.....	5	0
Southport Yellow Globe.....	Ewing.....	2	0

These figures cannot be claimed as reliably representing the merits of the varieties. The lowest in this list was highest in 1921, but the Giant Prizetaker, which heads this list, has been among the very best of previous years.

Multiplier onions gave the earliest green onions and matured a satisfactory yield.

Onion sets of yellow and red varieties produced excellent results and they were ripened much sooner than those from seed. The yellow proved superior to the red.

A row of onions seeded the previous year and taken up on October 20 did not equal the sets in yield but was better than those seeded in the spring.

PARSLEY was a comparative failure for the first time, yet there was sufficient for household use.

PARSNIP.—Three varieties were sown on May 5. They were greatly retarded by the early drouth and in consequence the yield was not up to the average. The flavour, however, was excellent.

		tons	lb.
Cooper Champion.....	14,520 lb. per acre..	7	520
Guernsey Rennie XXX.....	12,540 " ..	6	540
Hollow Crown, O. 1919.....	4,290 " ..	2	290

PEA.—Sixteen varieties were sown on May 10 in rows 44 feet long and 3 feet apart. At the same time there were sown in rows alongside each of eight varieties, home-grown seed of those varieties. There was moisture enough to start the early varieties fairly well and part of the rest, but the greater part of the seed lay dormant until after the rain of June 12. Thus there was the spectacle of peas in bloom and alongside others just coming up. As a result no very reliable data can be given.

As to earliness, Eight Weeks was first ready for use on July 13, followed by Gregory Surprise on July 14, Manifold July 15, and Early Morn on July 20. They were gathered as green peas and in six varieties out of the eight where home-grown seed was sown the yields were greater in those from the home-grown seed than from the others.

PUMPKIN.—There has not been much success in growing pumpkins on Grande Prairie, but sufficient fruits have been obtained at the Station to show their possibilities. The best results for 1923 were obtained from a special hill. A hole was dug two feet square and one foot deep, then in centre of that a further hole one foot square and another foot down. This was filled with fresh horse manure to within six inches of the top, then filled with earth and planted with home-grown seed of the Connecticut Field variety. A box covered with cheesecloth was placed over. The plants came on rapidly and began pushing the cheesecloth up, when the box was removed. As the vines grew, all unnecessary branches were pruned and growth concentrated on two pumpkins. These ripened in the open when about one foot in diameter, being covered a few nights to protect from frost.

In the Date-of-planting Test several specimens ripened, though not large.

RADISH.—The showing was fine in all varieties, the White Icicle being superior. This variety seems to retain its crispness better than others.

RHUBARB.—In the old row of rhubarb the size and length of stalks exceeded those of previous years. New seed was received from Ottawa, No. 10-1, No. 10-2, and Victoria. Though these were delayed in germination, the seedlings made a good showing before the season was over.

SPINACH.—Victoria and New Zealand were sown and as usual were good. The Victoria soon went to seed while the New Zealand continued until heavy frost.

SQUASH.—In the variety test six varieties were sown on May 10. As usual, the English Vegetable Marrow more than equalled all the other varieties put together. The Bush Marrow was not sown this time, but from past experience is highly recommended in point of yield and as taking up so much less room, having no spreading vines.

SWISS CHARD was good (though not the equal of former years), proving that in a poor year it can be produced to advantage.

TOMATO.—Great interest centered in the tomato experiments. Some were sown in boxes in the office April 2. Of these, a few were transplanted to cans and then to the open. Others were transplanted to the hotbed and then to the open. The greater number, sixteen varieties in all, were sown in the hotbed on April 21. There was prompt germination and rapid growth so that they passed in vigour of plant those sown indoors and were transplanted to the open before



More than one bushel of excellent tomatoes like these ripened in the garden at Beaverlodge—430 miles north of the 49th parallel.

them. These sixteen varieties were set out, four plants of each, six inches deep on the slant and well watered. They were trained to one or two stalks and trimmed to one truss of fruit, to two trusses, and to three trusses respectively, in contrast to leaving all trusses on. During the wet weather the whole tomato patch was given a treatment of nitrate of soda. Unfortunately, no check was left.

As varieties in point of yield, Select Earliana, Earliana Grade 2, Red Head (Langdon), and Burbank (Bruce) are in the lead and almost equal in point of earliness. Fifty Day had first ripe fruit, then came First of All, with Avon Early, Earliest of All, Earliana Grade 2, and Peep of Day as close rivals.

In the test of leaving all trusses of fruit on versus trimming to one, two, or three trusses, it was found that the outside rows, viz., those with all trusses left on, and those trimmed to three trusses were strongly in the lead, but something may be due to their being outside rows, without a flank, thus having more moisture. The two inner rows are a fair comparison and the trimming to two trusses shows an advantage of more than 25 per cent over trimming to one. There was little apparent advantage in trimming to three trusses as the third truss proved a negligible quantity when left on. Likewise leaving all trusses on seemed no better than trimming to two. No third truss had more than unripe marbles. The great mass of fruit in this locality has been from the first truss. The second sometimes bears some good fruit. The possible effect of the extra foliage is another matter, however.

In comparing tomatoes sown in boxes in the office and transplanted to cans, with those sown in the office and transplanted to the hotbed, each being later transplanted to the open, those which were transplanted to the hotbed showed 10 per cent of advantage.

In comparing those sown in the office at an earlier date, with those sown in the hotbed later, and each transplanted to the open, there was little to choose. The hotbed-plants looked the sturdier of the two.

Summing up the whole tomato experiments, a contrast is shown to all former seasons. Whereas never before were there more than five or six fruits ripened in the open, this year there were sixty-six pounds of beautiful ripe fruit, and the harvest of green fruit was also far beyond former gatherings, viz. 111 pounds. In the size, too, superiority is seen, several samples weighing a half pound each, while the largest weighed ten ounces.

DATE-OF-PLANTING VEGETABLES

What is the best time to sow the different vegetable seeds? To answer the question, this experiment has been conducted now for six years. The first row is sown as early as the seed can be put in, viz., on April 21, and a row each succeeding week until June 1. The 1923 plot had been potato ground the previous year but was not worked up until the spring. So with no spring rains, the soil was dry from the first. There was no rainfall throughout the seven dates of planting. During the time of the third and fourth dates, strong, drying winds prevailed, so that the last sowings were in the dry dust. There was moisture enough at first to germinate corn, peas, squash, and pumpkins. The seed of all the rest lay dormant, some of them seven weeks, until the copious showers of June 12, when they came up fairly evenly.

BEAN.—The reports suggest the best time for sowing is from the 15th to 20th May.

BETT.—The mathematical average favours about the middle of May. General experience would favour an earlier date as a rule.

CABBAGE.—Sowing in the open. In 1923 there was very little difference as they came up evenly after the June rain. One year the best was the first sown and another year the last sowing was best. Sow, as a rule, the first week in May.

CAULIFLOWER.—The remarks on cabbage apply to cauliflower also.

CARROT.—The reports favour the second week in May as an average, but other experience points to an earlier date.

CORN.—Being so susceptible to the early frosts, it would seem best to sow after the middle of May. Yet on one occasion sowing on April 20 proved the best. Two other sowings give the 3rd or 4th of May as producing the better results. When frost does not kill the early plantings, these have the best chance of maturing.

LETTUCE can be safely planted early and late. There is little choice. The earlier-sown usually gives the earlier results.

ONION.—About the 1st May is the average time from the six-year reports.

PARSLEY.—The reports favour the first week in May. The early sowings give early results but later sowings have been very successful. This vegetable is very slow in germinating.

PARSNIP.—The six-year reports indicate that, on an average, May 1st is the best time for sowing parsnips.

PUMPKIN.—Here again the early frosts are an element to be reckoned with. From one initial sowing on April 26 the best results were obtained, yet the majority of sowings were best in the second week of May.

PEA.—From the reports, an average date would be May 14, but other experience shows they may usually be sown sooner. They generally withstand early frosts. It is always wise to sow a few peas quite early.

SQUASH.—Here the early frosts have to be reckoned with. Still, in two years out of the six the first week in May was superior.

RADISH.—May be sown both early and late. Many sow repeatedly.

About the first week in May would appear to be the average favourable time for onions, peas, cabbage, cauliflower, parsnips, parsley, carrots, and beets. Lettuce, radish, and parsley may be sown earlier than the 1st of May. Mid-May for beans, corn, squash and pumpkins.

Often a person would be well advised to reserve sufficient seed from the early sowing for a second and even a third sowing. In a very dry spring he may find his later sowing the superior.

FRUITS

CURRENTS

The row of black, red, and white currants is still thriving, but owing to the extremely dry spring and insect attacks, the 1923 yield was very low. The aphid appeared on the leaves, especially of the reds, making many brown and curled. The bushes were sprayed twice with Black Leaf 40, a nicotine solution. This appears the most successful way of treating for the aphid. After the fruit was formed on the red and white and when approaching ripeness, it was noticed that they were falling rapidly. From inquiries coming from different parts of the prairie this loss appeared to be general. The cause proved to be the Currant Fruit Worm or Fly (*Epochra canadensis*). Eggs are laid on the green fruit and the larvae upon hatching enter the tissue, living upon the pulp. The fruit colours and usually drops prematurely. The only control measure we have been able to ascertain is keeping cockerels in the plantation at the time the fruit is falling, and for a few weeks thereafter, thus reducing future infestation. If the birds scratch the earth away from the roots too much this should be replaced. The natural food plant of this insect is the wild gooseberry. It attacks the wild currant found in the mountains and has probably spread from these to our cultivated plants, says Professor E. H. Strickland, Entomologist, of the University of Alberta.

On account of these attacks results for 1923 are very low. We give the yield as calculated to a basis of six bushes of each variety, as usual.

RED CURRENTS, 1923.

Variety	Aggregate 1917-19	1920	1921	1922	1923	Total
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
New Red Dutch.....	30.50	42.0	72.25	56.50	25.30	226.55
Cumberland Red.....	39.0	29.0	55.25	29.25	8.58	161.08
Victoria Red.....	27.50	37.0	62.75	31.87	7.47	166.59
Fay Prolific.....	0.20	1.50	13.20	8.93	2.13	25.96
Wilder.....	0	0	3.50	0.87	1.20	5.57

The black currant bushes did not present a good appearance in the spring. They had been well pruned in the fall, which would make them look thinner, but there must have been some winter killing to make them look so bedraggled. Consequently here again the yields are small. Yields from six bushes of each variety are as follows:—

BLACK CURRANTS, 1923.

	Aggre- gate 1917-19	1920	1921	1922	1923	Total
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Topsy, O. 568.....	18.40	38.0	37.3	7.43	12.0	113.13
Collins Prolific, O. 565.....	14.30	26.0	33.4	1.71	4.2	79.61

GOOSEBERRIES

It has been a difficult matter at this Station to get seedlings sent in from "outside" to grow. Repeated attempts have been made without success. However, of fifteen bushes of Oregon Champion received from Mr. John Watson, of Flying Shot Lake, Grand Prairie, and set out May 15, 1922, ten at least are doing well.

STRAWBERRIES

The Early Dakota variety wintered well. On June 8 the first blossoms appeared. The rains of June 10 and 12 refreshed the plants and increased the bloom. The first ripe fruit was picked on June 25th and by August 6th the season was over. Rows of 1922 planting were the most prolific. The size of fruit was medium. Though the season was so unfavorable, some 52½ quarts were gathered. Five additional rows were set out May 25th, thus adding materially to the area in strawberries. No great success can be reported for the Everbearing varieties, but that may be the fault of the strawberries. A little fruit was gathered this year. One ripe, luscious specimen was picked as late as September 12th.

RASPBERRIES

The bushes showed considerable damage from the rabbits. They also suffered from lack of rain through May and part of June. The first ripe fruit was picked on July 26th. On the Herbert variety the fruit was large, but the record yield was not kept.

SASKATOONS (AMELANCHIER)

The hedges were in bloom on May 26 and by June 8 the bloom was almost all gone. The blossoms were numerous, giving promise of a good supply of fruit. On June 25 fruit appeared abundantly and on July 16 the bushes were well laden. At this time robins came on the scene in great numbers disputing the right to the crop. To save the fruit, wire netting was placed around and over a great part of the hedges. This proved a considerable deterrent and the Station was able to gather a share.

Wild grape vines produced from seed received from W. J. Boughen, Valley River, Man. and planted in 1921, continue to come up after being frozen down early each fall. They are making little headway. Seedlings of the Hudson Bay sand cherries from Mr. Boughen, planted April 25, 1921, are hardy and thrifty and have shown bloom but yielded no fruit. A great number of these sand cherries produced from pits sown in the fall of 1921 are all thriving. So also of the Nigra plum. There is hope for this fruit.

ORNAMENTAL TREES AND SHRUBS

Successful transplantings of seedlings and suckers of Chinese lilac and caragana were made in the spring, thus filling up gaps and affording additional ornament. On June 8 the Common lilac was blooming while the Chinese lilac was budded. On June 18 the early lilacs were fading and the Chinese was in full bloom on the 25th. Seeds for distribution were gathered on August 25th.

The caragana on June 8th was blooming well and looked pretty in its yellow dress. Some of the untrimmed caragana shrubs now attain a height of eight or nine feet, while the hedge continues to thrive.

The row of Tartarian honeysuckle also claims favourable attention. The bloom was almost full on June 18th and by June 25th was nearly gone.

The trees of the windbreak with the ornamental shrubs are becoming an immense asset in three ways. This is particularly true of the orchard windbreak which has grown up thickly and is attaining a fair height.

(1) They add greatly to the appearance. The bareness is gone and the place looks beautifully clothed.

(2) They hold the snow, thus affording winter protection, and a very considerable quantity of additional moisture.

(3) They break the sweeping winds, giving protection to the various fruits and flowers in the orchard.

FLOWERS

The year 1923 may be termed the banner year to date for flowers on the Beaverlodge Station. The soil in which they grew was the best in the garden, for the moisture was better conserved than in other parts. The early drouth, which affected the vegetables so materially, beyond retarding germination to some extent in seed sown in the open, had little effect on the flowers, while the plants from the hotbed were in prime condition. There was thus a continuity of attraction for visitors from the blooming of the large tulip bed at the end of May, till the severe frosts of October.

Results are given from some individual species first, especially from bulbs, somewhat in order of their blooming.

TULIPS.—Of these there were three beds. First, an older bed planted October 18, 1921, consisting of eighteen varieties, which made a good showing in 1922. The appearance in 1923 was not so gratifying, as the stand was not complete. Aside from the Artus, Picotee and Duchesse de Parma the stand would not average fifty per cent.

On May 29 the Duchesse de Parma was first to bloom, followed closely by the Artus. On June 1st, Cottage Maid and Tom Moore had begun blooming. On November 9th part of this bed was taken up and replanted. Many of the original bulbs had now become six or seven, giving a sufficient number to make a new bed.

The second bed planted October 22nd, 1922. Five varieties, rows 10 inches apart, 6 inches apart in the row, planted 4 to 5 inches deep.

200 Pottebakker—White.

200 Cottage Maid—Pink.

200 Chrysolora—Pure yellow.

200 Duchesse de Parma—Terra cotta and yellow.

200 Artus—Scarlet.

On May 1, Duchesse de Parma and Pottebakker were up and making a good appearance. The others just showing. Pottebakker had the first buds opened on May 20th, while the first gleam of colour could be seen in Duchesse de Parma. The Artus was not yet blooming on May 26th, a contrast to the older bed where the Artus was about the first to bloom. The Cottage Maid

was ahead of the Artus in this bed. On May 29th nearly the whole one thousand plants were blooming. The blooms on the first two began to fall on May 31st, and by June 3rd were nearly all gone.

The third was a bed of Darwin Tulips. Fourteen varieties were planted October 31st, 1922, the snow being removed for the purpose though the ground was not yet frozen. On May 15 four varieties were showing through the ground. Edmee, Clara Butt, Whistler, and Isis. On May 21st nearly all were up and fairly uniform though the Whistler was somewhat in the lead. It may be noted how much later these are than bed No. 2, where on May 20th the Pottebakker was beginning to bloom. On June 11th there was a good stand in all varieties and most were in full bloom. The plants in this bed were much superior to those in the other two. The flower stalks were longer and the flower cups much larger. The whole presented a brilliant array of colour. Pink and scarlet predominated, shading through carmine and crimson into the very dark red of *La Tulipe Noire*. The mauve of Rev. Ewbank was the only contrasting colour. On July 1st, only a few fine blooms were left.

NARCISSUS, OR DAFFODILS.—Ten varieties were planted October 31, 1922. These came up unevenly. Several were blooming while others were just showing through the ground. The variety *Princeps* led in earliness, followed closely by *Golden Spur*.

HYACINTHS.—Four varieties were planted October 31, 1922. These have not put in an appearance.

PAEONIES.—A row was planted on November 3, 1922, snow being removed for the purpose. As all could not be put in, a number were held over till spring and planted May 11. These had fine buds. They were all growing nicely on June 11, with the fall planting in the lead. Very few bloomed, however, but on July 16 one in particular was in full bloom, pink tinged, white in the centre and with a delightful fragrance. Paeony plants were little affected by the first fall frosts.

IRIS.—On November 3, 1922, a row of nine varieties were put in when the ground was beginning to freeze. Some kept over were planted early in spring. The first to come up of those planted in the fall were *Iris Flavescens* and *Prosper Laugier*. On June 11 the spring planting was in the lead and one budded to bloom. On July 6 the Mrs. Sherwin Wright, a pretty yellow, and the *Prospero*, a purple and yellow, were in full bloom.

GLADIOLI.—The bulbs kept well over winter and were set in rows about twelve inches apart, eight inches apart in the row, and five inches deep on May 12. They consisted of the following varieties: *Prince of Wales*, *Maiden Blush*, *Orange Brilliant*, *Loveliness*, *Baron Hulot*, *Flora*, *Mrs. Frank Pendleton*, *Mrs. Francis King*, *War*, and *Peace*. The *Maiden Blush* was first to bloom on August 25, then the *Prince of Wales*.

On September 11 there was some frost, ruining nasturtiums and dahlias, but the gladioli were not affected. In fact there were three inches of snow in September, but they bloomed on until the severe frost of the 21st. The *Flora*, *Orange Brilliant*, *Mrs. Francis King*, and *Peace* all bloomed about the middle of September. The *War* had scarcely a bloom. The *Flora*, a delicate cream, had excellent plants, but the handsomest of all, as in 1922, was the *Prince of Wales*.

A row of *kochia* made an excellent background for the gladioli bed.

A number of bulblets, secured when the gladioli bulbs had been taken up in the fall, were planted on May 21. They were put in two inches deep and five inches apart and all made good growth.

SWEET PEAS.—A trench was made on May 8 one inch deep, filled with well-rotted manure and then soil up to within two inches of the top. Two rows were

put in six inches apart, using the seed of two collections from Robert Sydenham, Birmingham, and one from Burpee, Philadelphia, about thirty varieties in all. Germination was very slow on account of the dry weather through May and part of June. The north end of the row attained twice the growth and vigour of the south end. This may be accounted for by the fact that it ran along in the lee of a raspberry row against which the snow lodged heavily in the winter, thus giving more moisture, while the south end was more in the open.

On July 26 the first blossoms appeared on the following varieties: Alfred Watkins, a pale lavender; Liberty, a bright pink, but the packet calls for a rich salmon; Charity, a rich brilliant crimson, and the White Spencer. Willow brush was used for a support. Possibly the King Manoel, a beautiful maroon, attracted most attention.

NASTURTIUMS, sown in the hotbed on May 1, germinated quickly and had continuous growth. They were transplanted to fill up vacant points, where they bloomed profusely from July to September. On May 11 a row was sown in the open in poor soil and though delayed by the drouth eventually germinated well and made a fine showing.

PORTULACA.—A row was sown on May 11 beside the main path to act as a border to the main body of flower beds. Just when all hope of seeing them come up was exhausted, they began to appear and rapidly spread out so as to make a brilliantly coloured mat the length of the row.

In May, four beds were formed to determine the comparative advantage of sowing the different species of annuals in the open, in contrast to those sown in the hotbed and then transplanted to the open. There were two open-sown and two transplanted. The shortest-growing species were placed in the outside rows while the tallest were in the centre rows and the others graded between, so they gradually ascended from lowest to highest, making a pretty effect. The following eighteen species were used and placed one foot apart in order mentioned:

Leptosiphon, Pansy, Calendula, Coreopsis, Phlox, Schizanthus, Snapdragon, Clarkia, Cornflower, Sunflower, Cosmea, Stocks, Sweet Sultan, Aster, Mignonette, Godetia, Verbena, and Sweet Alyssum.

As it was impossible to sow the open beds simultaneously with the hotbed, the latter had the advantage in time. Then the germination was slow in the open-sown beds, thus the hotbed plants, having the advantage of time of sowing and rapidity of germination, were for a long time considerably superior, and, taken all around, were better right through. But the season, proving so excellent for flowers, the contrast between the two was finally not so marked. There was a magnificent display from both and when the Field Day came all were in a glory of bloom and claimed the admiration of the crowd.

In climbing flowers, the Scarlet Runner, Morning Glory, and Canary Flower were a success.

Hollyhocks and dahlias bloomed from seed sown on May 1. The Kochia was an attraction both as a background for the gladioli and as completing the symmetry of the main flower bed.

On July 6 several species were sown to show the results of late sowing. On September 12, Leptosiphon, Linaria, Calendula, and Cosmea were blooming well, and had been for some time, while Asters, Stocks, Phlox, Verbena, and Salpiglossis had no bloom, although the plants were good and healthy.

On August 1, many large plants in bloom were transplanted from the hotbed, giving an opportunity of learning what success would result at that stage. These continued blooming and there was scarcely a failure. Up to September 21st the following were doing well: Asters, Pansies, Nasturtiums, Jacobea, Phlox, Coreopsis, Helichrysum, Calendula, Statice, Petunia, Snapdragon, and Dianthus, or Pinks.

The beds of pansies and of Eschscholtzia, or California Poppy, suggest that any person can have a permanent bed of these. They may be dug and worked up every year. The seeds in the ground will give a bed which will be a delight for months. All they need is thinning. The same holds true with Petunias.

EFFECT OF THE FROST NIGHT OF SEPTEMBER 21 (TEMPERATURE 24° FAH.)

Plants utterly destroyed	Plants partially destroyed	Plants uninjured
Balsams Nasturtiums Celosia Plumosa Dahlia Scarlet Runner Morning Glory Cosmea Canary Flower Portulaca	Asters Jacobea Helichrysum Sunflower (considerable) Coreopsis (but little) Sweet Peas Godetia (little) Schizanthus (but little) Sweet Sultan	Linaria Stocks Phlox Pansy Calendula Petunia Snapdragon Candytuft Mignonette Clarkia (slight) Dianthus Leptosiphon Verbena Nigella Hollyhock Alyssum Cornflower

RABBIT INJURY

Regarding the rabbit menace to fruit trees and shelter belts reported in 1922, mention was made of the injury to the Russian poplars. Nearly 50 per cent of these were girdled, trunk and branches, so that they had to be cut off low down. The new willow hedges were entirely gone above snow level. During a chinook the snow banks disappeared, letting down the supports for the chicken-wire protection and before notice was taken of it considerable damage was done to the best spruces. Lateral and terminal buds appeared to be choice meat for the rabbits. Slight damage was done to Balm of Gilead, Manitoba maple, caragana and ash. None observable on Tartarian honeysuckle or lilac. The apple trees suffered the most and more permanently. These had been wrapped with building paper up to the spread of the branches, but the snow drifting in enabled the rabbits to clean every branch above the wrapping. On one apple tree in particular, the best in the orchard, which had attained a height of full five feet and a spread of the branches to a diameter of over five feet, every branch had the bark completely stripped off.

By August 1, however, a person would not recognize very much injury to any of the trees with the exception of the apple trees. The willow hedges were higher than the previous year. Even the Russian poplars cut so low had branches shoot out with a vigorous growth, attaining nearly the height of the original, though bushy instead of pyramidal. Outside of the apple trees it might be said that not a single tree was actually killed. Being cut in winter the sap would be in the roots and ready in the spring to ensure rapid growth. When the winter of 1923 set in, the rabbits reappeared in great numbers. Adequate protection was given the Scotch pines and spruces in the main windbreak.

Chicken wire netting was placed around the orchard and the orchard windbreak. This, while keeping many out, failed to keep all. Quite a number would break through the netting but they were promptly killed each morning. Very little damage is noted at date of reporting.

CEREALS

Each year's work in variety testing of cereals emphasizes more strongly to the observant experimentalist the defects of practice which in an earlier and cruder day passed muster.

The very elementary character of much of the agronomy experimentation in America to date doubtless explains in part the peculiar fluctuation in yields of varieties under test at a given point, and likewise, in part, the inconsistency of results from various Stations not dissimilarly situated. A further explanation of such fluctuations may lie in biological or other principles not yet discovered.

PRECAUTIONS OBSERVED

The Beaverlodge Sub-station has, year by year, been seeking to improve its technique but each advance serves to disclose yet greater need for improvement.

An extremely variable field is studied closely each season to permit the most advantageous layout possible in the circumstances. Long parallel plots help to minimize the handicap. When one test succeeds another, the direction of the plots in the second case is usually at right angles to the previous direction, and old paths are scrupulously avoided or uniformly overlapped, as may often be done safely by crossing them. Commencing in 1922, the practice has been followed of eliminating, just prior to harvest, the two outer drills of each side of every plot, except in the case of peas, where it was not found practicable. Duplication is resorted to whenever space permits. Partial hand-threshing of variety plots is practiced as the best means of obtaining pure seed and samples, the beaten sheaves being afterwards run through the separator to obtain the complete yield. The wheat stooks in 1922 were protected with canvas stook covers. In the case of wheats and barleys, weights were taken of the total crop as well as of the threshed grain. Notes on date of heading, etc. are systematically recorded and the plots are scanned for factors that, otherwise, might obscurely affect yields.

SEASON OF 1923

From the drouth year of 1922 a modicum of moisture was carried forward, except in early-ploughed summer-fallow, and even there it was limited enough. In the spring of 1923, melting snow percolated to a depth of two feet or more in some areas, but its penetration was extremely irregular. Prominent, bare-surfaced knoll-points were moistened scarcely below the depth of the seed drills. Knolls covered with a brush of stubble or a roughened layer of soil received, in most instances, enough snow moisture to reach the bottom of an ordinary plough furrow. The arid condition was unrelieved by rain at Beaverlodge until June 10th, so that for thirteen months certain of these knolls were never dampened to the depth of a furrow slice, and a considerable percentage of the high land was not, during all that time, moistened to a point beneath the furrow sole.

Uneven germination was only to be expected. A more noteworthy condition was the arrested progress of the plants on many knolls, which had enough moisture to germinate the seed but insufficient to support growth, so that these patches practically stood still until the mid-June rains, and harvest presented the unusual spectacle of fields with the hollows well ripened but the knolls green. In many oat fields where the moisture was not quite so scant, spindling stems were sent up and bore small heads, followed later by a profuse crop of secondary or suckering shoots, which over-topped the others and constituted much more than fifty per cent of the crop. This was especially noticeable in the cases of early-sown fields or plots of the precocious varieties. Later sorts and later seedings of all varieties brought their primary and secondary shoots on more nearly together, so that in many instances these were evenly matured while early kinds adjacent had a marked green tinge, albeit the first-formed heads of the latter were over-ripe and shattering. Both yields and sample of such kinds were unsatisfactory.

Weeds, legacy of the dry season of 1922, gave an uncommon degree of trouble on summer-fallow throughout the district and were particularly injurious on these patches of deferred growth. The knolls were not only the greenest but the weediest portions of most fields.

The rather frequent occurrence of these prolonged dry periods in early summer, stunting particularly the early kinds of grain, goes to establish the undesirability of extreme precocity, pointing rather to the medium-early sorts as most likely to escape the Scylla of early drouth on the one hand and the Charybdis of early-autumn frosts on the other.

SPRING WHEAT

Eleven important varieties and strains of wheat were seeded April 25 and 26 in duplicate ranges of plots located on land which had been cropped for several years and summer-fallowed in 1922. In that year the land was ploughed about eight inches deep during the middle and twentieth of June and the rocks picked off. Awaiting this latter operation, the furrow slice dried out considerably. On July 12 the land was seeded to single drills of oats, the rows three feet apart, but drouth caused germination to be very irregular and a small percentage of the kernels did not sprout until the ensuing spring, giving trouble then by volunteering here and there in the wheat and barley plots. (Oat plots were circumspectly kept off this area.) Cultivation and hoeing failed to keep all the wild buckwheat and other annuals from seeding along the oat drills, while the abstraction of moisture by the summer-fallow-substitute-crop very likely worked to reduce slightly the yields in 1923, as compared with what would have been obtained from bare fallow. The oats in drills were grazed off during the autumn and the land merely surface-tilled in spring, commencing April 23 with the spring-tooth and smoothing off with spike-tooth harrows.

Germination of the wheats on this area was fairly satisfactory but when the wheat was being drilled a disconcerting number of sprouting weeds were noticed. To destroy these, the wheat plots were twice harrowed as the grain was coming through the ground, first on May 10th and again as the blades were re-emerging on May 14th. The treatment was remarkably efficacious in killing weeds, but the second harrowing following so closely on the first mutilated the wheat plants perceptibly, and as there was no early rain to refresh them, the stands were left somewhat thin and irregular. Whether this finally reduced the yield to any important extent is debatable since one plot in the south range, which was repeatedly noted as being extremely thin, from some cause, finally yielded slightly more pounds of total crop than, and exactly as much grain as, its fellow in the other range. It is a moot question as to how far such thinning of stands really affects results.

EARLY VARIETIES SUFFERED

While there was sufficient moisture to maintain a slow but steady rate of progress in the growth of these wheats, the effect of the early drouth was to handicap all varieties that made their vegetative development largely in June. Since all had plenty of time to mature in the autumn, the late kinds scored a more than normal advantage in yield. This was still true after allowing for a slight leakage in threshing, discovered only when the five latest varieties had been separated, and reducing possibly by two or three bushels per acre the record of yields of the following sorts, in order of loss probably about as mentioned: Early Red Fife, Marquis 10 B., Marquis, O. 15, Huron, Kitchener. Except for this unfortunate oversight the season's threshing operations were carried through with precision. Happily the new, earlier kinds of wheat, on which interest chiefly centres, were unaffected by the mishap, the leak being stopped before they were put through.

VARIETY VAGARIES

For the ninth successive season Huron has substantially outyielded its always adjacent competitor, Marquis, its average betterment for the period being 7 bushels 54 pounds, or over twenty per cent. A peculiarity is that in few, if any, of these nine years would one have been at all certain from looking at the standing plots which would thresh the heavier crop, yet the Huron has invariably emerged with the greater bushelage. A nine-year average of 43 bushels 54 pounds per acre is not bad even for small plots. In appearance the threshed grain has frequently excelled Marquis.

During the past four seasons the Huron has in turn been outyielded by Kitchener, the four-year average for the latter figuring out at 47 bushels 26 pounds against 45 bushels 32 pounds for Huron; 41 bushels 9 pounds for Red Bobs; 40 bushels 20 pounds for Early Red Fife; 40 bushels 12 pounds for Marquis, and 30 bushels 49 pounds for Ruby in the same time.

All these varieties, except Ruby and perhaps Red Bobs, are a shade too late for the district. They may mature on some hundreds of favoured farms, such, for instance, as that of Herman Trelle at Lake Saskatoon, where the Chicago-International third-prize hard red wheat was grown in 1923, and may succeed pretty generally in seasons such as 1915, 1922, and 1923, but too often the grade and sometimes also the yield of wheats in the Marquis class are lowered by early-fall frosts. Even when the grain is cut in advance of these it often has to stook-cure in the cool, wet weather of September, whereas earlier sorts, ripening and curing in August, usually give a harder, better-coloured sample. Red Bobs is enough earlier than Marquis to be considerably safer from frost, but it shatters rather easily and is very subject to piebald or yellow-berry. It seems as though a plump, short berry, such as that of Red Bobs, is liable to spread the glumes apart and allow the kernel to be bleached by weathering. Early Red Fife, while slightly exceeding Marquis in average plot yields, shells much too easily to be recommended in field practice.

Since its advent to the Station in 1919, Ruby has repeatedly demonstrated its serious susceptibility to shattering, and as a yielder it leaves much to be desired. Its earliness, however, is a big point in its favour for several reasons, while one or two observant farmers have told the writer that their cattle greatly preferred its straw to that of Huron. In comparing Ruby with Marquis, few farmers allow adequately for the advantage of getting their harvest off early so as to prepare the land in good season for the next year's crop. Ruby, however, is properly regarded as a fill-in, awaiting the advent of a superior early variety.

Among the more recent introductions the Early Triumph strain of Red Bobs is proving a heavy yielder, but the colour of its grain leaves much to be desired. The Supreme is less satisfactory. Dr. Wheeler's 10 B selection of Marquis, after slightly outyielding the Ottawa strain in 1922, fell down decidedly in 1923. Of the two Ottawa-bred novitiates, Garnet and Reward, the former is proving to require about the same period of maturity as Ruby and has considerably outyielded it, though the increase was not quite so great in 1923 as the year before. An extra plot of Garnet, allowed to stand until the late wheats were cut, yielded considerably more than the plot cut when adjudged reasonably mature and did not shatter to any particular extent. The quality of the grain seemed high. If, under more severe test than 1923 afforded, it proves satisfactory resistant to shattering, to disease and pests, and if the yield holds up to present performance, it should displace Ruby easily. Reward has been thus far at Beaverlodge a shade earlier than Ruby, has a beautiful berry and has in the average of two years slightly outyielded the older sort, though falling considerably short of Garnet, which is regarded as much the more promising cropper.

SPRING WHEAT, VARIETY TEST

Variety	Days to Mature		Total crop average 2 years 1922-1923	Ratio grain to total crop average 2 years 1922-1923 p. c.	Yields of Threshed Grain per Acre										
	1923	Average 2 years 1922-1923			Average 4 years 1920-1923	Average 2 years 1922-1923			Average 4 years 1920-1923			Average 5 years 1918-1923			
						bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	
Early Red Fife, O. 16.....	131	124.0	3,993	46.4	37	46	30	54	40	20	..	..	..	..	..
Early Triumph.....	128	121.0	4,061	45.0	36	56	31	7	..	..	..	..	..	..	..
Garnet, O. 652.....	125	118.0	3,481	48.5	34	33	28	12	..	..	..	..	..	..	..
Huron, O. 3.....	132	124.5	4,397	46.3	40	14	34	0	45	32	45	41	44	44	54
Kitchener.....	132	124.5	4,493	48.8	44	55	36	33	47	26	..	..	..	..	..
Marquis, O. 15.....	131	124.0	4,259	40.8	36	7	28	59	40	12	41	25	39	17	36
Marquis, 10 B.....	131	124.0	3,704	45.4	33	49	28	2	..	..	..	..	..	..	..
Red Bobs.....	130	122.0	3,357	49.3	34	17	27	35	41	9	41	55	..	..	..
Reward, O. 928.....	124	117.5	3,223	47.9	31	37	25	46	30	49	31	27	30	8	..
Ruby, O. 623.....	125	118.0	3,263	42.7	30	59	23	16	..	..	..	..	..	..	..
Supreme.....	130	123.0	3,476	46.8	35	1	27	8	..	..	..	..	..	..	..

NOTE.—In 1923 the five latest varieties were subjected to a leak at threshing, amounting, perhaps, to an average of two bushels per acre, the loss probably falling on Early Red Fife, Marquis 10 B, Marquis O. 15, Huron, and Kitchener in order of severity about as mentioned.

OATS

Twenty-one varieties and strains of oats were seeded in duplicate plots on a strip of land where potatoes had been raised in 1922. In spite of the fact that the yield of potatoes was only around a hundred bushels per acre, it was sufficient to exhaust the scanty moisture pretty completely and as there was nothing to hold the snow it drifted off the knolls, so that these received barely enough moisture to germinate the seed of the following crop. To superficial appearance the seed bed in 1923 was as perfect as we have ever prepared, but after germination the crop on the knolls stood still until the redeeming June rain. In a few cases there were instances of deferred germination, but these were few.

As the plots had to be laid out only half the usual length and the land where the oat plots were located was more abruptly undulating than most portions of the grounds, the growth and maturity of the oats were so extremely irregular that even duplication failed to avoid many erratic results and the 1923 yields are published with many misgivings. Had seeding been deferred a fortnight or so there is no doubt that the oat yields would have been considerably higher all round. Such, indeed, was the neighbourhood experience.

Illustrating the point, while the two variety-test plots of Banner oats sown at the end of April averaged only 64 bushels per acre, another plot sown May 9th as a second date of seeding and, incidentally, as a check against an additional strain of Banner whose seed was late in arriving, yielded 90 bushels and 18 pounds, the competing strain doing nearly as well. Both these latter plots had much ranker straw and larger heads than the early-sown plots of any variety. Maturity, also, was much evenner than in the case of the others, save one or two plots of the earliest-maturing sorts, situated wholly in hollows.

Another example: On a certain part of the grounds there was a rod-wide strip of Banner oats, amounting to about a sixth of an acre, sown June 4th as a nurse-crop for a grass-mixture experiment. The preparation there was the same as that for the variety plots of wheat and barley, viz. oats in drills in 1922, intercultivated as a fallow substitute. This strip yielded, in 1923, at the rate of 8,235 pounds total cured crop and 102 bushels 9 pounds threshed grain per acre. These oats were cut before fully ripe and therefore the ratio of grain to total crop was only 42 per cent. It is true that marginal drills were not excluded from the calculation in this particular case and that the area was not so precise as in the case of the variety plots, but certainly its vegetation was out of all comparison to that of the regular plots, and, allowing for immaturity, the yield of threshed grain was also good. The season emphatically favoured late sowing and late varieties. Many a late-seeded stubble field in the district outyielded early-sown fallow in tonnage per acre. This was in direct contrast to 1922, when only early seedings had moisture for a proper start.

While the extreme variability of germination and growth renders close deductions from the 1923 yields unwarrantable, a few points stand out worthy of attention:

Precocious varieties, such as Alaska, Daubeney, and O.A.C. No. 3, are not desirable for general culture. They are too liable to be severely curtailed by a prolonged early period of dry weather. Legacy would appear to be about forward enough for most conditions and is a rather likely sort for districts needing an earlier kind than Banner.

Of the two hulless oats, Laurel and Liberty, the former is decidedly too short in the straw to find favour in general practice. Liberty has excellent field qualities. With reference to the latter, it is satisfactory to note that while gravely subject to smut where exposed to infection, yet during the six years it has been grown on the Beaverlodge Station, always in plots and sometimes

in larger blocks as well, the first head of smut has yet to be discovered. The seed has always been treated and the land, as well as the seed, thus kept free of smut infection. On the other hand, it is disappointing to find evidence of a certain tendency to revert to the hull-bearing type. One of the most suspicious symptoms was a head rogued from the variety plot having the upper glumes distinctly resembling an ordinary oat, while the lower glumes of the panicle exhibited the characteristics of the Liberty. While this was a novel exception, it is quite the regular thing to rogue from the Liberty plots each year a large number of hull-retaining heads, and persistent roguing has thus far failed to diminish the tendency. The best we have been able to do is to hold it in check. Whether hybridization or atavism may be responsible is not known.

In 1921, the Leader exhibited a marked tendency to depart from its cluster type of head. Roguing the variants to the extent of perhaps five per cent of the crop seemed to subdue the tendency and since then this oat has run truer to type.

Critical examination leaves the staff still baffled to explain the apparent tendency of varieties of similar character and season to see-saw or fluctuate in yield from year to year. It sometimes seems as though the fact of a certain variety doing uncommonly well in one season caused the seed obtained from its crop to manifest a reactionary tendency the next. While this cannot yet be regarded as anything more than a surmise or speculation, the observations suggesting it are provocative of systematic study. Typical of many is the behaviour of Swedish Crown and Victory, two Svalöf creations of about the same period of maturity and tested in adjacent plots both in 1922 and 1923. In 1922 Swedish Crown surpassed Victory by 4 bushels and 17 pounds per acre. In 1923, Victory leads by 9 bushels. In 1922 the Victory plot had, for no recognized reason, fallen below many of the standard sorts in yield. In 1923 it leads the field quite handily, adding to its consistent margin in all the long-term averages. Its inferior 1922 result is a complete puzzle. (The Victory is a little late for many districts in the North.) A similar puzzle is the case of the new southern Alberta discovery called "Mammoth," which after giving a good yield in 1922, dropped to one of the lowest positions in 1923. Careful observation of the growing crop sometimes sheds clear light upon such defections but our field notes fail to explain the phenomena of either of the examples cited above.

Ligowo maintains its record as a medium-season, high-yielding oat of good field qualities, but for general utility the claims of Banner have yet to be conclusively superseded. Gold Rain ranks well but not superlative.

The leafiest, finest-strawed, greenest-stemmed oat of the medium or late class is the so-called Black Winter oat, seeded in spring. It is quite late, however, its colour is against it, and it shatters too easily.

The two new Ottawa originations, Columbian and Prolific, promise well but cannot be pronounced upon with any confidence from the single-plot tests it was possible to provide in 1923. The Columbian plot had favoured soil conditions; Prolific not so favourable. Differences in date of seeding and other factors already discussed render it impossible to compare closely the three new strains of Banner supplied. The Dow strain, for instance, ranks highest in bushelage but when compared with an adjacent plot of Banner O. 49, seeded on the same day (May 9th) it falls short. More satisfactory tests should be possible in 1924.

OATS, VARIETY TEST

Variety	Days to Mature			Yields of Threshed Grain per Acre							
	Average 2 years 1922-1923	Average 4 years 1920-1923	Average 6 years 1918-1923	1923	Average 2 years 1922-1923	Average 3 years 1921-1923	Average 4 years 1920-1923	Average 5 years 1919-1923	Average 6 years 1918-1923	Average 7 years 1917-1923	Average 8 years 1916-1923
	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.
Abundance.....	118-5	119-5	124-0	59	48	64	83	88	85	..	..
Alaska.....	116-0	..	..	38	37	46	..	..	..	..	..
Banner, O. 49.....	121-5	122-0	..	64	52	66	81	..	..	..	..
Banner (Waugh).....	..	..	..	77	..	..	..	..	..	..	..
Banner (Dixon).....	..	..	..	61	..	..	..	..	..	..	..
Banner (Dow) (May 9).....	..	..	..	88	..	..	..	..	..	..	..
Banner, O. 49 (May 9).....	..	..	..	90	..	..	..	..	..	..	..
Black Winter.....	122-5	..	..	63	53	..	..	..	..	..	..
Columbian, O. 78.....	..	..	..	76	..	..	..	..	..	..	..
Daubenev, O. 47.....	116-0	110-6	112-7	41	..	50	57	63	69	68	68
German Heath.....	118-5	..	..	54	44	..	..	..	..	..	..
Gold Rain.....	119-5	120-2	..	65	52	66	80	..	..	..	..
Laurel, O. 477.....	118-0	..	..	39	32	..	..	..	..	..	..
Leader.....	122-5	123-7	..	68	53	66	80	..	..	..	..
Legacy, O. 678.....	118-5	..	..	59	47	..	..	..	..	..	..
Liberty, O. 480.....	118-0	118-3	123-4	41	31	43	50	54	58	90	90
Ligowo.....	122-0	121-2	126-3	66	57	69	81	87	93	19	11
Mammoth.....	119-5	..	..	44	43	..	..	..	..	..	..
O. A. C. No. 3.....	116-0	110-6	..	46	41	50	59	..	..	..	..
O. A. C. No. 72.....	121-5	..	..	63	53	..	..	..	..	..	..
Prolific, O. 77.....	..	..	..	67	..	..	..	..	..	..	..
Swedish Crown.....	121-5	..	..	70	55	..	..	..	..	..	..
Victory.....	122-5	123-7	129-1	79	57	71	87	93	92	93	22

BARLEY

Fifteen barleys were compared in single plots each ten rods long and trimmed to an area of a twenty-second of an acre. The preparation was the same as for the wheats. Drilling of all but the Fenil was done on April 28th into a beautiful seed-bed, which had been cultivated and harrowed three days previously. The seed of all these, except the beardless-hulless Eureka had been treated with formaldehyde. The stock of this latter was from a crop grown from seed treated with hot water in 1922. The Fenil was late in arriving and could not be planted until May 21st.

Growth was stronger and maturity evener than in the case of the oats, although certain early kinds, notably the Himalayan, developed under the stimulus of belated rains a strong suckering growth which made it extremely difficult to know when to harvest. Nevertheless, it is believed that the single plots of barley afforded much more reliable data on which to base deductions than did the duplicate plots of oats.

Running notes on the several varieties will serve to supplement the tables:—

Albert (6).—Too early to be productive. Sample inferior. Variety not recommended.

Bark's Excelsior (6).—Heavy-yielding but too late for general favour. Bristles like a porcupine.

Bearer (6).—Heads the list in two-year average yield. Rather late and coarse. Well be-whiskered.

Beardless (6).—Two very similar strains of beardless barleys have been grown for the past two years, one a local barley and the other a very unsuccessful sort called Success. The old saying that there are three days in which to cut barley, viz., the day it is ripe, the day before and the day after, calls for amendment in this case for in Grande Prairie the time to cut Success to prevent shattering is a week or so before it is ripe. This usually means a low yield and a poor sample. The local sort, whether through the cumulative effect of natural selection or through other influence, seems a little less prone to waste. It was two or three days later in heading and ripening. Neither strain is fully satisfactory.

Canadian Thorpe (2).—Lateness probably contributed to the bounty of this barley in 1923, it standing third in yield of grain. Produces a very superior sample. Liable to get nipped in a season of early-fall frosts.

Charlottetown No. 80 (2).—At Beaverlodge, this variety has not quite lived up to its Eastern repute of readily parting with its awns.

Chinese (6).—Attained a fuller stature than in 1922. Seemed reasonably satisfactory this time.

Eureka (beardless-hulless) (6).—In 1920, seed of this variety was obtained locally in a very impure condition, being mixed with other cereals and infected with spores of loose smut, which neither formaldehyde treatment of the seed nor prompt roguing of smutted heads controlled. Roguing did, of course, eliminate the other kinds of grain, and in 1922 a treatment of the seed with hot water resulted in a perfectly smut-free crop. Omission of any treatment at all resulted in a small percentage of smutty heads in 1923, though so far as determined these were all heads of the covered smut, probably resulting from infection of the seed in threshing or handling, and would, therefore, have been controlled by the modified formaldehyde treatment, which is a safe and easy form of disinfection compared to the hot-water bath. If time proves the feasibility of controlling the smut with formaldehyde, supplemented, perhaps, by a very occasional resort to hot water in order to keep down any incipient

reinfection of the loose-smut fungus, the variety will have very strong claims to attention, indeed, by all who dislike personal intimacy with barley beards or who have a humane regard for the animals that consume the straw. This barley is peculiarly immune from shattering. It is true the culm frequently bends or lodges under the heavy head and that some of the heads break off when allowed to stand too long. Both difficulties may be largely overcome by harvesting on the green side, and hogs roaming the stubble should glean what the binder leaves.

The variety is fairly early and quite productive, if allowance be made for absence of hull when making comparisons. Thus in the four-year average it has to its credit a yield of 45 bushels 5 pounds, against 48 bushels 27 pounds for O. A. C. No. 21; 52 bushels 5 pounds for Hannchen; 42 bushels 28 pounds for Early Chevalier; and 25 bushels 27 pounds for Albert. Making an estimated allowance of 10 per cent for hull, the Eureka would have a meat content equivalent to 50 bushels 5 pounds of ordinary barleys—only two bushels behind the Hannchen, which is considerably later.

The superintendent thinks so well of the Eureka that unless deterred by factors not yet known, he proposes to adopt it exclusively in his main cropping.

Fenil (2).—This is a two-rowed barley, also bald and naked, bred by Dr. Charles E. Saunders and recommended for use as an annual hay crop. For ripening, it would be open to the grave objection that it shells too easily in the field, but this would not matter for hay production, except in so far as it might add to the cost of renewing the seed supply. Its total crop yield of 3,938 pounds did not compare well with that of certain other kinds, such as Eureka, for instance, with its 5,192 pounds per acre. However, Fenil cannot be considered to have yet been adequately tried out.

Hannchen (2).—This rather short-strawed, late, two-rowed barley seems to be climbing the scale in yield, improving decidedly over the rather mediocre showing it made here when first tried out. The separator "shaves" it cleaner than most sorts and though it is not counted a show barley, its sample is usually good.

Himalayan (6).—A very productive but short-strawed hullless barley, whose soft pliant beard is less objectionable than that of certain other sorts.

O. A. C. No. 21 (6).—Though a consistently good performer, is of late years being decidedly out-scaled by several of its newer competitors.

Trebi (6).—Productive, reasonably early and capable of a very good turnout of threshed grain. Unfortunately, during the last two seasons it has scarcely protruded its head out of the sheath and the straw is therefore short. In 1922, this was charitably attributed to severe drouth during the period of heading but it was harder to make allowance in 1923, albeit the moisture was none too plentiful. In 1921, the year of its Beaverlodge initiation, its difference was not so excessive. It seems to be a barley with good general qualities otherwise and with high potentialities under favourable conditions. It bears a high percentage of grain to straw.

BARLEY, VARIETY TEST

Variety	Days to Mature		Total Crop		Ratio grain to total crop average 2 years 1922-1923	Yields of Threshed Grain per Acre											
	1923	Average 2 years 1922-1923	1923	Average 2 years 1922-1923		1923		Average 2 years 1922-1923		Average 3 years 1921-1923		Average 4 years 1920-1923		Average 5 years 1919-1923		Average 8 years 1916-1923	
		bush. lbs.		lbs.		bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.	
Albert, O. 54.....(6)	111	106.0	2,970	2,244	p. c.	29	27	22	0	22	22	25	27	25	43	..	..
Bark's Excelsior.....(6)	128	121.5	5,914	3,870	47.7	57	36	43	46	51	0	..	..	..	..	..	..
Bearer, O. 475.....(6)	127	121.0	6,809	4,790	54.4	70	6	48	30	..	..	..	..	..	..	..	..
Beardless, Local.....(6)	112	106.0	4,890	3,465	48.7	48	17	35	16	..	..	..	..	..	..	..	..
Canadian Thorpe.....(2)	130	126.0	6,028	3,971	48.9	59	6	40	2	..	..	..	..	..	..	..	..
Charlottetown No. 80.....(2)	122	118.0	6,248	4,279	48.4	56	18	40	10	..	..	..	..	..	..	..	..
Chinese, O. 60.....(2)	121	113.5	5,170	3,509	45.1	46	36	33	16	38	20	42	28	43	21	36	30
Early Chevalier, O. 51.....(2)	126	117.0	4,928	3,784	43.7	44	11	34	23	41	36	45	5	..	..	..	..
Eureka (beardless-hulled).....(6)	125	114.5	5,192	3,883	49.5	55	11	40	3	26	28	..	..	..	..	..	..
Fenil, O. 670 (beardless-hulled).....(2)	104	..	3,938	..	..	63	12	46	3	49	38	52	5	..	..	..	..
Hannchen.....(2)	128	121.5	6,094	4,268	51.8	52	34	36	22	40	41	48	27	50	1	40	44
Himalayan, O. 59 (hulled).....(6)	119	115.0	5,082	3,521	49.7	45	29	35	16	25	0	..	..	..	..	..	..
O. A. C. No. 21.....(6)	122	115.0	4,928	3,619	46.8	35	47	28	47	50	43	..	..	..	..	..	..
Success (beardless).....(6)	110	105.0	3,135	2,534	55.1	53	19	40	6	..	..	..	..	..	..	..	..
Trebl.....(6)	126	119.5	4,840	3,586	53.7	..	..	..	..	..	..	..	..	..	..	..	..

NOTE.—Fenil being sown late, owing to late arrival of the seed, made rapid growth and matured in relatively short time.

FIELD PEAS

To the eight varieties of field peas tested in 1922, three others were added, viz., the Mackay, Invermere No. 13, and Invermere No. 15. All the peas were inoculated with nitro culture and drilled April 26th on a piece of summer-fallow, which was surfaced with spring-tooth and drag harrows. Notwithstanding that this land was high and none too favourably situated as to moisture, the fallowing had conserved a sufficient reservoir that, when augmented by some melting snow, it carried the crop along reasonably well through the early drouth, and creditable yields were obtained. As in 1922, even the latest kinds ripened fully, but this would not occur in every season. As a rule, the small varieties, of the Golden Vine Sask. 625 and Chancellor type, are to be preferred. These kinds resemble one another closely, while the Empire is a little larger and blue in colour. Arthur and Mackay are productive but too late to be safe in the district. Alberly Blue is intermediate. Alaska is a dwarf early pea. O. A. C. No. 181 seems to approach the Alaska in respect both to period of maturity and low yield. The Invermere are two sorts which the Station was asked to compare as field peas. They proved early and reasonably prolific. No. 13 was slightly the earlier and was conspicuous in that, for some reason, its foliage was pale in contrast to the dark-green complexion of No. 15.

The nine-year average yield of the Arthur pea is only 20 bushels and 59 pounds per acre, having been seriously cut down by frost injury prior to ripening in some seasons. During the past three years it has averaged 31 bushels 58 pounds. Only three pounds behind it is the Chancellor, which, by reason of five and a half days briefer period of maturity is a much safer kind to grow.

It was not found practicable to remove marginal drills from the pea plots.

Common vetch is a shade later in blossoming and ripening than are any of the peas under test here. It is also worse affected by drouth. At least, dry weather is more liable to shorten the vines to the point of making harvesting difficult. The yield of seed is much smaller than the turnout of peas, though at the ruling price of vetch seed its production should be a profitable side-line or specialty for someone who chose to equip himself and get in touch with commercial marketing agencies.

PEAS AND VETCH—VARIETY TEST

Variety	Days to mature				Yields threshed grain per acre			
	1923	Average 2 years 1922-23	Average 3 years 1921-23	Average 5 years 1919-23	1923	Average 2 years 1922-23	Average 3 years 1921-23	Average 9 years 1915-23
					bush.lb.	bush.lb.	bush.lb.	bush.lb.
Alaska.....	113	117.5	.....	.....	28 17	20 11	.. ..	.. ..
Alberly Blue.....	122	123.0	123.0	.....	35 49	23 9	26 26	.. ..
Arthur, O. 18.....	127	127.0	126.6	128.8	46 12	29 48	31 58	20 59
Chancellor, O. 26.....	120	121.0	121.0	.....	38 53	26 42	31 55	.. ..
Golden Vine, Sask. 625.....	120	121.0	.....	.....	41 29	26 39	.. ..	.. ..
Empire.....	120	121.0	.....	.....	37 28	25 13	.. ..	.. ..
Invermere No. 13.....	121	.....	.....	.....	36 46	.. ..	.. ..	.. ..
Invermere No. 15.....	122	.....	.....	.....	37 57	.. ..	.. ..	.. ..
Mackay, O. 25.....	128	.....	.....	.....	49 58	.. ..	.. ..	.. ..
O. A. C. No. 181.....	119	120.5	.....	.....	29 13	20 34	.. ..	.. ..
White Alberta.....	120	121.0	120.6	.....	38 25	23 43	29 45	.. ..
Common Vetch.....	129	.....	.....	.....	19 19	11 18	.. ..	.. ..

SPRING RYE

The two races of spring rye, developed, respectively, by Drs. Saunders and Zavitz, grown side by side at Beaverlodge since 1921, were drilled May 1 on land prepared as for the oat plots, and adjacent to them. In spite of dry weather the stand seemed complete and growth comparatively vigorous. By June 25, practically all the heads were showing, but they were Lilliputian. When the rains came a plentiful secondary growth over-topped the early heads, causing very uneven ripening, although, unlike the oats, regular enough throughout the plots. There were no patches conspicuously greener than others. The admixture of green and ripe heads was prevalent. Harvesting was deferred to permit as many as possible of the late arrivals to register, but both yield and sample were marred.

FLAX

Under the same conditions of soil and preparation as shared by the oats and spring rye, a plot of Premost flax yielded 11 bushels and 6 pounds per acre. A larger area adjacent, grown as a nurse crop for grass seedings, did very much better, threshing 20 bushels and 16 pounds of very nice seed. The preparation here was inter-tilled oats as a summer-fallow substitute and the ground having been left somewhat ridged by the cultivation, and being, besides, a little lower, collected enough more snow moisture, apparently, to make the difference. Certainly both germination and staple were much better than in the case of the variety plot.

The six-year average yield of flax is now 12 bushels and 11 pounds, including one year of complete failure from spring frost.

BUCKWHEAT

A plot of common buckwheat was drilled May 29th, adjoining the flax and on land similarly treated. About sixty per cent of the seed waited for the mid-June rain. By July 6th, about half the early-starting plants were in bloom.

A second plot was sown June 8th, and by July 14th, this was coming into flower. Through the rainy weather, bloom continued in profusion and on August 15th, the plots were still showing a mass of colour, but seed was then forming abundantly and the bees, which had previously worked it very freely, were no longer paying it much attention.

Touches of frost on the mornings of August 1st, and 3rd, with respective registers of 32 and 34 degrees Fahrenheit, in standard caged instruments, slightly singed the leaves of squash in the garden, but no slightest effect on the buckwheat blossoms was discerned, and the set of seed was good.

The first seeding ripened in 102 days and the second in 103. The second plot was of small size and irregular shape, and yield was not computed. The first threshed 30 bushels 17 pounds of pancake provender per acre.

SPRING RYE, FLAX, AND BUCKWHEAT—VARIETY TEST

Variety	Days to mature		Yields of threshed grain per acre			
	1923	Average 3 years 1921-23	1923	Average yield 2 years 1922-23	Average yield 3 years 1921-23	Average yield 6 years 1918-23
<i>Spring Rye</i> —			bush. lbs.	bush. lbs.	bush. lbs.	bush. lbs.
O. A. C. No. 61.....	130	125	33 8	26 20	29 51	.. ..
Select, O. 12.....	130	125	31 50	25 12	31 10	.. ..
<i>Flax</i> —						
Premost.....	133	.....	11 6	8 54	.. ..	12 11
<i>Buckwheat</i> —						
Common.....	102	.....	30 17	.. ..	.. ..	.. ..

WINTER GRAIN

Three kinds of winter rye, three of winter wheat, all in single plots, and a plot of hairy vetches were drilled August 11th, 1922. Through the zeal of a helper the grains were too severely pickled, some varieties being injured worse than others, hence germination was tardy and in some cases very defective, though all were emerging by August 25th.

A particularly trying winter was followed by some erosion-injury in spring, so that these plots were well tested in adversity.

The ryes consisted of the Ottawa strain, propagated for six years at Beaverlodge, as well as Rosen and North Dakota 959, these two received from Professor Cutler in 1921, too late to sow that year. No conclusions should be attempted from this year's results, except that the yields of from 35 to 50 bushels per acre denote the extreme hardiness and enormous yielding power of winter rye under Grande Prairie conditions.

The wheats consisted of Turkey Red, propagated for many years at the Station, O. A. C. No. 104, from the plot crop of 1921, and a strain of Kharkov from Macdonald College, Quebec. The O. A. C. No. 104 almost entirely succumbed. The others seemed about equal in hardiness and the yields, which were very close, were unfortunately confused in threshing, so that only an average of the two can be given.

It seemed as though the very light frost of early August must have caught these wheats at a vulnerable stage for their sample was decidedly inferior. It is suspected that a few of the earliest spring wheats were also touched, though their sample did not reveal it at harvest.

The six-year average yield of 25 bushels 41 pounds for Turkey Red, covering, now, two exceedingly adverse seasons, and produced on land that was often sub-standard in quality or preparation, is encouraging.

The hairy vetches practically all winter-killed or failed to come at all.

A late-sown plot of Black winter oats killed out completely. This variety has, so far, succeeded only when spring-sown.

WINTER GRAINS—VARIETY TEST

Designation	Days to mature		Yields of threshed grain per acre	
	1923	Average 6 years 1918-23	1923	Average 6 years 1918-23
		bush. lbs.		bush. lbs.
<i>Rye</i> —				
North Dakota No. 959.....	382	.....	35 46	.. ..
Ottawa.....	382	371	50 5	44 34
Rosen.....	382	.....	43 14	.. ..
<i>Wheat</i> —				
Kharkov (Macdonald C.).....	388	.....	*7 5	.. ..
Turkey Red.....	388	376	*7 5	25 41
O. A. C. No. 104.....	388	.....	a trace	.. ..

* Average of two plots.

NOTE.—Vitality of all the seed of winter grains injured and to an irregular degree by over-severe treatment with formaldehyde, August, 1922. Winter-killing also very irregular.

FORAGE CROPS

During the past six years over sixteen hundred plots of meadow crops have been seeded at Beaverlodge. A majority of these have been embraced in two leading series of cultural experiments, styled, respectively, the Nurse Crop Test and the Grass and Clover Mixtures Experiment. Inoculation experiments with legumes; special cultural experiments with alfalfa; tests of grasses and clovers for seed production; variety tests of some of the less common grasses and clovers, as well as of alfalfa; and thickness-of-seeding tests with grasses, have represented other important lines of effort.

From the tabulated records of this volume of very carefully conducted work, data of great value is emerging. Pending completion of the several series of tests it is not thought wise to attempt definite deductions on the more problematical points, but certain facts of outstanding importance appear in bold relief.

The low average yields of hay obtained, even from the better-adapted grasses and legumes, are disappointing and thought-provoking. In part they are due to the abnormal proportion of dry early summers that have occurred during the progress of the forage-crop experiments to date; but a comparison of hay yields with the excellent yields of grain obtained from the several cereals grown from year to year in the Nurse Crop Test demonstrates that under Peace River conditions the annual cereal crops are far more productive of tonnage than are the perennial hay crops. Meadows require liberal precipitation and need it earlier in the season than grain.

It does not follow, however, that hay crops have no place. Their virtue in conserving soil fertility; in supplying the conditions necessary for successful stock husbandry, their economy of labour, arising from the fact that one ploughing and seeding produces several crops, and their frost-hardiness warrant and will eventually demand their inclusion in cropping systems. It becomes, then, of prime importance to decide upon those that are best adapted. The cropping returns thus far available point to western rye and brome among the grasses and to alfalfa and sweet clover among the legumes.

Timothy gives a poor account of itself, especially in the drouthy seasons when forage is most needed. It seems, furthermore, to be followed by light yields of other crops immediately following.

Meadow fescue is no better than timothy as a cropper—perhaps a little inferior, even—but it does not seem to exert the same degree of depressive influence upon the yields of ensuing crops when the sod is broken up. On this latter point, however, the data is as yet limited.

As a rotation grass, western rye looks most promising despite several drawbacks. It is often hard to mow, especially if over-mature stems and old bottom are mixed with an undergrowth of green stuff. Again, if not promptly cut after heading out it is liable to become wiry and unpalatable to stock. The hay is slippery to handle. As grown wild, this grass is subject to ergot, through we have noticed little of it so far in cultivated fields. On the other hand, it is relatively productive and drouth-resistant; it may be successfully seeded in an ordinary year, either with or without a nurse crop. Its sod breaks with comparatively light draft and is easily killed. It seems to be followed by better grain crops than is timothy sod. A mixture of alfalfa and western rye grass promises well for hay.

CAUSES OF VARIATION IN YIELDS

Whilst there is marked variation in the yields of different grasses, a still greater variation is generally attributable to the lay of the land, occurrence of moisture and difference in soil character. This proved especially true in 1923, when only snow moisture was available to support growth until June 10,

and as this supply varied sharply according to drifts, the plots presented a curious sight. Some patches started into growth in the spring and were consequently ripe when haying commenced. Other areas were as short and sere in early June as they ordinarily would be in April. These portions did not carry any sustained growth until after the June rains and were quite immature at cutting, even although this operation was in some cases long delayed in order to give the late growth a chance to produce what it would.

WINTER KILLING AMONG CERTAIN GRASSES

For the first time in the history of the Station a certain amount of winter-killing was discerned among the grasses, being confined to the more prominently exposed sites, which had been the driest in autumn and were the most windswept during winter. Likely the effect was accentuated by subsequent drouth. The injury was most marked on Red top and meadow fescue. Timothy had some patches. Brome, western rye and Kentucky Blue seemed to escape.

In order to crystallize the copious data into simple percentage comparisons that may be readily grasped, pains has been taken to work out the relative showings of the several grasses in each of the important series of experiments in which they respectively occur. Five well-known grasses are used in the Nurse Crop Test. Three of them also occur as singles (except for their rather unimportant clover combinations) in the Grass and Clover Mixtures Experiment. Two of them occur also in the Thickness-Of-Seeding Test With Grasses. The accompanying table summarizes the figures.

RYE GRASS OUTYIELDING TIMOTHY BY FIFTY-EIGHT PER CENT

Interest will centre upon the comparison of per acre per annum yields of 309 plot-harvests from 133 plots each of timothy, western rye grass, and meadow fescue occurring in the two principal experiments. According to these, rye grass ranks 58 per cent above timothy in yield and meadow fescue 4 per cent below timothy. Of the plots involved in this comparison a little over one-third were seeded with nurse crops. A further, though not quite equable comparison of rye grass and timothy is supplied by the Thickness-Of-Seeding Experiment, wherein the average yield from 22 plots of rye grass was 48.7 per cent ahead of the average from 30 plots of timothy. The fact that the rye grass in this test was at first sown quite too thinly for best results will go to explain its slight falling off. Inequality in the number of plots interferes with an actuarial computation. If this test were included, however, rye grass would, according to our calculation, still be 56.3 per cent ahead of timothy on the grand average representing more than 150 plots per grass.

Though the experiments are not yet complete and the figures subject, therefore, to future modification, it is doubtful whether a more thorough comparison of these two grasses has ever been made at any Station. The soil where the tests were conducted is an undulating upland, with from three to six inches of black silt loam overlying a clay subsoil. The average annual precipitation (including snow moisture) during the six years covered by the data has been 16.85 inches, amounting to 15.13 inches in 1918; 20.08 inches in 1919; 22.12 inches in 1920; 16.56 inches in 1921; 11.90 inches in 1922, and 15.30 inches in 1923. In total quantity this precipitation appears to run close to the average for the district so far as yet obtained, but a marked feature has been the preponderant proportion of the rainfall that has in at least three out of six seasons, fallen during the latter half of the growing season, which disposition is distinctly adverse to hay crops.

SUMMARY of Cropping Data down to 1923 from Experiments with Grasses in Five Successive Seedings (1918 to 1922, inclusive) of two Series of Experiments, viz., the Nurse Crop Test and the Grass and Clover Mixtures Experiment.

Designation	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome
	lbs.	lbs.	lbs.	lbs.	lbs.
Aggregate of 111 plot harvests from 53 nurse-crop-seeded plots of each grass in the Nurse Crop Test.....	94,794	159,373	87,812	41,636	147,496
Aggregate of 32 plot harvests from 10 plots of each grass seeded alone and clipped in year of seeding, Nurse Crop Test.....	44,070	64,600	34,680	22,150	61,680
Aggregate of 22 plot harvests from 10 plots of each grass seeded alone and not clipped in year of seeding, Nurse Crop Test.....	34,690	57,540	33,150	19,650	64,740
Aggregates of the 165 plot harvests from 73 plots of each grass in the Nurse Crop Test.....	173,554	281,513	155,642	83,436	273,916
Average of the 165 plot harvests from 73 plots of each grass in the Nurse Crop Test.....	1,051.8	1,706.1	943.2	505.6	1,660
Percentage comparisons.....	100%	162.2%	89.6%	48%	157.8%
Aggregates of 144 plot harvests representing 60 plots of each grass in the Grass and Clover Mixtures Experiment	204,999	316,960	207,580		
Totals of 309 plot harvests representing 133 plots of each grass in both experiments.....	378,553	598,473	363,222		
Grand averages of 309 plot harvests representing 133 plots of each grass in both experiments.....	1,225	1,936.8	1,175.4		
Percentage comparisons.....	100%	158%	95.9%		
SUPPLEMENT TO ABOVE TABLE					
Aggregate of 100 plot harvests representing 30 plots of timothy in Thickness-of-Seeding Test.....	123,515				
Aggregate of 70 plot harvests representing 22 plots of western rye grass in the Thickness-of-Seeding Test.....		128,596			
Super grand average of 409 plot harvests representing 163 plots of timothy in all three experiments.....	1,227				
Super grand average of 379 plot harvests representing 155 plots of western rye in all three experiments.....		1,918			
*Super grand average percentage comparisons.....	100%	156.3%			

* Slightly inaccurate from an actuarial standpoint owing to the fact that in the Thickness-of-Seeding Test there were a smaller number of rye grass than timothy plots.

THE MAIN NURSE CROP TEST

The sixth successive seeding of the main Nurse Crop Experiment was made in 1923. In this test, as originally designed, ten kinds of grasses and legumes for hay production are sown in strips across four quarter-acre blocks of each of three kinds of cereals, the four strips of each grain grading from thin up to thick rates of sowing. The strips of meadow seedings extend beyond these blocks of grain into a couple of check ranges seeded without nurse crops, one of the check ranges being sown on the same date as the strips through the grains, while the duplicate range is reserved for seeding ten days to a fortnight later. The check ranges ordinarily produce quite a growth of hay in the year of seeding. To test the advisability of leaving or removing this growth, the south half of each plot in both check ranges is clipped in late summer and the clippings cured into hay. The north half is left untouched. Thereafter, yields of the two halves are taken separately until the sod is ploughed up. Thus there are virtually one hundred and twenty fortieth-acre plots of grasses, clovers, and alfalfa seeded with nurse crops and forty eighth-acre plots in the two check ranges—one hundred and sixty in all.

To the plan as outlined occasional supplements have been added. On two or three occasions an extra block of oats has been drilled in at a later date than the sowing of the other nurse crops and the meadow strips extended across this. Results from it have been irregular, depending upon seasons.

Latterly it has been sought to learn whether, when seeding without nurse crops, annual weeds could be prevented from seeding by grazing animals on the stands during the initial season and vigorous plants of the hay crops still secured. Results are as yet inconclusive but the plan appears to hold a degree of promise, and more elaborate trials with it are proposed.

RATES OF SEEDING

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 50 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 12 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 quantities of small seeds, which are now sown 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.

PAINSTAKING WORK

Great care and accuracy have been observed in every operation connected with the experiment. Even distribution of seed has almost always been secured. After making all due allowance for undulating soil and experimental error, it is believed that the main cropping data obtained are a reasonably close approximation to absolute truth, so far as our soil and prevailing seasonal conditions are concerned.

It is recognized that the seasons 1918 to 1923 have comprehended an abnormally large percentage of dry early summers, in which the drouth-resistant grasses show up to better relative advantage than usual. On the other hand, some of the stands from which data are so far available have been cropped for but one or two years, and this tends to handicap said drouth-resistant grasses, notably western rye and brome, whose greatest leads are commonly obtained in the latter harvests from a given ley. On the whole, therefore, the figures as accumulated to date afford a fairly trustworthy comparison of the five grasses involved.

FIVE GRASSES COMPARED

The tabulated summary brings out several impressive comparisons of these five grasses, expressed both on a per-acre-per-annum-yield and on a percentage basis, timothy being taken as a standard of comparison in the latter case. Yields are first of all given separately and by seedings seriatim for the check ranges and for the nurse-crop sowings. The former are subdivided to afford a comparison of the results from the south halves (cut in the year of seeding) and the north halves (not cut in the initial year).

In order that the south halves may be more directly and graphically compared with the north halves, the former are averaged in two different ways.

In addition to giving the per-acre-per-annum yield of all cuttings, a supplementary line presents an average obtained by throwing in the initial season's yield as a bonus, so to speak, averaging the sum of the cuttings by using the same divisor as in the case of the north halves. This latter gives the obvious comparison between the effects of the two practices.

It will be seen that in all cases except that of brome, slightly the more hay has been obtained by cutting and curing the crop offering in the initial season, though when this first-season crop is averaged in as one of the harvests it rather pulls down the apparent yield, because it is seldom so heavy as subsequent cuttings. It should be pointed out, further, that the extra crop obtained by cutting in season of seeding has usually been too small to compensate in the long run for the extra labour, since by the end of the third season the unclipped portions have, as a rule, very nearly equalled in three crops the yields obtained from four harvests from the clipped areas. It would appear, therefore, that unless one especially needed the hay produced in the first season or unless it were a heavier crop than usual he would often be farther ahead, labour considered, to leave it on the ground. Timothy would be the most likely exception. The reader is warned, however, against drawing too sweeping an inference on this particular point, since at the completion of the experiment the figures may be somewhat altered. The replications of this comparison are not yet sufficient to warrant conclusions as to whether it pays to clip the first year or not.

LOW YIELDS AFTER NURSE CROPS

An instructive comparison lies between the nurse-crop and non-nurse-crop seedings. Taking the average of all the nurse-crop seedings and setting them against the averages of the north halves of the check ranges, since these, not having been clipped in the year of seeding, afford the simplest basis of comparison, we find that the average per-acre-per-annum yield of hay has been roughly twice as great from stands laid down without nurse crops as from those seeded with nurse crops, under the methods practised in this experiment. It is possible that with other methods of seeding the nurse-crop plots might do a little better; nevertheless the contrast is striking.

The grand average of seventy-three plots of each of five grasses in this test covering all yields down to 1923 from five successive annual seedlings, viz., 1918 to 1922 inclusive, places them in the following order of productiveness: Western rye, brome, timothy, meadow fescue, and Kentucky blue. The two first-named rank close together, rye grass having excelled under nurse-crop seeding and brome in the average of the check ranges. Brome seems slower than rye grass in establishing itself and makes its most advantageous comparison in leys of not less than two or three years' duration. It may have out-yielded rye grass by the time all the seedings will have been cropped for the full period proposed.

Taking timothy as the standard of comparison we find rye grass surpassing it by 62.2 per cent and brome by 57.8 per cent. Meadow fescue is 10.4 per cent below timothy, while Kentucky blue has yielded scarcely half as much as timothy and considerably less than a third as much as rye grass or brome.

NOTES ON THE CLOVERS AND ALFALFA

The legumes in this test were so badly handicapped in the early years by lack of inoculation that the data on these are too incomplete to average with the grasses. However, it may be said that since inoculation has been attended to, alfalfa has compared well with them in yield and drouth-resistance, though unable to measure up as a competitor against weeds. Sweet clover is less winter-hardy than alfalfa, or perhaps we should say more subject to root disease, and more difficult to get a catch of in a drouthy season, but when established and surviving the winter it is liable to prove more productive. The common clovers are not well adapted. They withstand drouth very poorly, especially alsike, while common red is not satisfactorily winter-hardy. White Dutch makes a mat but is not tall enough to mow.

TABLE SUMMARIZING CROP DATA OBTAINED DOWN TO 1923 FROM THE GRASS PLOTS IN THE NURSE CROP TEST, FIVE YEARS' SEEDINGS, 1918 TO 1922 INCLUSIVE

Designation	Yield in pounds per acre				
	Timothy	Western Rye	Meadow fescue	Kentucky Blue	Brome
<i>South halves of check ranges (clipped in year of seeding), averages of duplicate plots—</i>					
Aggregate yields from 3 cuttings on the 1918 seeding.....	8,820	8,380	5,200	2,840	7,440
Aggregate yields from 4 cuttings on the 1919 seeding.....	6,525	9,200	5,900	4,835	12,750
Aggregate yields from 4 cuttings on the 1920 seeding.....	3,350	7,160	3,140	1,420	5,000
Aggregate yields from 3 cuttings on the 1921 seeding.....	25.40	4,480	2,500	1,460	4,070
Aggregate yields from 2 cuttings on the 1922 seeding.....	800	3,080	600	520	1,580
Totals of 16 cuttings as above.....	22,035	32,300	17,340	11,075	30,840
Yields per acre per annum averaging 16 cuttings representing duplicate plots on each of five successive annual seedings (32 plot harvests each).....	1,377	2,018	1,083	692	1,927
Yields per acre per annum as if averaged on a basis of 11 crop years for direct comparison with the north halves, which are not clipped in year of seeding. (See below).....	2,003.1	2,936.3	1,576.3	1,006.8	2,803.6
Percentage comparison of grasses.....	100%	146.5%	78.6%	50.2%	139.9%
<i>North halves of check ranges (not clipped in year of seeding), averages of duplicate plots</i>					
Aggregate yields from 2 cuttings on the 1918 seeding.....	7,160	7,840	4,600	2,000	7,640
Aggregate yields from 3 cuttings on the 1919 seeding.....	3,505	6,450	5,915	3,955	9,510
Aggregate yields from 3 cuttings on the 1920 seeding.....	2,840	6,760	3,360	2,280	7,980
Aggregate yields from 2 cuttings on the 1921 seeding.....	2,900	4,780	2,140	1,290	4,920
Aggregate yields from 1 cutting on the 1922 seeding.....	940	2,940	560	300	2,320
Totals of 11 cuttings as above.....	17,345	28,770	16,575	9,825	32,370
Yields per acre per annum averaging 11 cuttings representing duplicate plots on each of five successive annual seedings (22 plot harvests each).....	1,576	2,615	1,506	893	2,943
Percentage comparisons of grasses.....	100%	165.9%	95.5%	56.6%	186.7%
<i>Seeded with nurse crops (some of plots occasionally sacrificed, thus introducing irregular numbers of plots from year to year)—</i>					
Aggregate yields from 2 cuttings on the 1918 seeding (averages 12 fortieth-acre plots).....	3,020	3,659	2,722	1,443	3,071
Aggregate yields from 3 cuttings on the 1919 seeding (averages 13 fortieth-acre plots).....	2,706	4,190	2,730	1,598	4,605
Aggregate yields from 3 cuttings on the 1920 seeding (averages 10 fortieth-acre plots).....	1,409	3,936	1,496	97	3,126
Yields from one cutting of the 1921 seeding—Stand then ploughed up account weeds. (Average 6 fortieth-acre plots).....	657	997	673	427	970
Yields from one cutting on the 1922 seeding (averages 12 fortieth-acre plots).....	748	1,576	290	186	1,516
Totals of 10 cuttings as above.....	8,540	14,358	7,911	3,751	13,288

TABLE SUMMARIZING CROP DATA OBTAINED DOWN TO 1923 FROM THE GRASS PLOTS IN THE NURSE CROP TEST, FIVE YEARS' SEEDINGS, 1918 TO 1922 INCLUSIVE—*Concluded*

Designation	Yield in pounds per acre				
	Timothy	Western rye	Meadow fescue	Kentucky blue	Brome
Crop yields per acre per annum averaging 10 cuttings representing in all 53 plots of each grass seeded with nurse crops during five successive annual seedings.	854	1,435.8	791.1	375.1	1,328.8
Percentage comparison of grasses.....	100%	168.1%	92.6%	43.9%	155.5%
Grand totals representing 165 plot harvests taken from 73 plots per grass, laid down in five successive years, comprising 53 fortieth-acre plots seeded with nurse crops and 20 eightieth-acre (subdivided) plots seeded without nurse crop.....	173,554	281,513	155,642	83,436	273,916
Grand averages showing the per-acre-per-annum yields of five grasses representing 165 plot harvests made from 73 plots laid down in five successive years, comprising 53 fortieth-acre plots seeded with nurse crops and 20 eightieth-acre plots (subdivided) seeded without nurse crops.....	1,051.8	1,706.1	943.2	505.6	1,660
Grand average percentage comparison of grasses.....	100%	162.2%	89.6%	48%	157.8%

COMPARING yields of hay in pounds per acre from the five grasses seeded in 1920 in the Main Nurse Crop Experiment. Three successive years' results in all cases and four years' crop in the case of the south halves of the check ranges (clipped in the year of seeding). To condense the table the yields of these areas in the initial season are doubled up in the columns carrying the 1921 yields.

Description of seeding	Timothy at 6 lbs. per acre		Western rye at 9 lbs. per acre		Meadow fescue at 18 lbs. per acre		Kentucky blue at 18 lbs. per acre		Brome at 18 lbs. per acre								
	*1921	1922	*1921	1922	*1921	1922	*1921	1922	*1921	1922							
	Ag'te		Ag'te		Ag'te		Ag'te		Ag'te								
Seeded alone. North half of Check Range B. (Not clipped year of seeding).....	2,160	240	80	2,480	4,160	1,080	520	5,760	3,000	200	40	3,240	2,840	2,320	1,320	9,520	
Seeded alone. South half of Check Range B. (Clipped year of seeding).....	400	280	40	2,800	800	880	240	6,080	3,200	80	0	3,280	1,640	640	320	4,560	
Seeded alone. North half of Check Range A. (Not clipped year of seeding).....	2,800	320	80	3,200	5,520	960	1,280	7,760	3,400	80	0	3,480	1,720	2,040	240	6,440	
Seeded alone. South half of Check Range A. (Clipped year of seeding).....	1,680	200	20	3,900	1,840	1,560	760	8,240	2,920	80	0	3,000	1,200	40	1,040	5,440	
Seeded with 16 pecks Ligowo oats.....	2,000	120	40	900	1,400	580	460	2,440	820	100	40	960	0	20	680	860	440
Seeded with 12 ".....	800	20	40	860	2,040	1,060	1,200	4,300	1,020	100	60	1,180	0	20	1,040	1,140	1,020
Seeded with 10 ".....	680	80	200	960	1,640	1,040	1,360	4,040	1,340	80	180	1,600	0	20	880	1,000	860
Seeded with 8 pecks Huron wheat.....	1,480	180	220	1,880	2,040	920	1,140	4,100	1,220	200	260	1,680	0	20	1,080	980	400
Seeded with 7 ".....	1,560	240	180	1,980	2,560	980	900	4,440	1,220	280	260	1,760	0	80	1,840	2,080	1,360
Seeded with 6 ".....	1,120	220	400	1,740	2,840	1,060	740	4,640	1,550	180	20	1,780	0	80	20	1,300	580
Seeded with 5 ".....	1,240	160	10	1,410	2,800	900	360	4,060	1,560	140	40	1,740	0	140	300	1,700	1,880
Seeded with 8 pecks O.A.C. 21 barley.....	1,840	380	380	2,600	2,240	1,380	1,220	4,840	1,180	140	220	1,540	0	40	30	70	800
Seeded with 7 ".....	720	200	60	1,980	1,980	960	540	3,480	1,340	160	40	1,540	0	80	80	640	120
Averages (14 plots in each case).....	1,570	193	128	1,891	2,970	1,019	811	4,800	1,770	137	90	1,997	446	117	35	598	2,076
Averages 10 plots seeded with nurse crops.....	1,086	166	157	1,409	2,102	978	856	3,936	1,226	148	122	1,496	0	52	45	97	1,106
Averages 2 plots not clipped in year of seeding.....	2,480	280	80	2,840	4,840	1,020	900	6,760	3,200	140	20	3,360	1,880	400	0	2,280	5,020
Averages 2 plots clipped in year of seeding.....	3,080	240	30	3,350	5,440	1,220	500	7,160	3,060	80	0	3,140	1,240	160	20	1,420	3,980

*(Including 1920 crops from south halves Check Ranges).

NOTES

- (1) Preparation—In 1919, summer-fallow. The 1920 nurse crops were sown May 20th and 21st. Grasses and clovers in the nurse crop blocks and in check range A. were seeded May 24th. Range B. seeded June 3rd.
- (2) Weeds necessitated ploughing up the grasses in the two thinnest seedings of barley.
- (3) Clovers and alfalfa were sown without inoculation owing to the nitro-culture not having arrived in time. In late October, inoculated soil was broadcast over the seedings but this proved too late for good results. Weeds compelled the ploughing up in 1920 of all the nurse-crop seedings of legumes. Inoculation was then found to be quite generally commencing. It was much slower in taking effect on the check ranges and produced little effect on the crop of these, which were, in consequence, extremely poor.
- (4) Considerable winter killing occurred among meadow fescue in the higher and drier portions of the plots and a little on timothy.
- (5) On July 20th and 21st, 1923, following removal of the hay crops, all the sod plots were ploughed up excepting the alfalfa in the check ranges and the grass sods in one range at the south end of the block, this latter being reserved for a comparison of late breaking against July breaking followed by backsetting. The breaking of this one range and the backsetting of the other land was done in September and the land disked down.
- (6) When breaking in July, moisture was found in the bottom of most furrows. Western-rye sod was found the easiest to break, followed by fescue, timothy, Kentucky blue, and brome.

PRESENTING results in pounds of hay per acre from the five grasses and four legumes seeded 1921 in the Main Nurse Crop Experiment. Two years' crop in all cases and three years in the case of the south halves of the Check Ranges, (clipped in year of seeding). As White Dutch clover produced no yield of hay, it was excluded from this table. Sweet clover in the Check Ranges gave two cuttings in 1922 and would have done so from the Nurse-Crop areas if left.

Description of Seeding	Alsike at 5 lbs. per acre		Common Red at 10 lbs. per acre		Alfalfa at 10 lbs. per acre		Sweet Clover at 10 lbs. per acre		Timothy at 6 lbs. per acre		Western Rye at 12 lbs. per acre		Meadow Fescue at 18 lbs. per acre		Kentucky Blue at 18 lbs. per acre		Brome Grass at 18 lbs. per acre					
	*1922	1923	*1922	1923	*1922	1923	*1922	1923	*1922	1923	*1922	1923	*1922	1923	*1922	1923	*1922	1923				
Seeded alone. North half of Check Range B. (Not clipped year of seeding).....					2,560	1,400	3,960	4,000	2,600	1,160	3,720	1,800	5,520	1,860	920	2,800	1,360	560	4,480	2,040	6,520	
Seeded alone. South half of Check Range B. (Clipped year of seeding).....	80	1,320	1,240	1,940	320	3,840	2,320	2,640	1,760	280	3,360	1,040	5,760	2,560	1,320	2,880	0	1,280	2,840	480	4,280	
Seeded alone. North half of Check Range A. (Not clipped year of seeding).....	480	1,840	320	2,160	3,600	1,520	2,040	3,600	1,520	520	2,040	680	4,040	1,320	160	1,480	640	20	660	3,060	3,320	
Seeded alone. South half of Check Range A. (Clipped year of seeding).....	680	1,940	1,600	2,560	2,190	1,360	1,920	2,190	1,360	160	1,920	200	3,200	1,760	160	1,480	0	1,320	3,320	360	3,860	
Seeded with 10 pecks Banner oats.....	240	740	520	1,040	820	560	840	520	540	640	740	700	960	740	380	480	480	840	640	840	840	
" 11 " " ".....	140	440	440	560	680	360	560	680	360	360	440	360	540	460	300	480	300	740	640	960	960	
" 12 " " ".....	220	420	420	560	720	460	640	720	460	460	560	500	640	540	420	460	420	920	840	920	920	
" 13 " " ".....	560	720	720	1,160	1,160	800	1,160	800	800	1,320	1,320	1,420	1,420	860	520	520	520	1,780	1,780	1,780	1,780	
" 14 " " ".....	600	700	700	1,160	1,160	760	1,160	760	1,000	1,000	1,420	1,420	1,420	860	520	520	520	1,780	1,780	1,780	1,780	
Averages (10 plots in each case).	224			1,386		2,232		2,232		1,270		2,078		1,176		732		2,060		2,060		2,060
Averages 6 plots seeded with nurse crops.....	327			590		833		833		657		997		673		427		970		970		970
Averages 4 plots seeded without nurse crops.....				2,580		3,130		3,130		2,190		3,700		4,630		390		1,150		1,375		3,695
Averages 2 plots not clipped in year of seeding.....	280			2,200		3,060		3,060		2,060		3,540		4,780		540		2,140		2,900		3,740
Averages 2 plots clipped in year of seeding.....	1,120			2,960		3,200		3,200		2,320		3,860		2,260		240		2,500		1,380		3,650

*Including 1921 crop from south halves of Check Ranges.

NOTES

- (1) Part of the alsike and red clover plots followed hoe crop, chiefly turnips, after which the growth was much less rank than after fallow. The brome, Kentucky blue, and meadow fescue followed hoe crop, chiefly potatoes, while the remaining plots were on land fallowed in 1920.
- (2) Range A was seeded April 26, Range B on May 7.
- (3) The impracticability of protecting certain of the stands from shepherd's purse necessitated ploughing up in 1922 the nurse crop areas that had been seeded on barley and on the two thinnest sowings of wheat.
- (4) In the spring of 1923 all the remaining areas originally seeded with nurse crops were ploughed up and the land put in hoe crops.
- (5) On May 31, 1923, the plots of red, alsike, white Dutch, and sweet clover in the Check Ranges were scuffled up, the latter being later reseeded to a mixture of sweet clover and grass.

PRESENTING results in pounds of hay per acre from the five grasses and two of the five legumes seeded, 1922 in the Main Nurse Crop Experiment. One year's crop in all cases and two years' in the case of the south halves of the Check Ranges (clipped in year of seeding). Sweet clover, though very sparse and irregular in its stand, occurring chiefly on the low spots, gave two cuttings in 1923, the second cutting being taken for seed, of which it gave a small yield, much of it being immature. Only the first cutting considered in this table.

Description of Seeding	Alfalfa	Sweet	Timothy	Western	Meadow	Kentucky	Brome
	at 10 lb. per acre	Clover at 10 lb. per acre	at 6 lb. per acre	Rye at 12 lb. per acre	fescue at 18 lb. per acre	blue at 18 lb. per acre	at 18 lb. per acre
	*1923	*1923	*1923	*1923	*1923	*1923	*1923
Seeded alone. North half Check Range B. (Not clipped year of seeding)....	2,080	3,760	840	2,920	560	320	1,920
Seeded alone. South half Check Range B. (Clip- ped year of seeding)....	1,040	720	440	480	600	400	40
	1,080	2,360		2,800			1,760
Seeded alone. North half Check Range A. (Not clipped year of seeding)....	840	1,840	1,040	2,960	560	280	2,720
Seeded alone. South half Check Range A. (Clip- ped year of seeding)....	240	640	1,160	960	560	640	40
	520	1,280		1,920			1,360
Seeded with 16 pecks Victory oats.....	1,240	460	1,540	1,800	420	360	0
Seeded with 14 pecks Victory oats.....	1,120	900	800	1,440	300	260	1,640
Seeded with 12 pecks Victory oats.....	1,000	1,880	1,280	1,840	400	340	1,440
Seeded with 10 pecks Victory oats.....	1,040	780	1,260	1,700	240	220	1,660
Seeded with 8 pecks Ruby wheat.....	1,000	300	420	1,680	120	0	1,980
Seeded with 7 pecks Ruby wheat.....	1,120	80	260	1,160	20	0	1,420
Seeded with 6 pecks Ruby wheat.....	660	0	0	1,340	320	160	1,700
Seeded with 5 pecks Ruby wheat.....	520	0	380	1,240	40	0	1,820
Seeded with 10 pecks Trebi barley.....	820	300	460	1,360	160	160	1,300
Seeded with 8 pecks Trebi barley.....	1,020	340	600	1,700	460	180	1,740
Seeded with 6 pecks Trebi barley.....	780	20	200	1,520	360	220	2,060
Seeded with 4 pecks Trebi barley.....	1,160	4,000	1,780	2,140	640	340	1,440
Average (16 plots in each case).....	1,080	1,228	778	1,935	362	242	1,625
Averages 12 plots seeded with nurse crop.....	956	755	748	1,576	290	186	1,516
Average 2 plots not clipped in year of seeding.....	1,460	2,800	940	2,940	560	300	2,320
Average 2 plots clipped in year of seeding.....	1,440	2,500	800	3,080	600	520	1,580

*(Including 1922 crop from south halves Check Ranges).

NOTES

(1) This, the fifth successive seeding was made in 1922 according to the plan originally laid out in 1918 and on exactly the same area, which had grown potatoes in 1921 and was prepared by surface cultivation for further cropping. Seed-bed conditions in 1922 seemed ideal but the unprecedented drought resulted in a very weak growth of all the hay crops that were sown with nurse crops. Brome grass, Western rye, and alfalfa finally made the best stand, with sweet clover about fourth in order. Kentucky blue, meadow fescue, and timothy did very poorly. In the check ranges better stands were obtained all round, although the later-sown range (B) did not give nearly so good a plant as did the earlier-sown range (A) which germinated during the period of early moisture.

(2) Thanks to inoculation, the five legumes made a much better showing by autumn and again the next spring than they had done in the much more favourable season of 1918. The alfalfa this time did particularly well as compared with the other legumes or with the grasses.

(3) Quantities of seed were as in 1918, except Western rye which was sown at 12 pounds instead of 6 pounds as in the first year.

(4) The grains used as nurse crops were drilled April 27th and 28th. The grasses and legumes directly afterwards, excepting Check Range B, which was seeded May 17th and 18th.

(5) Owing to drought in the year of seeding and the early part of 1923 the strips of common red, alsike, and white Dutch clovers were so poor that they were sacrificed. The sweet clover came through the winter very badly patched. Only the alfalfa among the legumes made a full stand, Western rye grass full, brome nearly full but short and backward, the nurse crop seeding of this grass not being cut until August 18th, 1923—more than two weeks after the other strips alongside; timothy very irregular, fescue and Kentucky blue nearly failures.

THE 1923 SEEDING

The 1923 repetition of the Nurse Crop Experiment was seeded on undulating land that had been manured and deeply ploughed early in 1922, then fallowed until July and drilled to oats and barley in single rows intercultivated as a summer-fallow substitute, the resulting half-matured growth of cereals being grazed off in late autumn.

Of this block, an acre each was drilled on April 30 and May 1, 1923, to Ruby wheat, Banner oats, and Trebi barley.

Wheat yielded 4,586 pounds total crop and 1917 pounds grain per acre.

Oats yielded 6,144 pounds total crop and 2,665 pounds grain per acre.

Barley yielded 5,707 pounds total crop and 3,089 pounds grain per acre.

Because of wind and delay in arrival of supplies, the grass and clover seeds were not all sown immediately thereafter, but on the nurse-crop blocks and Check Range A the timothy, rye grass, and all the legumes except white Dutch clover were sown May 3rd, the legumes being inoculated with nitro-culture received from the Division of Botany, Ottawa. The white Dutch clover was sown May 4th; the brome, Kentucky Blue, and meadow fescue on May 7th.

Rates of seeding were the same as in 1922.

On May 18th an extra range 4 by 10 rods was seeded south of the barley block. After the usual ten grass and clover seeds had been here applied, a block of flax 2 by 10 rods was drilled across them, the drill disks covering the grass seeds. South of this again was drilled a strip of Banner oats 1 by 10 rods, sown at one bushel per acre, and the remainder of the area amounting to a strip 1 by 10 rods was covered without any nurse crop, the intention being to keep weeds down by pasturing.

The legumes in Check Range B were sown May 18th. The grasses in this range were sown May 19th, except the meadow fescue, which could not be sown until May 28th. The south halves of these check ranges were mown on September 8th.

While germination of the nurse crops, with the partial exception of flax, was fairly even, because these were drilled deeply enough to get most of the grain into contact with the moisture, most of the small seeds among the grain lay inert in a dust-bed until June 10th, by which time the grain had too much of a lead to give them a chance, and by autumn their showing among the grain was extremely meagre, Western rye, brome, alfalfa, and sweet clover being the best.

An exception to the foregoing generalization was found in the strip of flax, which, as usual, proved a very non-restrictive nurse crop both as to the hay crops and the weeds. Labourious hand-pulling pretty well controlled the latter, resulting in a twenty-bushel yield of nice flax, while excellent stands of the several hay crops were apparent among the stubble.

The late-sown block of oats produced a very heavy crop, part of which was bound on August 8th when in the milk, while the remainder was cut September 8th when nicely ripened. The yields of this strip of oats have been lost but would have been close to four tons of fodder per acre. The stand of meadow plants among the stubble was much better than among the stubble of the lighter-yielding oat crop sown in April. Here, as elsewhere, the deferred seeding of the grain seemed to result in the small seeds having a better chance to take advantage of the June rains.

CONTROLLING WEEDS BY GRAZING

The 1 by 10-rod pasturing-test block, comprising a square rod of each of the ten grasses and legumes employed in the whole experiment, was so located as to give the severest kind of a test to this system of seeding, being

in a position where it received barnyard and stackyard wash and consequently was polluted with an unusual quota of the Station's *bête noire*, i. e. Shepherd's purse. This weed got the start of the young hay seedlings while the former were thought too weak to stand pasturing. By about the middle of July the weed had formed a dense mat averaging a foot in height and before stock were turned in, it was thought well to mow the weed and rake it off. It was estimated that the Shepherd's purse, if cured, would have weighed at least a ton per acre. The block was then fenced into a paddock and milch cows turned in from time to time. These kept the weed down fairly satisfactorily and by autumn all the grasses and clovers except Kentucky Blue were nicely established and occupying the ground with little competition. Thus one more bit of evidence points hopefully in the direction of seeding without nurse crops and grazing to keep weeds under during the season of seeding.

DETERMINING HAY YIELDS ON BASIS OF ABSOLUTE DRY MATTER

In ascertaining the yields of hay from the south halves of the check ranges, the new plan was followed of weighing the crop in the field (in this case nearly cured before the apparatus was on hand), then chaffing a representative portion and taking from this a carefully weighed composite sample for absolute dry-matter determination. To this an allowance of twelve per cent was added to represent the amount of moisture in well-cured hay. It is believed that this method gives the most accurate comparison possible between such slow-curing, sappy crops as sweet clover on the one hand and, on the other, those finer-stemmed crops which ordinarily cure out most thoroughly in the field.

PRESENTING YIELDS OBTAINED IN 1923 FROM THE CLIPPED (SOUTH) HALVES OF THE CHECK RANGES IN THE 1923 NURSE CROP EXPERIMENT

Description of Seeding	Yields in Pounds per Acre		
	Range A	Range B	Average
White Dutch.....	0	0	0
Alsike.....	221	379	300
Common red.....	192	461	326
Alfalfa.....	1,363	1,143	1,253
Sweet clover.....	1,296	819	1,057
Timothy.....	916	2,099	1,507
Western rye.....	1,415	1,721	1,568
Meadow fescue.....	159	600	379
Kentucky blue.....	0	223	111
Brome.....	1,220	1,395	1,307

GRASS AND CLOVER MIXTURES EXPERIMENT

The primary purpose of this experiment, initiated in 1918 and now seeded for the sixth successive time, is to compare various combinations of grasses and legumes.

OUTLINE OF EXPERIMENT

About the beginning of June in each season, or as soon thereafter as practicable, forty-eight fortieth-acre plots have been sown in three series, representing mixtures of certain grasses with each of three leguminous bases, viz., alfalfa, common red clover, and a blend of common red and alsike. Each series consists of two ranges, one (Range A) sown at a fairly heavy rate per acre, and the other (Range B) at a reduced rate, usually just two-thirds that of the first. In each range there are, thus, 48 divided by 6 equals 8 plots, six of which, constituting a complete quota in themselves, have always been sown without any

nurse crop, while the seventh and eighth plots of each range repeat the sixth, being sown, generally, on a strip of grain drilled early as a nurse crop. The purpose 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 is well up, with the results of sowing the small seeds directly after the grain is drilled, as practised in the Main Nurse Crop Experiment. As the two experiments have always been laid out on adjoining land, usually quite similar in nature and preparation, this incidental nurse-crop comparison has been instructive. The implied results have very emphatically favoured sowing the grass and clover seeds directly after the grain is drilled rather than after it has come up. The less head start the nurse crop has the less it strangles the "seeds." This has been more particularly true of the clovers, which, until 1921, failed almost completely under the system of deferred seeding.

Apart from the twelve plots seeded each year on the nurse-crop strip along one side of the block, there are always 36 plots which lend themselves to fair averaging and computation. So far as the primary objects of the experiment are concerned, the 36 plots are complete in themselves. Whenever the initial season's growth was worth while, the practice has been to clip the south half of each plot in the year of seeding, curing and weighing the product. The north halves have never been clipped the first year, but left for a comparison of the point involved.

The plots in this experiment have been divided by paths, but an attempt has always been made to eliminate the excess of marginal growth along these.

Failure to receive the nitro-culture in time precluded inoculation of the legumes until 1920, when merely the seeds for the legume-only plots were treated, the several mixtures having been prepared and sown before the culture arrived. In the ensuing season the legumes in the mixture plots received some benefit, however, from accidental inoculation. In 1921, and subsequently, inoculation was systematically attended to.

PREPARATION

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

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 5 grasses, viz., the three named at 4, 4, and 7, as well as 4 pounds each of red top 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 the legumes were the same in 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 other two series were always 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 quantities of clover seed were 10 pounds red and 4 of alsike for the legume-only plots in the full-seeded range (A), with 8 of red and 2 of alsike in each plot of the range where grasses occurred.

FINDINGS TO DATE

The summary of cropping data down to the end of 1923 brings out an illuminating comparison of the three main grasses employed, viz., western rye, timothy, and meadow fescue. While, as originally seeded, there were in the non-nurse-crop block 30 fortieth-acre plots of each of these grasses in combination with the three leguminous bases, subdivision of plots has virtually rendered them into 60 eightieth-acre plots, yielding from one to four harvests and representing five consecutive seedings, 1918 to 1922 inclusive, in other words, all the crops taken off to date.

Since, for lack of inoculation in the earlier seedings and from drouth in the later years, the legumes have usually constituted a minor proportion of the crop; and since the layout has been such as to afford the evenest possible conditions for the single grasses involved, a plot of rye grass being always flanked by timothy on the one hand and fescue on the other, it is believed that this experiment yields exceptionally reliable data, roughly equivalent to what might be obtained by sowing twelve eightieth-acre plots of each for five years in succession.

From this extensive replication it has been found that the lowest-yielding grass has been timothy, with meadow fescue practically the same, while western rye grass has outyielded timothy by 54.6 per cent. The blend of timothy, rye grass, and fescue has exceeded timothy by 15.6 per cent, while the five-grass mixture, in which red top and Kentucky blue are added to the above three, has outyielded timothy by 16.3 per cent. As to this latter, however, it must be said that if any plot has been favoured in location it has probably been the five-grass mixture, which, in half of the ranges, has been virtually a flanking plot, being situated next a roadway. All the others have been interiorly situated.

In the comparison of western rye with the other grasses it is to be noted that while it has outyielded them in nearly every comparison, its greatest lead has been obtained in the drouthiest years. From the 1921 seeding, for instance, which was cropped in 1922 and 1923, the average yield of the six fortieth-acre timothy plots was only a trifle over a quarter of a ton per acre per annum, while from the adjoining rye-grass plots it was slightly over a ton. The fescue in that seeding for some reason showed up a little better than the timothy, but not much more than a third as well as the rye grass.

For combining with legumes, rye grass seems distinctly superior to timothy. This is judged not so much from the yield tables as from the appearance of the plots. Timothy at Beaverlodge soon forms a tight sward in which such legumes as alfalfa and clover grow weakly, while in the rye-grass mixtures they are noticeably taller, more vigorous, and have a decidedly better colour. This is especially true in leys of two or more years' standing, notwithstanding the fact that on nearly all such the moisture supply has been drawn upon by much heavier crops of hay in the first and second seasons than have been produced on the timothy or fescue plots. Possibly the bunching habit of the rye-grass growth is, directly or indirectly, a factor in the case, though it is questionable whether this affords the complete explanation. From the soil-fertility investigations made elsewhere on the Station it would seem as though the nitrogen factor likely entered in.

Of the legumes employed it is observed that alfalfa has been decidedly the best of the three bases from the fourfold standpoint of getting a catch; of winter-hardiness; of drouth resistance, and of yield. Of the several grass-legume combinations in the experiment, the blend of alfalfa and western rye is quite the most prepossessing, save in regard to the present cost of alfalfa seed. Further deductions await the completion of the test.

SUMMARY comparing grasses and combinations thereof in the Grass and Clover Mixtures Experiment. In this table, for the purpose of arriving at true final averages, the fortieth-acre plots are, in all cases, reduced to an eightieth-acre basis. Thus in each of the 1919, 1921 and 1922 seedings the harvest is shown as from twelve eightieth-acre plots of each grass, although yields in these three cases were originally taken as from six fortieth-acre plots. Thus the data summarized is shown as representing, in the case of each grass, sixty eightieth-acre plots covering (uniformly) from one to four years' harvests from five consecutive seedings, 1918 to 1922 inclusive.

	Timothy	Western rye	Meadow fescue	Three grasses	Five grasses
	lb.	lb.	lb.	lb.	lb.
<i>1918 Seeding</i>					
Aggregate 3 crops, average 2 ranges.....	8,280	9,080	6,480	8,760	6,600
“ 3 “ “ 2 “	8,760	9,320	6,280	6,960	6,960
“ 3 “ “ 2 “	7,080	8,640	6,400	7,320	6,560
“ 2 “ “ 2 “	6,100	9,160	6,800	8,920	7,080
“ 2 “ “ 2 “	5,640	6,600	4,370	5,920	5,920
“ 2 “ “ 2 “	4,680	6,800	5,360	6,640	4,760
Aggregate 15 crops (average 2 ranges) representing 12 eightieth-acre plots.....	40,600	49,600	35,690	44,520	37,880
Average per acre per annum of 30 plot-harvests representing 12 plots.....	2,706	3,306	2,379	2,968	2,525
<i>1919 Seeding</i>					
Aggregate 3 crops, average 2 ranges.....	4,130	6,220	4,230	4,890	5,130
“ 3 “ “ 2 “	4,560	6,810	4,350	4,860	4,670
“ 3 “ “ 2 “	3,990	6,260	4,650	4,420	5,990
“ 3 “ “ 2 “	4,130	6,220	4,230	4,890	5,130
“ 3 “ “ 2 “	4,560	6,810	4,350	4,860	4,670
“ 3 “ “ 2 “	3,990	6,260	4,650	4,420	5,990
Aggregate 18 crops (average 2 ranges) representing 12 eightieth-acre plots.....	25,360	38,580	26,460	28,340	31,580
Average per acre per annum of 36 plot-harvests representing 12 plots.....	1,409	2,143	1,470	1,574	1,754
<i>1920 Seeding</i>					
Aggregate 4 crops, average 2 ranges.....	3,732	6,609	4,549	4,693	5,122
“ 4 “ “ 2 “	4,480	5,380	3,820	4,440	3,960
“ 4 “ “ 2 “	3,760	5,620	4,100	4,540	5,280
“ 3 “ “ 2 “	2,227.5	5,431	3,631	3,472	3,301
“ 3 “ “ 2 “	1,960	4,880	3,720	3,000	2,360
“ 3 “ “ 2 “	2,500	4,420	3,540	4,360	4,500
Aggregate 21 crops (average 2 ranges) representing 12 eightieth-acre plots.....	18,659.5	32,340	23,360	24,505	24,523
Average per acre per annum of 42 plot-harvests representing 12 plots.....	888.5	1,540	1,112.3	1,166.9	1,167.7
<i>1921 Seeding</i>					
Aggregate 2 crops, average 2 ranges.....	610	3,640	1,280	930	1,350
“ 2 “ “ 2 “	1,160	4,220	1,310	1,260	2,690
“ 2 “ “ 2 “	1,380	4,650	2,060	1,820	2,540
“ 2 “ “ 2 “	610	3,640	1,280	930	1,350
“ 2 “ “ 2 “	1,160	4,220	1,310	1,260	2,690
“ 2 “ “ 2 “	1,380	4,650	2,060	1,820	2,540
Aggregate 12 crops (average 2 ranges) representing 12 eightieth-acre plots.....	6,300	25,020	9,300	8,020	13,160
Average per acre per annum of 24 plot-harvests representing 12 plots.....	525	2,085	775	668.3	1,096.6
<i>1922 Seeding</i>					
One crop, average two ranges.....	1,990	2,240	1,530	2,210	1,960
“ “ “	2,510	2,280	1,550	2,580	2,370
“ “ “	1,290	1,950	1,410	1,800	1,710
“ “ “	1,990	2,240	1,530	2,210	1,960
“ “ “	2,510	2,280	1,550	2,580	2,370
“ “ “	1,290	1,950	1,410	1,800	1,710
Aggregate 6 crops, (average 2 ranges) representing 12 eightieth-acre plots.....	11,580	12,940	8,980	13,180	12,080
Average per acre per annum of 12 plot-harvests representing 12 plots.....	1,930	2,156.6	1,496.6	2,196.6	2,013.3

SUMMARY comparing grasses and combinations thereof in the Grass and Clover Mixtures Experiment. In this table, for the purpose of arriving at true final averages, the fortieth-acre plots are, in all cases, reduced to an eightieth-acre basis. Thus in each of the 1919, 1921 and 1922 seedings the harvest is shown as from twelve eightieth-acre plots of each grass, although yields in these three cases were originally taken as from six fortieth-acre plots. Thus the data summarized is shown as representing, in the case of each grass, sixty eightieth-acre plots covering (uniformly) from one to four years' harvests from five consecutive seedings, 1918 to 1922 inclusive.—*Concluded.*

	Timothy	Western rye	Meadow fescue	Three grasses	Five grasses
	lb.	lb.	lb.	lb.	lb.
<i>Condensed Summary (averaging two ranges in each case)</i>					
1918 seeding, aggregate 15 yields.....	40,600	49,600	35,690	44,520	37,880
1919 " " 18 "	25,360	38,580	26,460	28,340	31,580
1920 " " 21 "	18,659.5	32,340	23,360	24,506	24,523
1921 " " 12 "	6,300	25,020	9,300	8,020	13,160
1922 " " 6 "	11,580	12,940	8,980	13,180	12,080
Aggregate of 72 crops representing 60 eightieth-acre plots.....	102,499.5	158,480	103,790	118,565	119,223
Average per acre per annum of 144 plot-harvests representing 60 plots.....	1,423.6	2,201.1	1,441.5	1,646.7	1,655.8
Percentage comparisons.....	100	154.6	101.2	115.6	116.3

PRESENTING THREE AND FOUR YEARS' YIELDS OF HAY IN POUNDS PER

Designation	South Halves (Clipped in Year of Seeding)										Average aggregate both ranges four crops
	Range A (full seeding)					Range B (two-third seeding)					
	1920	1921	1922	1923	Ag'te 4 years	1920	1921	1922	1923	Ag'te 4 years	
<i>Alsike and Red Clover Series</i>											
Clovers only.....	320	1,360	247	.....	1,927	560	760	520	.....	1,840	1,883
Clover and timothy.....	1,360	1,280	664	520	3,824	1,280	1,840	240	280	3,640	3,732
Clover and western rye grass.....	1,120	1,800	1,339	1,760	6,019	1,280	2,600	2,000	1,320	7,200	6,609
Clover and meadow fescue.....	1,200	2,320	418	720	4,658	1,520	2,120	440	360	4,440	4,549
Clover and three grasses.....	720	1,840	546	960	4,066	1,760	2,120	680	760	5,320	4,693
Clover and five grasses.....	1,200	2,160	765	640	4,765	2,240	2,280	600	360	5,480	5,122
Averages.....	986	1,793	663	766	4,209	1,440	1,953	746	513	4,653	4,431
<i>Red Clover Series</i>											
Clover only.....	560	2,400	.....	.....	2,960	320	1,640	560	.....	2,520	2,740
Clover and timothy.....	2,400	2,440	960	80	5,880	800	1,160	600	520	3,080	4,480
Clover and western rye grass.....	80	1,960	1,280	480	3,800	1,040	1,960	1,760	2,200	6,960	5,380
Clover and meadow fescue.....	720	2,440	440	0	3,600	720	2,400	600	320	4,040	3,820
Clover and three grasses.....	1,760	1,640	560	440	4,400	880	2,880	400	320	4,480	4,440
Clover and five grasses.....	1,840	1,800	440	240	4,320	1,200	2,160	120	120	3,600	3,960
Averages.....	1,226	2,113	613	206	4,160	826	2,033	673	580	4,113	4,136
<i>Alfalfa Series</i>											
Alfalfa only.....	560	760	480	520	2,320	2,160	2,080	1,640	800	6,680	4,500
Alfalfa and timothy.....	1,120	2,120	160	400	3,800	1,840	1,680	120	80	3,720	3,760
Alfalfa and western rye.....	880	1,880	960	800	4,520	1,760	2,280	1,400	1,280	6,720	5,620
Alfalfa and meadow fescue.....	1,040	2,360	480	400	4,280	960	2,040	240	680	3,920	4,100
Alfalfa and three grasses.....	2,000	2,280	400	400	5,080	1,040	1,840	240	880	4,000	4,540
Alfalfa and five grasses.....	1,840	3,200	1,320	920	7,280	1,440	1,280	200	360	3,280	5,280
Averages.....	1,240	2,100	633	573	4,546	1,533	1,866	640	680	4,720	4,633
Grand Averages (three series).....	1,151	2,002	636	515	4,305	1,266	1,951	686	591	4,495	4,400
						1921	1922	1923	Total, 3 years		
<i>Supplement presenting yields of plots seeded with nurse crops</i>											
Legumes and five grasses (In Range B of the Red clover and after nurse crop of hull-less oats.....)	In Range B of the Red clover and Alsike Series.....					1,080	480	360	1,920		
(Only three plots left for hay)	In Range B of the Red Clover Series.....					900	300	160	1,360		
	In Range B of the Alfalfa Series.....					1,060	300	360	*1,720		

*An unusually poor showing for alfalfa, especially from the 1922 and 1923 crops.

ACRE FROM THE 1920 SEEDING OF THE GRASS AND CLOVER MIXTURES EXPERIMENT

Designation	North Halves (not clipped in year of seeding)								Average aggregate both ranges three crops
	Range A (full seeding)				Range B (two-third seeding)				
	1921	1922	1923	Ag'te. 3 years	1921	1922	1923	Ag'te. 3 years	
<i>Alsike and Red Clover Series</i>									
Clovers only.....	1,880	495	.....	2,375	1,280	440	.....	1,720	2,047
Clover and timothy.....	1,960	415	720	3,095	1,120	160	80	1,360	2,227
Clover and western rye grass.....	2,120	1,422	1,880	5,422	2,920	1,600	840	5,440	5,431
Clover and meadow fescue.....	2,200	502	1,000	3,702	2,520	560	480	3,560	3,631
Clover and three grasses.....	2,080	504	720	3,304	2,560	520	560	3,640	3,472
Clover and five grasses.....	2,040	722	800	3,562	2,120	520	400	3,040	3,301
Averages.....	2,046	676	853	3,576	2,086	646	393	3,126	3,351
<i>Red Clover Series</i>									
Clover only.....	2,520	.....	.....	2,520	3,120	560	.....	3,680	3,100
Clover and timothy.....	1,600	40	0	1,640	1,600	480	200	2,280	1,960
Clover and western rye grass.....	1,480	1,200	600	3,280	3,000	1,920	1,560	6,480	4,880
Clover and meadow fescue.....	2,840	720	120	3,680	2,520	520	720	3,760	3,720
Clover and three grasses.....	1,360	600	600	2,560	2,160	560	720	3,440	3,000
Clover and five grasses.....	1,280	560	520	2,360	1,560	280	520	2,360	2,360
Averages.....	1,846	520	306	2,673	2,326	720	620	3,666	3,170
<i>Alfalfa Series</i>									
Alfalfa only.....	1,440	840	1,000	3,280	2,240	1,240	160	3,640	3,460
Alfalfa and timothy.....	1,880	160	200	2,240	2,280	320	160	2,760	2,500
Alfalfa and western rye.....	1,640	560	280	2,480	2,640	2,200	1,720	6,360	4,420
Alfalfa and meadow fescue.....	2,320	280	0	2,600	2,880	660	1,040	4,480	3,540
Alfalfa and three grasses.....	2,920	720	480	3,520	3,200	720	1,080	4,800	4,360
Alfalfa and five grasses.....	3,720	1,080	800	5,600	2,320	480	600	3,400	4,500
Averages.....	2,320	573	460	3,353	2,593	886	760	4,240	3,796
Grand averages (three series).....	2,071	500	540	3,201	2,335	751	591	3,677	3,439

NOTES

- (1) Seeded on summer-fallow June 16th, 1920, seed of the legume-only plots being inoculated with nitro-culture and sown after sundown while still a little sticky with the fluid, resulting in uneven stands on certain of these.
- (2) Quantities of seed were as in the initial seeding of the experiment made in 1918.
- (3) The nurse crop used on the two east plots of each range was a strip of Liberty, Ottawa, 480, hullless oats, sown May 22nd and cut August 30th.
- (4) On September 8th the south halves of the thirty-six plots seeded without nurse crop were clipped with mower bar set high to leave a long stubble, clippings being cured and weighed.
- (5) On May 31st, as a result of winter-killing, the following plots were ploughed up: The plots of red clover and alsike seeded without nurse crop in Ranges A and B, and the red clover plot seeded alone in Range B. This left no legume-only part in Range A of the Red-Clover Series.
- (6) On July 20th and 21st, following removal of the 1923 hay crop, all the remaining sods in this experiment were ploughed up. Moisture had gone to the bottom of the furrow in most places, but in a few instances dry ground was turned up.

PRESENTING TWO YEARS' YIELDS OF HAY IN POUNDS PER ACRE FROM THE 1921 SEEDING OF THE GRASS AND CLOVER MIXTURES EXPERIMENT

Designation	1922 Crop			1923 Crop			Two years' crop Range A (full seeding)	Two years' crop Range B (two-thirds seeding)	Two 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			
<i>Alsike and Red Clover Series</i>									
Clover only.....	680	0	340	680	.....	340	1,360	.....	680
Clover and timothy.....	320	260	290	600	40	320	920	300	610
Clover and western rye grass.....	1,840	1,240	1,540	2,540	1,660	2,100	4,380	2,900	3,640
Clover and meadow fescue.....	840	440	640	760	520	640	1,600	960	1,280
Clover and three grasses.....	440	360	400	460	600	530	900	960	930
Clover and five grasses.....	840	980	910	520	360	440	1,360	1,340	1,350
Averages.....	826.6	546.6	686.6	926.6	530	728.3	1,753.3	1,076.6	1,415
<i>Red Clover Series</i>									
Clover only.....	860	.....	430	.....	.....	.....	860	.....	430
Clover and timothy.....	280	560	420	340	1,140	740	620	1,700	1,160
Clover and western rye grass.....	1,360	1,620	1,490	2,340	3,120	2,730	3,700	4,740	4,220
Clover and meadow fescue.....	460	820	640	580	760	670	1,040	1,580	1,310
Clover and three grasses.....	380	900	640	280	960	620	660	1,860	1,260
Clover and five grasses.....	1,180	2,200	1,690	1,060	940	1,000	2,240	3,140	2,690
Averages.....	753.3	1,016.6	884.9	766.6	1,153.3	980	1,520	2,170	1,845
<i>Alfalfa Series</i>									
Alfalfa only.....	2,380	1,500	1,940	900	1,060	980	3,280	2,560	2,920
Alfalfa and timothy.....	860	940	900	460	500	480	1,320	1,440	1,380
Alfalfa and western rye.....	2,260	1,920	2,090	3,340	1,780	2,560	5,600	3,700	4,650
Alfalfa and meadow fescue.....	980	1,060	1,020	1,180	900	1,040	2,160	1,960	2,060
Alfalfa and three grasses.....	980	1,040	1,010	580	1,040	810	1,560	2,080	1,820
Alfalfa and five grasses.....	1,560	1,660	1,610	960	900	930	2,520	2,560	2,540
Averages.....	1,503.3	1,353.3	1,428.3	1,236.6	1,030	1,133.3	2,740	2,383.3	2,561.6
Grand Averages (three series).....	1,027.7	972.1	999.9	976.6	904.4	940.5	2,004.4	1,876.6	1,940.5

Supplementary Table: Results from Nurse Crop Seeding, a very thin stand of Ruby Wheat

Designation	1922 Crop		1923 Crop		Aggregate two years' crops
	Occurring only in Range A	Occurring only in Range B	Occurring only in Range A	Occurring only in Range B	
Red clover and alsike only.....	320	.....	500	.....	820
Red clover, alsike, and five grasses.....	.....	230	.....	240	470
Red clover only.....	350	.....	.....	.....	350
Red clover and five grasses.....	.....	1,730	.....	920	2,650
Alfalfa only.....	1,470	.....	880	.....	2,350
Alfalfa and five grasses.....	.....	720	.....	830	1,550

Notes

(1) The land where this seeding was plotted had been under variety plots of cereals in 1919, in green-feed and potatoes in 1920, was disked in the spring of 1921, later ploughed, packed, left lying awhile, then disked and packed. Legume seed inoculated.

(2) As growth under these conditions of preparation was only moderate, no portion of the plots from this seeding was cut in the initial season.

(3) Winter-killing of clovers occurred extensively in 1921-22 on certain plots, while others more favourably situated as to topography, etc., came through fairly satisfactorily and produced some crop in spite of drouth.

(4) It was noted in 1922 that the nurse-crop seedlings showed up much better than usual, there being some crops from the legumes after nurse crops, which was contrary to previous experience in this series. The improvement was attributed to three factors: (1) inoculation of the legumes; (2) the extreme thinness of the stand of Ruby wheat, and (3) needed winter protection by the grain stubble.

(5) On May 31, 1923, winter-killed plots were scuffed up as follows: Three, that is to say, all the remaining legume-only plots in Range A of the Red Clover Series; one red-clover plot in Range B; the easterly nurse-crop-seeded plot of red clover and alsike in Range A, and the only red-clover-and-alsike plot in Range B of that series. Accident of location, of course, affected very much the matter of winter-killing.

PRESENTING THE 1923 YIELDS OF HAY IN POUNDS PER ACRE FROM THE 1922 SEEDING OF THE GRASS AND CLOVER MIXTURES EXPERIMENT

Designation	Range A (full seeding)	Range B (two-thirds seeding)	Average of both ranges
<i>Alsike and Red Clover Series—</i>			
Clovers only.....			
Clover and timothy.....	1,820	2,160	1,990
Clover and western rye grass.....	2,720	1,760	2,240
Clover and meadow fescue.....	1,640	1,420	1,530
Clover and three grasses.....	2,360	2,060	2,210
Clover and five grasses.....	2,380	1,540	1,960
Averages.....	1,820	1,490	1,655
<i>Red Clover Series—</i>			
Clover only.....			
Clover and timothy.....	2,620	2,400	2,510
Clover and western rye.....	2,800	1,760	2,280
Clover and meadow fescue.....	1,500	1,600	1,550
Clover and three grasses.....	3,000	2,160	2,580
Clover and five grasses.....	2,300	2,440	2,370
Averages.....	2,036.6	1,726.6	1,881.6
<i>Alfalfa Series—</i>			
Alfalfa only.....			
Alfalfa and timothy.....	1,120	1,460	1,290
Alfalfa and western rye grass.....	2,300	1,600	1,950
Alfalfa and meadow fescue.....	1,400	1,420	1,410
Alfalfa and three grasses.....	1,960	1,640	1,800
Alfalfa and five grasses.....	1,580	1,840	1,710
Averages.....	1,393.3	1,326.6	1,360
Grand averages (three series).....	1,750	1,514.4	1,632.2

PRESENTING RESULTS FROM NURSE-CROP SEEDINGS

	1922	1923
Results with a nurse crop of winter rye pastured in year of seeding and cut for hay in 1923. The 1923 yield in this case is of winter rye almost exclusively.....	Pasture	Pounds winter-rye hay per ac. in two cuttings 1,889

FOOT NOTES

(1) Location: Course 2, on the block where the 1918 seeding of the experiment had been made. The three series of ranges stood in the same sequence but the order of plots in each range was reversed as from west to east, thus placing on the nurse-crop strips two full-seeded plots of legumes-only (Range A) and two thin-seeded plots of the five-grass mixture (Range B), which, as in 1918, were along the west side of the block.

(2) Preparation: After being ploughed out of sod in 1920 the land was in oat and barley plots in 1921, these running across the block, i.e. east to west. The stubble of these was disked in the autumn, floated and harrowed in spring, then back-set, disked, floated, disked, and floated again. Seed-bed good but some turfs showing.

(3) Grass and legume seeds sown June 9 and 10, the latter without inoculation, as the intention was to apply inoculated soil later on.

(4) The nurse crops employed in the test this year were oats sown early to be harvested and winter rye seeded June 10 at 1½ bushels per acre to be pastured during the first season. A mishap in seeding caused the rejection of the former strip from the tables. The winter rye gave a considerable amount of grazing toward the end of the first season.

(5) Owing to drouth the germination of all the clover and grass seeds was extremely tardy and sparse. The alfalfa germinated better than the true clovers, but all the legume-only plots had to be sacrificed and re-seeded about June 1, excepting, of course, those seeded among the winter rye, which latter was left to produce rye hay in 1923.

GRASS AND CLOVER MIXTURES EXPERIMENT—1923 SEEDING

In Course 5, forty-eight plots of grass and clover mixtures were seeded June 4 on a piece of well-prepared summer-fallow, the seed being covered with the single-disk grain drill, levers set in the third notch. Rates of seeding and order were precisely as in 1922 seeding, except that the nurse-crop strips appeared on the east side of the block, with the sequence of the hay plots adjusted to suit.

The nurse-crop strips this time comprised two varieties of grain. On the extreme east was a strip of Liberty hullless oats sown April 28th, which yielded about 5,820 pounds total crop and 2,215 pounds, or 65 bushels of (hullless) grain per acre. Beside it was a corresponding strip of Banner oats sown June 4th and harvested in mid-September (without removal of marginal drills), yielding over four tons per acre of total crop and threshing at the rate of 102 bushels of grain per acre. It is unfortunate that the same variety of oats was not sown on both strips, but it is safe to say that, as the season turned out, the later date of sowing of the oats not only favoured a higher yield of grain and straw but also, as usual, worked to the advantage of the grass and legume seeds sown upon it. The hullless oats were well up when the small seeds were sown but were nevertheless run over by the same implement that covered the grass seed on the other plots, so that all the small seeds were uniformly covered, or nearly so.

The legume seeds were sown without inoculation, it being confidently expected that the soil would be naturally inoculated by the wash from growing plots of them higher up the slope. However, to make assurance doubly sure, inoculated soil was broadcast on June 13th during a drizzle of rain and following a half-inch rain in the night.

Very fine, even catches were obtained on the plots seeded without nurse crops and a fair sprinkling of grasses and alfalfa in the late-sown strip of oats, though vigour of growth of the hay plants here was not to be compared to that obtained by seeding alone. The catches among the early-sown oats were weak and thin as per usual.

THICKNESS-OF-SEEDING TEST WITH GRASSES

An experiment to determine how thickly certain common hay grasses should be seeded and whether the employment of a nurse-crop would particularly affect the matter was commenced in 1919 and four annual seedings have been made. At first, only timothy and rye grass were used. In 1922, red top was included, partly for the purpose of comparing this grass with the other two.

The experiment, as a whole, has been much more fruitful in the incidental data yielded than in respect to the object specifically in quest. The location did not admit of convenient duplication, and while a reasonably uniform ground was chosen for the test, yet field observation confirms the tabular deduction that differences in soil and lay of land have accounted for much greater discrepancies in hay yields than any due to the varying rates of seeding within the compass of the experiment.

A certain amount of winter-killing occurred. There was a marked difference among the grasses in this respect. Western rye here, as elsewhere, escaped harm. Some patches of killing occurred among the timothy but it was much more extensive among the red top, of which the two thickest-sown plots, lying on the most exposed sites, were almost annihilated while an adjacent plot of rye grass, similarly situated, came through unscathed.

WESTERN RYE THE HARDIEST AND THE BEST YIELDER

Comparison of the yield data from the 1921 seeding (the only one in which red top occurs) shows Western rye grass far in the lead with a three-year-

aggregate yield of 3,560 pounds of hay per acre from plots seeded alone and a two-year-aggregate yield of 1,956 from plots seeded with a nurse crop of oats, against respective yields of 2,720 and 1,099 for timothy and 1,012 and 384 for red top. In respect to timothy and rye grass, similarly impressive contrasts are afforded by the crops from the 1919 and 1920 seeding, especially the latter. In the 1919 sowing the rates of rye grass had probably been too low to provide this crop with the best possible conditions. Moreover, that year's seeding antedated the excessively dry seasons during which timothy gives such a poor account of itself. Had the haying in 1923 not been long deferred, most of the timothy plots would have yielded almost nothing at all.

A summary of the data from all the timothy and rye-grass plots in the three seedings of 1919, 1920, and 1921 reveals that the average annual hay yield of fifteen plots of timothy, seeded without nurse crop and cropped three and four years, has been 1,448 pounds per acre; ditto fifteen plots of timothy, seeded with nurse crops of oats and cropped from two to four years, 975 pounds per acre; ditto eleven plots Western rye grass, seeded alone and cropped three to four years, 2,047 pounds per acre; ditto eleven plots Western rye grass, seeded with nurse crops of oats and cropped two to four years, 1,573 pounds per acre.

On a percentage basis, Western rye seeded alone has exceeded timothy seeded alone by 41 per cent, while rye grass seeded with nurse crop has out-yielded timothy seeded in the same way by 61 per cent. On a basis of all the plots combined, the margin has been 48.7 per cent.

In a general way this relativity of rye grass and timothy accords substantially with the outcome of other experiments on the Station wherein these two have been compared. As a dry-season crop for our high land, timothy is a failure and red top apparently still worse.

FAVOURS FIVE POUNDS TIMOTHY PER ACRE

In regard to the comparison of rates of seeding, timothy is the only one of the three grasses regarding which satisfactory averages may be arrived at, and even here the figures must be accepted with reserve, for reasons already stated. It is really surprising how little variation in yields is exhibited by the two columns averaging the comparisons on this point. Such slight difference as there is seems rather to favour a five-pound seeding of timothy. Less consistent and less satisfactory are the data from the rye-grass plots. Little averaging is possible here because from year to year, the rates of seeding have been increased in search for a more likely optimum. It would seem that not less than eight pounds of this seed should be used and that very likely a rather larger quantity were desirable. One point to consider in connection with this test is that the plots were hand-weeded; hence the thin seedings have probably given a better relative account of themselves than they would do in common practice where left to wage their own battle with intruders.

TABLE SUMMARIZING CROPPING DATA FROM THREE ANNUAL SEEDINGS OF TIMOTHY AND WESTERN RYE GRASS IN THE THICKNESS OF SEEDING TEST. YIELDS IN POUNDS OF HAY PER ACRE

Designation	Seeded without nurse crop				Seeded with nurse crop			
	1919 seeding — Aggregate four crops	1920 seeding — Aggregate four crops	1921 seeding — Aggregate three crops	Average of 11 crops timothy (three seedings)	1919 seeding — Aggregate four crops	1920 seeding — Aggregate three crops	1921 seeding — Aggregate two crops	Average of 9 crops timothy (three seedings)
Timothy at 2 pounds per acre..	7,948	5,120	2,640	1,428	4,260	2,440	1,320	891
Timothy at 3 pounds per acre..	7,100	5,680	2,880	1,423	4,760	2,320	1,180	918
Timothy at 4 pounds per acre..	7,380	6,040	3,000	1,492	4,520	2,320	800	849
Timothy at 5 pounds per acre..	6,656	7,040	2,880	1,507	6,240	2,700	1,240	1,131
Timothy at 6 pounds per acre..	6,140	6,960	2,200	1,391	6,200	2,600	956	1,084
Grand averages all timothy plots.....	7,044.8	6,168	2,720	*1,448	5,196	2,476	1,099	†975
				Average of 7 crops Western rye grass (two seedings)				Average of 5 crops Western rye grass (two seedings)
Western rye at 4 pounds per acre	8,848				7,260			
Western rye at 5 pounds per acre	9,088				7,440			
Western rye at 6 pounds per acre	9,544	11,440	3,880	2,188	8,340	5,040	2,120	1,432
Western rye at 8 pounds per acre		13,120	4,120	2,463		5,840	2,560	1,680
Western rye at 10 pounds per acre.....		10,000	4,440	2,063		5,080	2,224	1,461
Western rye at 12 pounds per acre.....			2,720				1,480	
Western rye at 14 pounds per acre.....			2,640				1,400	
Grand averages of rye grass plots.....				‡2,047				**1,573
Percentage comparisons, excess of rye grass over timothy...				41%				61%

Grand average yield of 100 crops timothy, representing 30 plots seeded in three years, 1,235 lbs.
Grand average yield of 70 crops rye grass, representing 22 plots seeded in three years, 1,837 lbs.

Excess of rye grass over timothy, quantitative mean of nurse-crop and non-nurse crop plots, 48.7%.

* Representing 55 plot harvests.

† Representing 45 plot harvests.

‡ Representing 39 plot harvests.

** Representing 31 plot harvests.

PRESENTING FOUR YEARS' RESULTS IN POUNDS OF HAY PER ACRE FROM THE 1919 SEEDING

Designation	Seeded without Nurse Crop					Seeded with Nurse Crop				
	1920	1921	1922	1923	Aggregate 4 years	1920	1921	1922	1923	Aggregate 4 years
Timothy at 2 lbs. per acre.....	5,440	1,548	440	520	7,948	880	1,940	520	920	4,260
“ 3 “	5,360	980	280	480	7,100	1,520	2,280	600	360	4,760
“ 4 “	5,600	980	200	600	7,380	1,680	2,160	400	280	4,520
“ 5 “	5,200	1,056	200	200	6,656	2,320	2,880	360	680	6,240
“ 6 “	4,640	980	200	320	6,140	2,240	2,440	440	1,080	6,200
Average of 5 plots.....	5,248	1,108.8	264	424	7,044.8	1,728	2,340	464	664	5,196
Western rye 4 lbs. per acre.....	4,000	3,128	920	800	8,848	800	3,700	1,280	1,480	7,260
“ 5 “	4,160	3,168	920	840	9,088	1,120	3,280	1,720	1,320	7,440
“ 6 “	3,680	3,384	1,360	1,120	9,544	1,200	3,520	1,660	1,960	8,340
Average of 3 plots.....	3,946.7	3,226.6	1,066.7	920	9,160	1,040	3,500	1,553.3	1,586.6	7,680

NOTES

(1) History of Area.—1917, land broken; 1918, cereal plots east and west; 1919, spring-ploughed in May and harrowed twice, seeding in 1919 at rates specified, in plots north and south, crosswise of the cereal plots. North half of each plot was seeded with a nurse crop of 3 bushels of oats per acre, the two north swaths of which were cut for hay when oats were in the milk, yielding 6,240 pounds oat hay per acre. Volunteer grain rendered it impracticable to obtain the cured weight of the grasses produced on the south halves of the initial season.

(2) Land apparently uniform, except that the six-pound seeding of rye grass sown without nurse crop was located on rising ground.

(3) Crop mowed August 3, 1923, and sod broken afterwards.

PRESENTING THREE AND FOUR YEARS' RESULTS IN POUNDS OF HAY PER ACRE FROM THE 1920 SEEDING

Designation	Seeded without Nurse Crop					Seeded with Nurse Crop				
	1920	1921	1922	1923	Aggregate 4 years	1921	1922	1923	Aggregate 3 years	
Timothy at 2 lbs. per acre.....	1,600	2,720	160	640	5,120	1,960	80	400	2,440	
“ 3 “	1,760	3,200	160	560	5,680	1,880	40	400	2,320	
“ 4 “	1,440	3,600	120	880	6,040	1,900	20	400	2,320	
“ 5 “	2,400	3,600	320	720	7,040	2,200	20	480	2,700	
“ 6 “	2,400	3,600	320	640	6,960	2,040	80	480	2,600	
Average 5 plots.....	1,920	3,344	216	688	6,168	1,996	48	432	2,476	
Western rye 6 lbs. per acre.....	1,920	5,520	2,880	1,120	11,440	2,120	1,320	1,600	5,040	
“ 8 “	1,120	6,720	3,440	1,840	13,120	2,480	1,440	1,920	5,840	
“ 10 “	1,120	4,480	2,320	2,080	10,000	2,440	1,440	1,200	5,080	
Average 3 plots.....	1,386.6	5,573.3	2,880	1,680	11,520	2,346.6	1,400	1,573.3	5,320	

NOTES

(1) Location.—Abutting the 1919 seeding.

(2) 1917, broken; 1918, cereal plots (east and west); 1919, summer-fallow; 1920, seeded May 31, plots north and south, crossing previous plots of cereals. North two rods of each plot seeded with a nurse crop of oats (cut in milk) and beardless-hulled barley cut very short when grain was nearing maturity. South rod of each plot seeded without nurse crop.

(3) Soil appeared reasonably uniform, although the thickest seeding of rye grass was handicapped by being on rising ground—next a roadway, however.

(4) In 1923, the rye grass plots were mowed August 8 but the timothy plots were left till August 18. Land afterwards broken.

PRESENTING TWO AND THREE YEARS' RESULTS IN POUNDS OF HAY PER ACRE FROM THE ONE-EIGHTIETH-ACRE PLOTS SEEDED IN 1921

Designation	Seeded without nurse crop (clipped about Aug. 24, 1921)				Seeded with nurse crop		
	1921	1922	1923	Aggregate 3 years	1922	1923	Aggregate 2 years
Timothy at 2 lbs. per acre.....	1,200	800	640	2,640	320	1,000	1,320
Timothy at 3 lbs. per acre.....	1,680	520	680	2,880	180	1,000	1,180
Timothy at 4 lbs. per acre.....	1,800	280	920	3,000	120	680	800
Timothy at 5 lbs. per acre.....	1,880	320	680	2,880	160	1,080	1,240
Timothy at 6 lbs. per acre.....	1,320	440	440	2,200	196	760	956
Average 5 plots.....	1,576	472	672	2,720	195	904	1,099
Western rye at 6 lbs. per acre.....	1,120	1,080	1,680	3,880	560	1,560	2,120
Western rye at 8 lbs. per acre.....	1,160	1,160	1,800	4,120	800	1,760	2,560
Western rye at 10 lbs. per care.....	880	1,880	1,680	4,440	504	1,720	2,224
Western rye at 12 lbs. per acre.....	720	1,240	760	2,720	560	920	1,480
Western rye at 14 lbs. per acre.....	520	1,240	880	2,640	480	920	1,400
Average 5 plots.....	880	1,320	1,360	3,560	580	1,376	1,956
Red top at 6 lbs. per acre.....	160	560	400	1,120	120	280	400
Red top at 8 lbs. per acre.....	200	560	640	1,400	100	320	420
Red top at 10 lbs. per acre.....	400	560	240	1,200	130	440	570
Red top at 12 lbs. per acre.....	500	320	0	820	130	0	130
Red top at 14 lbs. per acre.....	280	240	0	520	400	0	400
Average 5 plots.....	308	448	256	1,012	176	208	384

NOTES

- (1) Location.—South of 1920 seeding of this test.
- (2) History of area.—Broken 1917; cropped in 1918 to cereal plots running east and west; summer-fallowed in 1919; cereal plots same direction in 1920; spring-worked and spring-ploughed in 1921 and seeded to this test, with plots running north and south.
Several Western rye plots, particularly those seeded at 12 and 14 pounds, and more particularly the latter, were mutilated and reduced in yield by the necessity of pulling and clipping volunteer oats where rows of stooks had stood on the variety plots of 1920.
- (3) From the two strips of oats grown as a nurse crop across the north halves of these ranges a good quality of green-feed was cut about September 12, amounting to 5,500 pounds per acre. The area might be roughly classed as three-fifths stubble ground and two-fifths summer-fallow, after the scuffed paths between the two previous season's grain plots. Growth on the paths was about twice as heavy as on the stubble strip.
- (4) In the very short, poor crop of hay secured in 1922 a considerable percentage of stubble occurred, for which an estimated deduction was made.
- (5) In 1922-1923 severe winter-killing occurred among the red top, and patches in the timothy plots, the two thickest seedings of red top being almost destroyed.
- (6) In 1923 the red top and Western rye were cut August 3; the timothy August 18.

CULTURAL EXPERIMENTS WITH ALFALFA

Special interest attaches to the accumulating data of this experiment for the reason that the broadcast area affords an effective illustration of the fact that under certain conditions, at least, alfalfa can be cropped successfully for a number of successive years. From a stand seeded in 1918 and gravely handicapped at first by lack of effective inoculation, the five-year average yield of hay is 2,955 pounds, or nearly a ton and a half per acre per annum, which compares very favourably indeed with average yields of gramineous hays produced on the Station during a like period.

It must be admitted that the plots in this particular experiment are favourably situated near a bluff and have, at times, derived considerable advantage by seepage of snow moisture. The broadcast area has been well disked up once or twice, without seeming to thin the alfalfa perceptibly.

The first extensive winter injury occurred in the season of 1922-23 and the rows suffered decidedly more than the broadcast area. Whether this was a result of the system of culture exposing the crowns and roots, or due to a slightly more exposed location, or to a combination of both factors is not definitely known.

PRESENTING FIVE SEASONS' YIELDS OF HAY IN POUNDS PER ACRE FROM ALFALFA PLOTS IN THE CULTURAL TEST, 1918 SEEDING OF NORTH (ONLY REMAINING) RANGE

Designation	1919	1920	1921	1922	1923			Aggregate five years	Average per annum five years
	One cutting only	Total two cuttings	Total two cuttings	Total two cuttings	First cutting	Second cutting	Total two cuttings		
30-inch drills at 2 lbs.....	3,150	2,820	3,555	1,590	180	960	1,140	12,225	2,445
30-inch drills at 4 lbs.....	2,400	1,980	2,865	1,620	330	1,350	1,680	10,545	2,109
24-inch drills at 2-5 lbs.....	1,320	3,180	3,540	2,100	240	1,260	1,500	11,640	2,328
24-inch drills at 5 lbs.....	960	2,520	3,000	2,190	1,200	1,830	3,030	11,700	2,340
Broadcast—average several rates.....	1,243	3,025	4,065	2,467	2,081	1,898	3,979	14,779	2,955

PASTURING TEST IN SEEDING DOWN

The pasturing test in seeding down had been conducted as outlined on page 26 of our 1922 report (Experimental Sub-stations for the year 1922). As remarked in that outline, droughty weather had resulted in an extremely severe trial of the method, with very tardy germination of most of the seeds, even drilled cereals having registered imperfect stands. A very trying winter subjected the weak, late-starting plantlets to an additional reverse. In consequence, very few plants of the three small clovers survived and the stands of these were of necessity torn up. Sweet clover fared badly, except on one or two favoured plots that had been seeded without nurse crop. Alfalfa did better, but failed on certain exposed plots. Timothy established itself no better than alfalfa, if as well. Meadow fescue did scarcely as well as timothy. Bromegrass and Western rye achieved full stands and produced passable yields in 1923, indicating that of all the crops represented they seemed best adapted to these trying conditions.

Comparisons between the legumes and the grasses are impaired by reason of the fact that certain stands of the former were left for seed production.

PRESENTING PARTIAL RESULTS FROM THE 1923 CROP OF THE 1922 SEEDING OF THE PASTURING TEST IN SEEDING DOWN. A CONSIDERABLE PROPORTION OF THE AREA HAD BEEN PLOUGHED UP AND IN THE EARLIER-SEEDED RANGE (A) THE ALFALFA PLOTS AND THE AFTERMATH OF THE SWEET CLOVER PLOTS WERE LEFT TO PRODUCE SEED.

Designation	Sweet clover at 10 pounds	Alfalfa at 10 pounds	Timothy at 6 pounds	Western rye at 12 pounds	Meadow fescue at 18 pounds	Kentucky blue at 18 pounds	Brome at 18 pounds
Seeded alone May 30, 1922, and pastured.....	*4,860 (hay) 365 (seed) 2,430 (hay) 182.5 (seed)	160 (seed) 160 (seed)	1,040	1,760	320	40	2,800
Seeded alone May 30, 1922, and not pastured.....			640	1,160	560	120	3,520
Averages.....			840	1,460	440	80	3,160
Seeded alone mid-July and pastured.....		280	920	2,720	1,920	360	2,080
Seeded alone mid-July and not pastured.....		2,720	1,840	2,720	1,440	40	1,360
Averages.....		1,500	1,380	2,720	1,680	200	1,720
Grand averages.....			1,110	2,090	1,060	140	2,440
Seeded May 30 with oats to be cut.....				2,540	920		

Grand averages 10 grass plots seeded without nurse crops and pastured in year of seeding, 1,396 lbs.

Grand averages 10 grass plots seeded without nurse crops and not pastured in year of seeding, 1,340 lbs.

Notes

(1) The pasturing in the above experiment was not severe, stock having been allowed but brief and deferred access on account of the drought.

* (2) In this table, the figure 4,860 includes the total weight of the aftermath cut for seed from the two plots seeded May 30. The plots seeded in mid-July being on higher ground were almost a complete failure owing to defective germination and winter-killing.

ALFALFA, SWEET CLOVER, AND GRASSES FOR SEED PRODUCTION

For the second consecutive season alfalfa ripened paying yields of seed, the dry, open fall favouring maturity. Of course, the seed pods on the early and late growth did not mature perfectly together and the sample was characterized by a considerable proportion of brown or shrunken seeds, reducing the average grade to rather below No. 2. Most of it was useful seed, nevertheless. The average yield of eight plots of alfalfa seeded late in 1922 in a variety test and presenting very thin stands in consequence of drouth and severe winter conditions, was 201 pounds, or 3 bushels 21 pounds, per acre, of which 17.7 per cent graded No. 1; 49.3 per cent No. 2, and 33 per cent No. 3, in the Ottawa Seed Laboratory. These plots had the advantage of some protection by a young hedge. Two out of the ten seeded in the test had failed entirely. These are excluded from the averages. Quite a number of other plots, representing stands of various durations, were harvested for seed, and in all cases where there was any top worth while, the yield of seed was comparatively good. Not all the yields have been kept track of, but two are given. One represents the out-turn of a plot seeded 1918 in rows in a cultural experiment and left each year for seed. Until 1922 it never ripened any worth mentioning, but then it produced at the rate of 6 bushels and 5 pounds per acre of very fair stock. In 1923, after very extensive winter-killing (the first to occur among it in five years), it still threshed at the rate of 2 bushels 14 pounds, besides which a large amount of seed had shattered from the standing rows and from the stook. Of this lot 61.2 per cent graded No. 1, and the balance No. 3, separation having been made by screens in the Forage Plants Division at Ottawa, before grading by the laboratory of the Seed Branch.

From a certain broadcast stand on an exposed site on a hillside where winter-killing had been particularly severe, the yield of seed was still 113 pounds per acre, of which 93 pounds graded No. 2, failing to rate higher only because of brown seeds. These two were typical of the other yields obtained.

PRESENTING TOTAL YIELDS AND YIELDS OF SEED FROM ALFALFA FOR SEED PRODUCTION

Designation	Area (fraction of acre)	Yield in Pounds per Acre				Data Reported by the Seed Laboratory, Ottawa						Remarks
		Total crop	Seed threshed	Seed as cleaned	Each grade as cleaned in Forage Plants Division	Germination		Hard seeds %	Number Lamb's Quarters per oz.	Other cultivated seeds less than—%	Grade	
						Three days	Five days					
Rows for seed (cultural test, seeded in 1918)	1/90	1,620	171	134	A-82 B-28 C-24	71 76 76	92 92 89	20 17 14	2 2	. . . . . 1 (red cl.)	No. 1 No. 3 No. 3	No. 3 on account general quality.
Inoculation Experiment, 1921 seeding. Badly winter-killed in 1922-23. Comprising 3 plots, each 2 x 4 rods, with dividing paths and marginal advantages	3/20	1,083	120	113	A-83 B-15 C-5	72 79 67	94 92 75	18 14 3	2 12 56	. . . . . . . . . . . . . . .	No. 2 No. 3 No. 3	Not No. 1 on account brown seed. Not No. 1 or 2 on account general quality. Not No. 1 or 2 on account brown seed.

SWEET CLOVER

Sweet clover has never failed to seed abundantly at Beaverlodge. In a number of cases very scant stands have turned off several bushels per acre. In the present season the average yield from four plots of Arctic sweet in the variety test, all very sparse owing, apparently, to the causes that thinned the alfalfa, was 464 pounds per acre, which, after separation into assortments by the Division of Forage Plants, was passed upon by the laboratory of the Dominion Seed Branch, being officially graded as 34.6 per cent No. 1, 61.9 per cent No. 2, and 3.4 per cent No. 3. In the spring these plots had been so unpromising that their stands were estimated at from only 8 to 20 per cent of normal.

Other seed yields of sweet clover have been tabulated in which a serial average from four miscellaneous plots, representing, principally, the aftermath cuttings from badly wintered stands, cleaned up 171.1 pounds of seed per acre, which, after being divided into three runs per lot by the Division of Forage Plants, was officially graded in the laboratory of the Dominion Seed Branch with the following result: No. 1, 40.9 per cent; No. 2, 19.6 per cent; No. 3, 22 per cent; Rejected, 17.4 per cent.

PRESENTING TOTAL YIELDS AND YIELDS OF SEED PER ACRE FROM MISCELLANEOUS SWEET CLOVER SEEDINGS

Designation	Area (fraction of acre)	Yield in Pounds per Acre				Data Reported by the Seed Laboratory, Ottawa						
		Total crop	Seed as threshed	Seed as cleaned	Each grade as cleaned in Forage Plants Division	Germination		Hard seeds	Number lamb's quarters per oz.	Other cultivated seeds less than	Other weed seeds	Grade
						Three days	Five days					
Aftermath of plot grown in nurse crop test of Hubam, etc., Course 1.	1/20	2,260	372	180	A B C	67	88	p.c.	2	p.c.	No. 3.	
						40	55	23	70	1 1/2	Rej.	
						17	30	100	344	4	Rej.	
Pasturing test, course 3.	1/40	3,720	365	186	A B C	66	85	19	48	Alsike 1 1/2	No. 2.	
						40	51	6	190	2	2 knotweed	
						9	13	2	54	23	Rej.	
First cutting from the 1922 seeding of inoculation Experiment year of Course 1.	1/20	1,860	377	316	A B C	72	93	20	332	.....	No. 1.
						70	84	7	Foul	.....	No. 3.
						83	94	12	36	red cl. 1 1/2	Rej.	
Aftermath of plots in the Nurse Crop Test, 1922 seeding.	7/20	300	5	2.5	A B C	72	79	4	106	alsike 1 1/2	No. 2.	
						37	41	3	.....	alsike 1 1/2	No. 3.
						.....	.....	.....	.....	64 plantain	Rej.
.....	.....	.....	.....	.....	.....	.....	.....	.....	3 knotweed	.....	

NOTE.—Average yield sweet clover in above plots, mostly aftermath from badly wintered stands, 171.1 pounds per acre, which, after separation in the Division of Forage Plants, was finally graded by the Seed Laboratory as 40.9 per cent, No. 1; 19.6 per cent No. 2; 22 per cent No. 3 and 17.4 per cent rejected.

LATE SWEDISH CLOVER VERSUS ALFALFA AND SWEET CLOVER

On page 25 of the Beaverlodge report for 1922 (Experimental Sub-stations) was described a test in which Hubam, biennial sweet clover, alfalfa, and Late Swedish clover were compared in a test where part of the areas of each was seeded without nurse crops and the remainder across strips of flax, hulless oats, and hulless barley. The Hubam amounted to very little, being a failure among the nurse crops. The Late Swedish made a poor growth, especially among the grain. Alfalfa made the best catch. In the spring of 1923 all but the alfalfa presented an utterly discouraging prospect and even it was extremely thin-looking. The Late Swedish had only a few patches left, these occurring on the flax stubble and the areas without nurse crop. The sweet clover plants appeared to be about as thick as a plantation of trees ought to be, and scarcely a root was sound to a depth of two inches. Photographic records afford most striking evidence of the superior hardiness of alfalfa and the comparative non-hardiness of the red clover. It is true the alfalfa, by reason of location, had rather the most snow protection, but the line of demarcation was too straight-edged and distinct to be attributable wholly to any such factor as snow drifts.

The first growth of all the crops was cut for hay, alfalfa yielding the best. July rains resulted in an aftergrowth much more prolific than the first crop and this was, in all cases, taken for seed. The yield of alfalfa seed has become possibly confused with that of another plot, hence cannot be stated positively in figures, but was very good. The sweet clover aftermath yielded total crop at the rate of 2,260 pounds per acre, and seed to the amount of 180 pounds, the bulk of which was No. 3, being rather immature. The Late Swedish red clover produced only five pounds of seed per acre. This comparison of Late Swedish and alfalfa is in harmony with the reports received from several dozen co-operative experimenters.

RYE GRASS AND TIMOTHY

Fourteen plots of Western rye grass, representing strains of Ottawa selections yielded at the average rate of 467 pounds of seed per acre, of which 35.2 per cent graded No. 1; 36.2 per cent No. 2; 22.6 per cent No. 3, and 5.9 per cent rejected. Unevenness of maturity accounted for the low grade and for a great reduction in the possible yield because of shattering of the early growth and greenness of the late heads.

The causes which reduced the yield and grade of the rye grass plots doubtless operated to cut still further into the yields of nine adjacent plots of timothy, which cleaned up only 33 pounds of seed per acre, of which, after grading into lots by the Forage Plants Division, the Seed Laboratory passed 91.3 per cent as No. 1 and 8.6 per cent No. 2. As a rule, timothy seeds abundantly in the Peace River country.

SUNFLOWERS

On a piece of one-year-old light sod that was winter-coated with rich cattle manure, then spring-ploughed, floated and harrowed, the variety test with sunflowers was located. Four kinds of seed had been received from Ottawa direct and another four later on from the C. P. R. These four required to be sown later than the others, but inasmuch as drought and shallow placing by the garden drill resulted in very little germination among the early-sown plots prior to the June rains, the circumstance of delayed seeding probably did not handicap the late arrivals much, if at all.

One of the lots received from Ottawa was the Mixed Mennonite from Rosthern. In the 1921 tests at Beaverlodge with three strains of Mennonite seed, a decided difference had been discerned among them and, as it happened,

some remnants of these seeds had been carried forward into 1923. Their inclusion, along with a lot of locally-obtained Russian Giant, brought the number of lots up to twelve. So far as possible they were compared in triplicate, but of the C. P. R. strains there was seed for but two plots each of the Black and the Giant Russian and for one plot only of the Mixed C. P. R. An extra plot of Early Ottawa was sown May 29 as a check against the four C. P. R. strains.

In comparison with the field crop of sunflowers sown with the grain drill, yields from the variety plots were absurdly low, because of drouth and delayed germination, so that comparisons are gravely interfered with. Yields, however, are put on record. All plots were one-hundredth acre in size.

VARIETIES OF SUNFLOWERS

Variety	Date of seeding	Date of harvesting	In bud	Showing yellow bloom	Average height	Tendency to branch	Yield in lbs. per acre	
							Green weight	Absolute dry matter
			p.c.	p.c.	ins.	p.c.		
Russian Giant (commercial).....	May 12....	Sept. 17-18.	88.3	0.2	38.6	0.0	11,450	2,960
Manteca (C.P.R.).....	" 29....	" 17-18.	100.0	95.0	40.3	0.3	11,550	2,917
Giant Russian (C.P.R.).....	" 29....	" 17-18.	100.0	40.0	41.5	0.0	11,600	2,889
Mammoth Russian.....	" 12....	" 17-18.	93.3	0.5	37.6	0.0	10,950	2,821
Early Ottawa.....	" 12....	" 17-18.	100.0	60.0	37.0	0.5	10,333	2,623
Early Ottawa.....	" 29....	" 17-18.	100.0	60.0	40.0	0.0	14,000	3,750
Black (C.P.R.).....	" 29....	" 17-18.	100.0	93.0	40.0	0.5	11,075	2,622
Burns (Rosthern).....	" 12....	" 17-18.	100.0	91.6	41.0	0.5	10,366	2,622
Mixed Mennonite.....	" 12....	" 17-18.	100.0	77.6	35.6	1.3	10,150	2,556
Mixed (C.P.R.), 1 plot only.....	" 29....	" 17-18.	100.0	90.0	40.0	0.0	9,700	2,380
Manchurian.....	" 12....	" 17-18.	100.0	81.6	38.6	2.0	8,600	2,193
R. No. 1 (Rosthern).....	" 12....	" 17-18.	100.0	98.3	37.3	1.6	7,433	1,867
Friesen (Rosthern).....	" 12....	" 17-18.	100.0	95.6	33.3	0.3	6,083	1,595

VARIETY TEST OF CORN

At the request of a neighbour, who kindly offered the seed, Kaffir corn was included in the 1923 variety test, bringing the number of varieties and strains up to seventeen, all of which were in duplicate plots, save Howe's Alberta Flint, of which the seed supply was limited.

Soil and preparation were the same as for the sunflowers. The method of seeding was the same and there was the same exasperating delay in germination. While effort was made to give all sorts an equal chance, there is probably an unusually large element of experimental error, complicated by the great unevenness and delay in germination and by cut-worm attack. The 1923 data are not considered a reliable indication of the relative merit of the several varieties. However, the two that have previously shown up best stand well again. These are Twitchell and Quebec 28. Slightly higher yields were achieved by Disco Longfellow (Lot 1099) and Northwestern Dent (McK.), despite the comparative immaturity of the former.

The relative degrees of maturity, as indicated by percentages in tassel and in silk, are of special significance. In this regard Twitchell again stands high, with McKenzies strain of Northwestern Dent also good. The earliest variety was Howe's Alberta Flint, but its yield was lowest of all except the Kaffir.

VARIETIES OF CORN, SEEDED MAY 14, HARVESTED SEPT. 13

Variety	In tassel	In silk	Average height	Yield—Pounds per Acre	
				Green weight	Absolute dry matter
Disco Longfellow, (Lot 1099).....	p.c. 1-0	p.c. 0-0	inch 44-0	9,850	1,954
Northwestern Dent (McK.).....	75-0	1-5	41-5	8,775	1,930
Quebec No. 28.....	25-0	0-2	38-0	9,250	1,874
Twitchell (Fredericton).....	78-5	0-5	44-0	8,725	1,816
Compton's Early (Duke).....	0-2	0-0	44-5	8,975	1,700
Leaming (Duke).....	0-2	0-0	42-5	8,100	1,695
Wisconsin No. 7 (Parks).....	0-1	0-0	43-5	8,575	1,667
Longfellow (Duke).....	3-5	0-0	44-0	8,700	1,650
Golden Glow (Duke).....	0-0	0-0	45-0	8,100	1,616
Leaming (Parks).....	1-0	0-0	41-0	8,325	1,611
Yellow Dent Divers Pride (Lot 1015).....	18-5	0-2	40-0	7,600	1,600
Northwestern Red Dent Disco.....	4-5	0-5	43-5	7,700	1,496
White Dent Divers 90-day (Lot 1318).....	0-0	0-0	40-0	6,750	1,353
White Cap Yellow Dent (S-B).....	0-0	0-0	40-5	6,425	1,329
Wisconsin No. 7 (Duke).....	0-1	0-0	42-0	6,925	1,298
Howe's Alberta Flint.....	100-0	98-0	36-0	5,300	1,089
Kaffir.....	0-0	0-0	23-5	2,000	552

FIELD ROOTS

Twelve varieties of fall turnips, thirteen Scandinavians, eleven mangels, eleven carrots, two sugar beets, were tested this year. Space denied duplication except with the Swedes. All varieties were drilled on the level on May 12. Germination was very uneven owing to drought, and on June 14, seed of carrots, mangels and sugar beets was re-sown. Digging of the roots was commenced on October 13, and finished on October 16.

Unfortunately, samples of certain mangels and carrots were, through an error, not taken. Dehydration data are presented so far as available.

VARIETY TEST OF SWEDES, AVERAGE OF DUPLICATE PLOTS, SEEDED MAY 12, LIFTED OCTOBER 16 AND 17

Variety	Green weight, pounds per acre	Absolute dry matter, pounds per acre	Standing on a basis of dry-matter content	Germination notes condensed from observations of individual plots made May 29 and June 8. Considerable Variations due to slight unevenness of the land	Remarks
Selected Westbury (S-B).....	36,480	4,962	4th	Uniformly good.....	Some roots warty
Jumbo (Steele-Briggs).....	34,200	4,749	8th	Fair to good.....	
Hartley's Bronze Top (Bruce).....	34,140	4,964	3rd	Slow to very good.....	Small woolly root-lets and warty.
Selected Purple Top (S-B).....	32,280	4,988	2nd	Slow to very good.....	
Monarch (Nappan).....	32,160	4,321	11th	Medium to excellent.....	
Famous Kangaroo Green Top (S-B).....	32,100	4,995	1st	Slow to excellent.....	
Good Luck Purple Top (S-B).....	31,380	4,354	9th	Slow and irregular to good.	
Monarch (raised at Nappan).....	30,300	4,008	12th	Uniformly good.....	
Bangholm 7021.....	30,000	4,758	7th	Tardy and irregular.....	
Bangholm 7022.....	28,900	4,930	5th	Slow to fair.....	
Selected Bangholm (Charlottetown).....	28,140	4,916	6th	Slow to extra good.....	
Bangholm (Ewing).....	26,460	4,331	10th	Slow to very good.....	
Breadstone Green Top (McKenzie).....	15,060	3,150	13th	Slow and irregular.....	
Averages, 13 varieties.....	30,123	4,571			

Average per cent dry matter 13 varieties swedes—15.17 per cent.

VARIETY TEST OF FALL TURNIPS, TWELVE VARIETIES IN SINGLE 1/120-ACRE PLOTS, SEEDED
MAY 12, LIFTED OCTOBER 16

Variety	Green weight, pounds per acre	Absolute dry matter, pounds per acre	Standing on a basis of dry-matter content	Germination notes condensed from observations made May 29 and June 8, soil somewhat uneven
Early Six Weeks (Sutton).....	45,120	5,324	1st	Very fair but rather irregular.
Red Paragon (Sutton).....	40,200	4,912	3rd	Tardy and irregular. Much of land dry.
Purple Top Mammoth or Improved Greystone (Steele-Briggs).....	39,840	4,565	7th	Tardy and irregular. Much of land dry.
Hardy Green Round (Sutton).....	37,800	4,940	2nd	Fair but slow on a receding knoll.
White Globe (Ewing).....	36,480	4,709	5th	Fair but slow on the rising ground.
Greystone (Steele-Briggs).....	35,040	4,607	6th	Tardy and irregular. Much of land dry.
Purple Top Mammoth (Sutton).....	34,800	4,172	9th	Tardy and very irregular. Much of land dry.
Pomeranian White Globe (Steele-Briggs).....	33,240	4,118	10th	Fair but slow on the rising ground.
Green Top Aberdeen (Sutton).....	33,000	4,821	4th	Fair but irregular.
Purple Top Abredeeen (Sutton).....	32,280	4,438	8th	Fair but irregular.
Aberdeen Purple Top (Steele-Briggs).....	25,320	3,965	11th	Tardy and irregular. Much of land dry.
Green Top Yellow Aberdeen (Ewing).....	24,840	3,758	12th	
Averages, 12 varieties.....	34,830	4,527		

Average per cent dry matter, 12 varieties—13 per cent.

VARIETY TEST WITH MANGELS, UNDUPLICATED PLOTS. SAMPLES OF DRY-MATTER DETERMINATION TAKEN FROM SEVEN PLOTS ONLY. SEEDED MAY 12, RESEDED JUNE 14, AND LIFTED OCTOBER 12

Variety	Green weight, pounds per acre	Absolute dry matter, pounds per acre	Germination, June 25 per cent
Giant Yellow Globe (Ewing).....	15,720		70
Barres Sludstrup 3084.....	15,000	2,850	85
Barres Strino 7034.....	14,880	2,885	65
Royal Giant Sugar (S-B).....	14,640	2,895	95
Giant White Sugar (S-B).....	14,640	2,554	80
Long Red.....	14,280		70
New Ideal (S-B).....	14,160	2,448	98
Half Sugar Rose 1141.....	13,680	2,679	95
Golden Fleshed Tankard (S-B).....	12,600		70
Danish Sludstrup (Ewing).....	10,800	2,289	90
Yellow Oval or Intermediate.....	10,680		70
Averages seven varieties from which dry-matter determinations were made.....	13,971	2,657	
Average per cent dry matter from seven varieties.....		19.02%	

VARIETY TEST SUGAR BEETS, SEEDED MAY 12, RESEDED JUNE 14 AND LIFTED OCTOBER 12

Variety	Green weight pounds per acre	Germination on June 25 p.c.
Kitchener.....	9,720	95
Chatham.....	7,320	90
Average two varieties.....	8,520	

VARIETY TEST WITH FIELD CARROTS, EXPERIMENT CONDUCTED IN DUPLICATE BUT DRY-MATTER DETERMINATIONS MADE OF ONLY NINE VARIETIES AND THESE IN BUT ONE RANGE. SEEDED MAY 12, RESEDED JUNE 14, AND LIFTED OCTOBER 13 AND 16.

Variety	Green weight, pounds per acre	Absolute dry matter pounds per acre (one plot only each case)	Germination, June 25
			p.c.
Intermediate White (Ewing).....	3,540	477	70 (strong)
White Belgian (Bruce).....	3,360	503	52
Improved Intermediate White (D. & F.).....	3,240	404	20
Mammoth Intermediate Smooth White (Bruce).....	3,180	408	30
Giant Green Top White (D. & F.).....	3,000	.....	55
Long Orange (Bruce).....	2,820	477	35
Intermediate White Belgian 7016.....	2,760	.....	50
Gulerod's Champion 7031.....	2,640	362	Very slow
Long White Vosges (Bruce).....	2,460	420	Very slow
New Yellow Intermediate (Ewing).....	2,400	367	75
Long Orange Belgian (Bruce).....	2,220	358	50
Averages nine varieties in south range (only range from which dry matter determinations were made).....	3,066	419	
Average per cent dry matter in above.....	13.66%		

MILLETS

Under favourable conditions of summer-fallow preparation a variety test of five kinds of millet was seeded on June 3rd in single plots, finally trimmed to 14 by 55 feet in size. The seed was broadcasted at the estimated rate of 23 pounds per acre, by the grass-seeder attachment of a 14-run, single-disc grain drill, with the discs, running light, used to cover the seed. Prompt germination and even stands were obtained and the growth was more satisfactory than has generally been produced by millet at this point.

Following a light touch of frost on the morning of August 3rd, notes were taken at noon on the apparent susceptibility of the several sorts. These are quoted:—

Siberian.—Insignificantly affected.

Hog.—Many leaves noticeably touched.

Golden.—Slightly touched.

Common.—Very slightly touched.

Hungarian.—Very slightly touched.

All kinds recovered and renewed their growth.

The next and a somewhat harder frost occurred on the morning of September 11th, but as the plots were cut the same day the effect upon them was not very marked.

Although the millet crop was considerably better than usual, the average yield of dry matter was only a trifle more than half as great as the yield of oats seeded alongside on the same date. Yields of the varieties were fairly even throughout. The Hog millet turned off rather the heaviest green weight but appeared to be immature and sappy. It fell to bottom place on a basis of dry-matter comparison. Siberian led in dry matter per acre. The varieties tabulate thus:—

VARIETIES OF MILLET

Variety	Green weight per acre, pounds	Absolute dry matter, pounds per acre	Per cent dry matter to green weight
Siberian.....	12,388	4,692	37.88
Hungarian.....	12,501	4,375	35.00
Common.....	10,578	4,237	40.06
Golden.....	10,408	4,000	38.43
Hog.....	14,029	3,922	27.96
Quantitative average five varieties.....	11,980	4,245	35.43

SOIL FERTILITY INVESTIGATIONS

Under way at Beaverlodge are six experimental projects bearing upon soil fertility problems. Three of these relate to alfalfa.

While it would be rash to attempt conclusions from the experiments as yet, it may be said that no evidence has come to light indicating a present need of applying chemical fertilizers for the growing of alfalfa at Beaverlodge. This does not prove that liming might not be of advantage on certain soils. Indeed, there is no adequate warrant for assuming that it may not be of some slight advantage on the Station soil at the present time, since much of the land in the Peace River Country exhibits a slight tendency to acid reaction. It does not seem to be enough, however, to prevent the successful growing of the crop when tilth, inoculation and other conditions are right.

NITRATE APPLICATIONS TO CEREALS AND MEADOWS

A study of meteorological data and soil-thermograph records, together with observation of growing crops, lends support to the opinion that during much of the open season in the North country the soil is either too cool, or too dry, or too cool and dry, and perhaps too compact as well, for decay and nitrification to proceed rapidly, especially in land exposed to the sweep of cool, drying winds. A few trials with nitrate of soda in 1922 suggested that the deficiency was liable to be especially acute in old grass meadows; also, quite probably, in new meadows seeded in rank nurse crops; and that such a deficiency might be one of the factors accounting for the scant production of perennial grass crops in the west, perhaps hastening or aggravating the condition styled "sod-bound."

The tests with nitrate were repeated in 1923, applications being made both to cereals and meadow-plots at the rate of one pound per square rod, or one hundred and sixty pounds per acre. In the case of wheat and barley no result was apparent to the eye and for reasons of economy the areas treated were not separately harvested, an additional reason being that the barley had germinated irregularly in the spring ploughed seed bed. Evidently in this dry May and June, following the very short crop in 1922, moisture was outstandingly the limiting factor so far as grain was concerned. This was to be expected.

Not so with timothy. Although the drouth was so acute that until June 10 there was not enough moisture either to start a growth or to wash the nitrate down to the roots, yet shortly afterwards a marked contrast in colour and length of top developed as between the treated and untreated plots. The application had been made to a one-half portion of each of eight plots of timothy and Western rye grass seeded in 1920, five of the former and three of the latter. Every one of the timothy plots exhibited a marked increase in yield, the average of five being 432 pounds of hay per acre from the untreated and 848 pounds, or nearly twice as much, from the treated areas.

Upon the western rye grass plots the effect of the application was not so evident, and the yields of hay were 1,573 pounds per acre from the checks and 1,706 pounds from the dressed areas. The trifling difference was all made up in one instance out of the three and may have been due to an irregularity in the distribution of snow moisture, or to other causes.

It will be noticed that the average yields of rye grass approximately doubled the yield of timothy even from the dressed plots, and the fact that nearly a hundred per cent increase was produced by the application of nitrate to timothy, while none to speak of attended the application to rye grass, would seem to indicate that available nitrogen was distinctly a limiting factor in the growth of timothy even in the drouthy June of 1923, and that timothy was more likely than rye grass to be restricted by this factor.

Contrary to previous experience, a small-scale application of nitrate in the spring of 1923 to new seedings of grasses had no conspicuous effect, but the grass plants were so small and thin, the area so limited, and the other conditions so subject to variability, that negative deductions were hardly warranted.

MANURING TEST

In 1918, a whitish-clay knoll top, representing a certain type of soil occurring occasionally throughout the district, was fallowed and one half of the area manured. The land was uniformly cropped to winter wheat, oats, and beardless-hulless barley in succession, the average increase from manuring amounting to 24.21 per cent, the third crop (barley) showing a considerably greater benefit than the first crop (wheat), notwithstanding that the manure had been applied and worked in in such a way as to lead one to expect prompt assimilation. In 1922 the land was again fallowed and in 1923 it was drilled into Ruby wheat. Results from the manuring were not expected in this crop for two reasons:

(1). Because, under the extremely dry conditions prevailing in the fallow year and the early part of the ensuing cropping season, moisture was undoubtedly the limiting factor in production of grain.

(2). Because a bluff immediately west of the area accumulated snow drifts which, in melting, undoubtedly contributed more moisture to the west or unmanured than to the east half to which the manure had been applied in 1918. Contrary to these expectations it seemed to the staff and most visitors that the east, or manured half, gave rather the better promise, and count of sheaves at harvest gave it an advantage of 10 per cent. However, when the weights of total crop and threshed grain were taken later on this advantage was not evident, the west plot recording a slightly greater yield of both straw and grain. Experimental error is, of course, always possible, but there is no known fact to raise the question in this case.

MANURING TEST—1923. CROP: RUBY WHEAT

Size of plots, 3 x 16.5 rods (49.5 sq. rods)

Designation	Total crop	Grain	Ratio
	per acre	per acre	grain to total crop
	lb.	lb.	p.c.
West plot (unmanured).....	3,859	1,603	41.54
East plot (manured, 1918).....	3,807	1,577	41.43

RESIDUAL EFFECT OF VARIOUS GRASSES

It has been a fairly general experience in the Upper Peace River Country that after land has been ploughed out of certain grasses, timothy in particular, the ensuing crop of grain was liable to be light, unless the sward were broken early in the season and well summer-fallowed thereafter. "I grew timothy on that field several years ago and I have never had a good yield of anything on it since," remarked a very thorough farmer to the writer on one occasion, pointing to the field in question.

In the phenomenally rich High Prairie District, west of Lesser Slave Lake, where the black soil is many feet deep and the precipitation fairly copious at times, timothy-growing is favoured partly as a means of reducing the rankness of succeeding crops of cereals in order that they may have a better chance of standing up and ripening.

In 1921 at Beaverlodge, variety plots of oats and barley were laid out across certain ranges where experimental grass plots had been ploughed up the previous August, after the removal of the hay crop. A rather marked fluctuation in the yield of every cereal plot throughout its length was observed, and while no absolute determinations were made to compare these variations as to cause or degree, it was noticed that wherever volunteer timothy showed among the grain the growth of cereals was somewhat meagre. These and other considerations suggested experimentation to ascertain, if possible, whether grass species differed in their residual effect upon soil productiveness.

Late in August, 1922, a series of forty-eight plots that had been seeded in June, 1919, to mixtures of grasses and legumes and cropped to hay for the next three years was ploughed up and before autumn it was doubled-disked. In the spring of 1923 the major portion of this area was drilled to Eureka beardless-hulless barley, at the rate of six pecks per acre.

Although in the original grass seeding, clover or alfalfa had been included in every plot except a few where the basic legumes occurred alone, yet owing to lack of inoculation, the clovers and alfalfa had virtually disappeared from the mixture plots after the initial season. By the time of breaking up the block there was practically not a plant of them in the grass sods. The legumes persisted somewhat better in the plots where they had been sown unmixed with grasses and in these plots sporadic patches of natural inoculation finally resulted in vigorous growth, especially of alfalfa. But so far as the comparison of the grass sods is concerned the matter is not complicated by the fact that the legumes had been originally included with them in seeding down.

LAYOUT AND RATES OF SEEDING

In the plan of the grass-mixture experiment there were three series of combinations, with two ranges in each series, and these companion ranges always in reverse order so as to equalize soil conditions as closely as possible. Details of arrangement and rates of seeding have been annually described in the Grass and Clover Mixtures section of the Forage-Crop report.

There have always been six complete ranges in which the various grasses and grass mixtures were separately compared, and it is confidently believed that the average of six comparisons gives very nearly a fair result in all cases. If any one grass sward had an advantage in position over the others it was probably the five-grass mixture.

Particularly close was the comparison between the timothy and Western rye grass plots, since these were in every range situated side by side, each grass being in three cases west of the other and in three cases east.

Timothy occurred not only by itself (*i.e.* after the accompanying legumes had disappeared) but as a component in mixtures of three and five grasses, respectively; and it appeared to be the predominant element in each of these

swards and to continue thus into the final cropping season, by which time it had become extremely unproductive. This observation is merely a casual one. No botanical analysis of the sods was made.

CHARACTER OF SOIL AND PREPARATION

The land where the 1919 seeding was plotted was high and sharply rolling, with a much thinner surface loam than the average of the farm, the black mould not having exceeded four inches when broken. Underneath was a thin layer of white silt clay and below this the usual chocolate sub-soil.

The land had been broken in July, 1918, fairly well disked that season and again the next spring; but as wet weather, rocks, and "grubs" had prevented a complete killing of the grass, the land was then backset about seven or eight inches deep and once more disked before being seeded on June 11, 1919. Good clean stands of hay were obtained, but no hay was made until 1920, when a fair crop was cut, though nothing to compare with what was produced that year on some other parts of the farm.

PRECIPITATION RECORDS

In 1920 the April-May-June precipitation amounted to 6.14 inches and this followed a winter in which the soil was saturated. In the corresponding three months of 1921 the downfall was 3.72 inches, while for the like period of 1922 it was 2.21 inches, with less than half an inch further in July.

Under this combination of adverse conditions in the form of thin, high, rolling land and two very dry seasons for grass growth, the three-year aggregate yields of hay were absurdly low.

The average successive and three-year aggregate yields of hay for the six plots of each respective grass or grass combination, and for the one plot of alfalfa that was left until the final cropping year, are as follows:—

	1920	1921	1922	Aggregate three years
Alfalfa (1 plot only).....	1,760	1,120	660	3,540
Timothy (average 6 plots).....	2,640	1,293	293	4,226
Western rye (average 6 plots).....	2,880	2,363	1,186	6,429
Meadow fescue (average 6 plots).....	2,653	1,513	243	4,409
Three grasses (average 6 plots) (T., W. R., and M. F.).....	3,013	1,410	300	4,723
Five grasses (average 6 plots) (T., W. R., M. F., R. T., and K. B.).....	3,366	1,506	390	5,262

Note that the Western rye grass outyielded timothy by 52 per cent, and in the final drought year of 1922 by 304 per cent.

The extreme drouth of 1923, was broken, happily, about the middle of June, though the weather remained drouthy until July, the precipitation by months being: April, .23 inches; May, .23 inches; June, 1.26 inches; July, 3.65 inches; August, .92 inches. For thirteen months there had never been rain enough to wet the bottom of an ordinary furrow. If ever there was a period at Beaverlodge when moisture might have been expected to prove the sole limiting factor in production it was 1922 and the fore part of 1923.

BARLEY SHORT AND PALE ON TIMOTHY SOD

It was remarked after the barley came up that on the timothy sod it was conspicuously short and yellow as compared with that on the rye-grass plots alongside. A similar, though not quite so marked a contrast occurred after both of the grass mixtures in which timothy had been included. After rye

grass and fescue the barley was taller and a much deeper green. The contrast was not due to differences in germination, for this, although irregular, was apparently quite as good on the timothy plots as on the others. The contrasts observable as between timothy and rye grass plots were clearly due to post-germination influences and were so striking that no visitor failed to recognize them at a glance. The shortness and paleness of the barley after timothy was apparent to all. A rainy July reduced the contrast somewhat but at harvest it was still very noticeable.

BARLEY HAND-PULLED FROM THIRTY-THREE SQUARE RODS

Steps were accordingly taken to hand-pull the barley from a precisely measured square rod—that is to say one quarter of each fortieth-acre sod plot. The work was systematically done, the pulled area being taken from the interior of each plot so as to keep well away from the marginal influences of old paths. Instructions were to take a certain calculated length of run of a certain number of grain drills and to follow the same drill runs in each of the six ranges through which they projected. This latter instruction was not followed absolutely, but very nearly so. The measuring, lining up and most of the hand-pulling were done by a trustworthy helper accurately trained in mensuration.

WEIGHTS OF TOTAL CROP AND OF GRAIN

The sheaves as pulled were neatly trussed with a double band on each, labelled and tied together into miniature stooks. After being thoroughly cured in the field the stooks were hauled to the barn and weighed with roots and a little dirt adhering. The roots were then chopped off with a broadax at about the length that would be cut by a low-tilted mower bar. This work was personally performed by the Superintendent, who was at special pains not to trim the crop from the timothy plots any closer than that from other areas.

After the second weighing the lots were sacked and set aside until threshing, when they were very carefully run through the experimental separator.

In separating, the method was to recover as much grain as possible without, in any case, cleaning up the floor between lots. Even with such pains the final clean-up produced a quantity of grain amounting to some eight or nine per cent as much as the total which was recovered and weighed. There is every reason to believe, however, that the waste was proportionate in each case to the yield recovered.

After threshing, the grain yields were weighed, with results indicated in our table.

TABLE giving the 1923 Yields of Beardless-Hulless Barley after various sods in the 1919 Seeding of the Grass and Clover Mixtures Experiment, broken in August, 1922

Previous Crop or Treatment	Yield total crop per acre before trimming roots off	Yield total crop per acre after trimming roots off	Yield threshed grain recovered	
	lb.	lb.	lb.	bush. lb.
Summer-fallow (average 2 plots).....	8,152	6,000	2,237	46 29
Alfalfa (partially inoculated) (1 plot only).....	6,480	3,840	1,650	34 18
Timothy (average 6 plots).....	3,962	3,026	1,117	23 13
Western Rye Grass (average 6 plots).....	4,957	3,533	1,398	29 6
Meadow Fescue (average 6 plots).....	5,208	3,413	1,306	27 10
Three Grass Mixture (average 6 plots).....	4,146	3,125	1,165	24 13
Five Grass Mixture (average 6 plots).....	4,144	3,165	1,303	27 7

NOTE.—In considering the yields of the barley, allowance must be made for the fact that the variety is hulless.

Perhaps the most graphic impression will be presented by reducing all comparisons to a percentage basis. In doing so, the respective yields of hay and grain crop from the timothy plots will be taken as the standard and set at 100 per cent in every instance, the yields from other plots being expressed in relative percentages of these.

TABLE EXPRESSING THE RESULTS ON A PERCENTAGE BASIS (TAKING THE TIMOTHY PLOT AS 100 PER CENT IN EVERY CASE)

Percentage Comparison of Hay Yields		Designation	Percentage Comparison of the Following Yields of Barley		
1922	Three years 1920-1922		Before trimming	After trimming	Threshed grain
p.c.	p.c.		p.c.	p.c.	p.c.
		Summer-fallow (average 2 plots).....	205.7	198.2	200.2
225.2	83.7	Alfalfa (1 plot only).....	163.5	126.9	147.7
100.0	100.0	Timothy (average 6 plots).....	100.0	100.0	100.0
404.7	152.1	Western Rye Grass (average 6 plots)....	125.1	116.7	125.1
82.9	104.3	Meadow Fescue (average 6 plots).....	131.4	112.7	116.9
102.2	111.7	Three Grass Mixture (average 6 plots)...	104.6	103.2	104.2
133.1	124.5	Five Grass Mixture (average 6 plots)....	104.5	104.7	116.6

Allowing for the factors of irregular germination, soil variation and unavoidable experimental error, the results, in the main, are remarkably consistent. The closest comparison of all is between timothy and rye grass, these plots being in all cases side by side. Though our table is confined to averages, it is a fact that in five out of six cases the barley after rye grass was greater than that after timothy in its yield of total crop, roots, dirt and all; greater in yield of sheaves as trimmed, and greater in weight of threshed grain. In the single exception timothy exceeded rye grass by a decimal of one per cent in yield of sheaves as trimmed, but not even there in the preliminary weights nor in yield of threshed grain, and examination of the stubble revealed that in this instance several of the drill runs were practically missing for a few feet due to a depression of the ground which the drill had doubtless skipped in seeding.

The five-grass mixture, for some reason, showed up better in yield of threshed grain than it did in yield of total crop. However, as explained above, the conditions where this series of plots occurred were not quite so closely comparable as was the case with the other grasses and mixtures.

The most outstanding facts apparent from an examination of the right-hand side of the table are:—

- (1) The inferiority of the grain yields produced on August-ploughed sod to those after summer-fallow.
- (2) The superiority of alfalfa sod to grass sod, even though the alfalfa stand had been but partially inoculated.
- (3) The inferiority of the yields after timothy sod and to a lesser degree after sods in which timothy had been a predominant element.
- (4) The superiority of the barley yields on rye-grass sod to those after any other grass sod.

Another point, and one worthy of particular attention, is the converse relationship which the hay yields, especially those of 1922, bear to ensuing yields of grain from the respective sods. The traditional tendency in the West has been to consider these matters with reference almost wholly to the factor of moisture supply. Now, our conditions in 1922 and the early part of 1923 were such as to accentuate this factor to a quite unusual degree, and yet the most casual examination of our data will furnish facts to challenge any such sweeping hypothesis. Whether considering the three-year aggregate or the 1922 column

of hay yields, it will be noticed that the heaviest-yielding grass was followed by the heaviest yield of barley, and so on with a few qualifying exceptions to the foot of the column. Especially significant is the comparison of barley yields with the crop of hay in the final drouth year of 1922. While the rye-grass plots averaged 1,186 pounds per acre, the timothy gave but 293 pounds, yet the former were followed by 16.7 per cent more weight of barley sheaves and 25.1 per cent more threshed grain. Is it a question of moisture, or does some other factor enter in? Is not a plausible hypothesis supplied by the section of the present report detailing the results of nitrate applications to meadows?

BEEKEEPING

The colony of Italian hybrids cellared in early November, 1922, though subjected to very inexpert handling in several respects, emerged in the spring with at least a queened nucleus of workers, but evidently weak. As the hive after being placed in the cellar had been taken up and examined it had been feared that the colony would perish entirely.

On April 28, when the willows showed yellow pollen, it was removed from the cellar and given some sugar syrup in a pail in the super, and about three pints more on May 5. Examination on May 7 revealed 6 or 8 pounds of honey but not much worker brood. More syrup was given. On June 6, Mr. John Fixter examined the colony, finding it in first-class condition with plenty of eggs and brood in all stages, especially worker brood. A super was put on over a queen excluder. Swarms issued on June 27 and 30, probably both led out by young queens. The prime or first swarm was hived on the old stand. Each swarm was given two frames of sealed brood and honey from the parent hive, one each at hiving and a second one apiece on July 1. All three colonies built up steadily but only the prime swarm yielded any surplus. Colonies 2 and 3 hatched brood of Italian character, but the original colony developed more hybrid tendency and was the least tractable colony.

The bees worked until October 12 on second-growth sweet clover and alfalfa. On September 28, the super, weighing 23 pounds, was removed from the parent colony (No. 1). On this date six frames in the hive body had considerable capped honey and brood in all stages.

From colony No. 2, the prime swarm, a super was removed weighing 61½ pounds, a full comb of capped honey having previously been abstracted for exhibition purposes. In the brood chamber on that date were five or six frames containing a fair amount of honey, a few eggs in one comb and more or less brood in all stages in the others, two sheets of foundation being as yet untouched.

Colony No. 3 on the same date had done no work in super, but in the brood chamber there was sealed honey in nine frames, a little immature brood scattered here and there, but scarcely any sealed brood.

During October, all three colonies were fed syrup to bring them up to standard weights. The syrup was a two to one mixture, with 2½ level tablespoonfuls tartaric acid per 18 pounds of sugar.

On November 7 the bees were flying, but seemed ill-natured. November 8 they were put in the cellar, though, as the season turned out, it would have been possible for them to fly much later than this.

GENERAL NOTES

Co-operative work was continued in 1923. Seed was sent out for nineteen tests in the inoculation of alfalfa. Detailed reports had not been received from many co-operators at the time of inditing this report, but a few exceedingly encouraging ones had come to hand. These and other tests attracted much local attention and encouraged many that alfalfa could be grown in the North, besides stressing the importance of inoculation as a means to that end.

The comparison of alfalfa with Late Swedish clover in seedings made during 1922 has been all to the advantage of the former. In fact, the Late Swedish has demonstrated a high degree of neither drouth resistance nor winter hardiness. As the past two seasons have been exceptionally trying in both respects, it remains to be seen how the crop might fare under normal conditions.

Alsike and common red were hopelessly dwarfed by drouth on the farms of co-operative experimenters, as at the Station. The common red, moreover, is quite insufficiently winter-hardy.

Continuing the policy of facilitating the introduction of small fruit culture by supplying small lots of stock to interested applicants so far as the supply permitted, the Sub-station sent out in 1923, 57 lots of raspberries, consisting of about half a doz roots each; 25 lots of strawberries, averaging about 25 plants each; 37 lots of currant cuttings, and a few seeds of ornamentals. These have been distributed widely over the Upper Peace River country. A good many volunteer letters reporting gratifying success with this stock have come to hand.

In times past the great impediment to small-fruit culture in the North was the difficulty of getting outside nursery stock, especially of strawberries, to survive the shipment. Often, too, the varieties were not the best. The Station tried three times before it got a single Ontario strawberry plant to survive, and finally had best results with Early Dakota plants locally obtained. By distributing suitable varieties of small-fruit stocks locally grown it is believed the Station has done more to promote the culture of fruits in the North than might have been accomplished by three times the amount of experimentation without such distribution.

The Victor projection lantern was equipped with an electrical storage battery and a 72-watt 12-volt Mazda lamp, which illuminated the slides much better than the acetylene lamp and is very useful at points where electric current is not otherwise available. A number of excellent slides illustrating home beautification were supplied by the Division of Extension and Publicity and several dozen additional ones were made depicting points of interest in the year's work of the Station. These slides are found invaluable when explaining experimental data.

**LIST OF PROJECTS UNDER WAY AT THE EXPERIMENTAL
SUB-STATION, BEAVERLODGE, ALBERTA**

ANIMAL HUSBANDRY

PROJECT No.	TITLE.
A. 195.	Cost of beef production.
A. 526.	Cost of maintaining breeding cows.
A. 566.	Cost of feeding dairy cows (at Beaverlodge).
A. 567.	Wintering grade calves (at Beaverlodge).

FIELD HUSBANDRY

CULTURAL

F. 153.	Place in rotation to seed fall rye.
F. 155.	Dates of seeding spring grain crops.
F. 156.	Dates of seeding corn and sunflowers.
F. 161.	Rates of seeding spring grain crops.
F. 167.	Method of seeding corn.
F. 181.	Thinning sunflowers to different distances.

FARM MANAGEMENT

F. 199.	Yield and profit from various silage crops.
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HORTICULTURE

POMOLOGY

H. 4.	Currants, variety experiments.
H. 6.	Gooseberry, variety experiments.
H. 11.	Raspberry, variety experiments.
H. 21.	Strawberry, variety experiments.
H. 33.	Apple, variety experiments.
H. 48.	Plum, variety experiments.

VEGETABLE GARDENING

H. 51.	Artichoke, variety experiment.
H. 54.	Asparagus, variety experiment.
H. 61.	Bean, variety experiment.
H. 65.	Beet, different dates of sowing.
H. 68.	Beet, variety experiment.
H. 69.	Borecole or Kale, variety experiment.
H. 70.	Brussels Sprouts, variety experiment.
H. 72.	Cabbage, different dates of sowing.
H. 77.	Cabbage, variety experiment.
H. 79.	Carrot, different dates of sowing.
H. 83.	Carrot, variety experiment.
H. 312.	Cauliflower, different dates of sowing.
H. 88.	Cauliflower, variety experiment.
H. 94.	Celery, variety experiment.
H. 309.	Citron, variety experiment.
H. 97.	Corn, different dates of sowing.
H. 102.	Corn, variety experiment.
H. 106.	Cucumber, variety experiment.
H. 110.	Kohl-Rabi, variety experiment.
H. 114.	Lettuce, different dates of sowing.
H. 116.	Lettuce, variety experiment.

VEGETABLE GARDENING—*Concluded.*

PROJECT No.	TITLE.
H. 122.	Muskmelon, variety experiment.
H. 129.	Onion, different dates of sowing.
H. 138.	Onion, variety experiment.
H. 378.	Onion Sets, variety experiment.
H. 134.	Onion sets vs. seed, variety experiment.
H. 140.	Parsley, variety experiment.
H. 142.	Parsnip, different dates of sowing.
H. 145.	Parsnip, variety experiment.
H. 155.	Pea, different dates of sowing.
H. 153.	Pea, variety experiment.
H. 162.	Potato, different dates of planting.
H. 163.	Potato, different depths of planting.
H. 171.	Potato, hill selection for seed.
H. 172.	Potato, hill vs. level cultivation.
H. 174.	Potato, home-grown vs. northern or eastern-grown seed.
H. 180.	Potato, seed-treated chemically vs. not treated.
H. 183.	Potato, sprouted vs. not sprouted.
H. 317.	Potato, stem end vs. seed end eyes.
H. 186.	Potato, variety experiment.
H. 188.	Pumpkin, variety experiment.
H. 192.	Radish, variety experiment.
H. 195.	Rhubarb, variety experiment.
H. 199.	Spinach, variety experiment.
H. 201.	Squash, variety experiment.
H. 203.	Swiss Chard, variety experiment.
H. 431.	Tomato, pruning experiment.
H. 211.	Tomato, variety experiment.

ORNAMENTAL GARDENING

H. 261.	Annual flowers, variety experiment.
H. 275.	Hyacinth, variety experiment.
H. 272.	Gladiolus, variety experiment.
H. 276.	Inis, variety experiment.
H. 278.	Narcissus, variety experiment.
H. 280.	Paeony, variety experiment.
H. 287.	Sweet Pea, variety experiment.
H. 290.	Tulips, treated as annuals, variety experiment.
H. 307.	Trees and shrubs, ornamental and shelter, variety experiment.

CEREALS

Ce. 1.	Common spring wheat, test of varieties or strains.
Ce. 4.	Winter wheats, test of varieties or strains.
Ce. 5.	Oats, test of varieties or strains.
Ce. 6.	Barley, test of varieties or strains.
Ce. 7.	Field peas, test of varieties or strains.
Ce. 9.	Flax, test of varieties or strains.
Ce. 10.	Spring rye, test of varieties or strains.
Ce. 11.	Winter rye, test of varieties or strains.
Ce. 12.	Buckwheat, test of varieties or strains.
Ce. 13.	Production of superior varieties of spring wheat by selection from old sorts.
Ce. 17.	Oats, production of superior varieties by selection from old sorts.
Ce. 18.	Barley, production of superior varieties by selection from old sorts.
Ce. 50.	Multiplication of cereals.

FORAGE PLANTS

PROJECT No.	TITLE.
Ag. 1.	Indian corn, variety tests for ensilage purposes.
Ag. 16.	Mangels, variety tests for yield and purity.
Ag. 36.	Carrots, variety tests for yield and purity.
Ag. 46.	Turnips, variety tests for yield and purity.
Ag. 51.	Swede turnips, variety tests for yield and purity.
Ag. 66.	Sugar beets, variety tests for yield and purity.
Ag. 76.	Sunflowers, variety tests for yield and purity.
Ag. 251.	Milletts, variety tests.
Ag. 129.	Alfalfa, broadcast vs. rows for hay production.
Ag. 130.	Alfalfa, broadcast vs. row seeding for seed production.
Ag. 131.	Alfalfa, rate of seeding for hay production.
Ag. 133.	Alfalfa, seeding with vs. without a nurse crop.
Ag. 161.	Sweet clover, variety tests.
Ag. 163.	Sweet clover, methods of seeding for hay production.
Ag. 166.	Sweet clover, seeding with vs. without a nurse crop.
Ag. 223.	Western rye grass, rates of seeding for hay production.
Ag. 258B.	Hay and pasture mixtures, alfalfa as a base.
Ag. 258C.	Hay and pasture mixtures, sweet clover as a base.
Ag. 258D.	Hay and pasture mixtures, red clover as a base.
Ag. 258E.	Hay and pasture mixtures, mixed clover as a base.
Ag. 258F.	Hay and pasture mixtures, mixed grasses.
Ag. 258G.	Hay and pasture mixtures, grasses and clovers alone and in combination.
Ag. 258H.	Hay and pasture mixtures, alsike clover as a base.
Ag. 258I.	Hay and pasture mixtures, seeding hay mixtures with different nurse crops.

CHEMISTRY

C. 72.	Alfalfa experiment (B).
C. 73.	Alfalfa experiment (C).
C. 74.	Alfalfa experiment (D).
C. 75.	Nitrate of soda experiment (E).
C. 76.	Potato planting investigation.
C. 10.	Sugar beet investigation.

APIARY

Ap. 7.	Wintering in cellar.
Ap. 20.	Returns from apiaries.
Ap. 28.	Study of honey flow.