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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

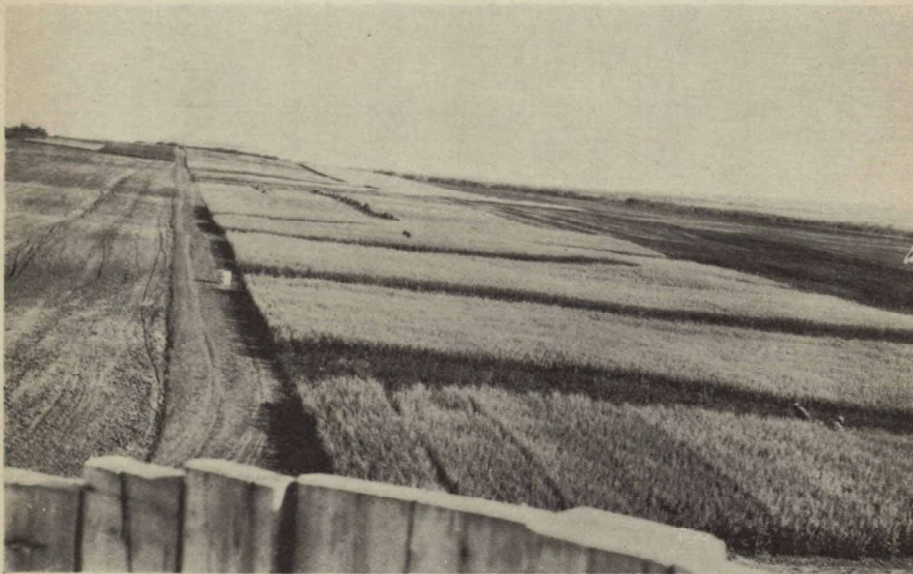
EXPERIMENTAL SUB-STATION

BEAVERLODGE, ALBERTA

REPORT OF THE SUPERINTENDENT

W. D. ALBRIGHT

FOR THE YEAR 1929



Part of the Beaverlodge Sub-station. Methods of seeding test in the foreground.
(Photo by W. D. Albright)

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DOMINION EXPERIMENTAL SUB-STATION BEAVERLODGE, ALBERTA

REPORT OF THE SUPERINTENDENT, W. D. ALBRIGHT

INTRODUCTION

The last five months of 1928 were so dry that when the freeze-up occurred any land which had produced an ordinary crop during the summer was too arid for the frost to stop a plough. Breaking and summer-fallow had but scant reserve and were pretty well surface-dried when winter set in.

In the spring of 1929 sleighing ceased about the twentieth of March and the top soil thawed somewhat. Intervals of subsequent precipitation resulted in an unusual penetration of snow moisture but it proved sufficient to satisfy the crop only a short stage past germination.

Seeding commenced on the Station April 20, but work had been done on the land earlier that week at widely scattered points. In fact, a ten-acre field of high, sandy land had been sown to wheat at Blueberry Mountain in the middle of March. Wheat seeding generally opened April 22, was sixty per cent accomplished by the end of the month and nearly finished on May 4. By May 11 coarse-grain seeding was largely completed on the Station and in the district.

Fall wheat and other over-wintering crops survived with scant loss excepting the exposed wood of trees. Apples and some other species killed back extensively, partly due, it was thought, to the arid condition of the soil, though a snow blanket protected their roots from injury. Covered roses came through well.

From seeding until midsummer the precipitation was frequent, totalling for each of April, May, June and July substantially more than the thirteen-year averages. However, none of the rains were heavy enough to carry much moisture down as far as the second foot of soil and seldom any below the furrow slice. Consequently, with the prevailing high winds, the loss of evaporation was heavy, and, what with a dry subsoil, the effective moisture supply was less than usual. Crops were more than once at the danger point. In some districts they suffered considerably, but at most points the rains came repeatedly in time to retrieve the situation.

The following comparison of precipitation month by month with that of the previous thirteen-year average for each month is interesting:—

Month	Thirteen-year average	1929
	in.	in.
April.....	0.68	1.17
May.....	1.46	2.05
June.....	1.88	2.17
July.....	2.25	3.54
August.....	1.78	1.20
September.....	1.39	4.89
October.....	1.12	0.70

Wireworm attack was rather extensive during the first half of June, particularly in the older-settled districts where wheat has been the leading crop.

A very few fields were partially blown out by wind and others evidenced mechanical injury to the leaves.

During the first week of July the crop suffered from bleak temperatures accompanied by high winds and drouth, but an inch and a quarter of rain on the 10th proved timely, stopping, however, twelve miles south of Pouce Coupé. There was a heavier rainfall around the 20th, soaking sod upland nine inches, and a light shower on the 26th. Another half-inch on August 4 helped filling.

Overcast weather in August favoured filling, but retarded ripening until the last week, when it was fairly rapid, with harvesting progressing fast until stopped by a rain at the end of the month.

No August frost was reported on the high land of the Station, but in the middle and latter part of the month light touches of it had singed occasional low-lying patches of potatoes. It was not supposed that any serious general damage was done to grain. There was much apprehension, however, and many fields were cut decidedly green.

The first frost recorded on the Station was a temperature of 30 degrees Fahr. by the official caged instrument on the morning of September 5. From many representative points came reports of six, seven, eight and ten degrees of frost. By this and the lighter frosts of August, the germination of some oat crops was affected, though in few, if any, cases completely destroyed. No further frost was recorded by the caged thermometer until September 22, when a series of light ones commenced, climaxed by a temperature of 26 degrees Fahr. on the 26th.

Perhaps three-quarters to four-fifths of the wheat and two-thirds to three-quarters of the oats were cut ahead of the early September frost. The value of early varieties was emphasized, for nearly every field of Garnet, Ruby and Reward was in stook, whereas much of the Marquis was standing.

By September 14, harvesting of all grains was virtually completed and a dribble of threshing began. By the 16th dry grain was coming in to the elevators and by the 18th all threshing outfits were at work.

There followed a week of ideal weather, during which dry, hard grain rattled from many hundreds of separators until the afternoon of the 20th, when scattering showers set in, soon developing into a general rain changing during the night of Saturday 21st, to heavy snow, which continued at Beaverlodge until Tuesday 24th. Trees and bushes still in leaf were bent to the ground, which was covered in places a foot or more deep, notwithstanding the steady melting in progress. The storm was much heavier south than north of the Peace. At Beaverlodge the moisture was estimated at four inches, at Grande Prairie, four and a half. At Spirit River it was still heavier, but at Fort St. John in the northwest only 1.66 inches, with little or no snow accumulating.

It was estimated that two-thirds of the wheat and possibly half the oats were threshed before the storm. The rest stood out through a long period of calm, moderately warm weather, during which the snow disappeared very gradually, nearly all its moisture soaking into the soil. Remnants of snow banks were observable ten days after the commencement of the storm. Many farmers brushed the snow off their stooks and some reset them. Threshing was resumed October 5 and 6, but the outfits moved with great difficulty over the sodden fields, and snatch teams were required on the bundle wagons.

During a week of excellent weather ending October 12, practically all the outfits completed their work, most of the grain grading dry and being depreciated only a grade or two. Some was not degraded at all, though undoubtedly deteriorated.

No hard killing autumn frost occurred on the high land of the Experimental Station until after the middle of October, and several unprotected rose

bushes bloomed until the night of October 17. Even after that some of the lower rosebuds, although bleached and frayed, continued to show a tint of colour until October 24.

Fall ploughing continued into early November and autumn work was particularly well completed, though some ploughs were held up until near the end of October by a too wet condition of the land. The moisture reserve for 1930 is extraordinary.

Grain-yield expectations were realized or exceeded, some field out-turns of over fifty bushels of wheat and over a hundred of oats being reported. District averages, though not bumper, were fair.

Most of the oats graded 2 C.W. and most of the early-threshed Garnet wheat 2 Northern, although some points reported about half 2 Northern and half 3 Northern. After the storm there was a little No. 4. Most of the Reward submitted to elevators was rated at No. 1 Northern. Marquis and Red Bobs ranged from a rare car of No. 1 Hard down through 1, 2 and 3 Northern to as low as 4 and 5, some of it tough.

Had Marquis been the only variety grown, conditions in many parts would have been trying. A week or ten days made a vast difference in grade, in harvesting, in economy and in the accomplishment of fall ploughing.

It was estimated by a bank in the town of Grande Prairie, after trimming and summarizing reports of local managers, that one hundred and twenty thousand acres of new crop land were broken during 1929 throughout the Peace River district. A. R. Judson, District Agriculturist, while by no means discrediting this figure, made the exceedingly conservative estimate of one hundred thousand.

ROYAL AND INTERNATIONAL WINNINGS

Notwithstanding that Peace River's premier exhibitor was prevented by illness from entering at the Royal and International exhibitions of 1929, high honours were captured by the Alberta territory north of Edmonton. At the former Robert Cochrane, Grande Prairie, won fourth with a sample of Victory oats and fifth with Golden Vine peas, while a sample of Reward wheat prepared from a bin run of 675 bushels of his personal crop, stook-threshed by a commercial outfit, the Superintendent of the Beaverlodge Station stood second at the Royal to Dr. S. W. D. Frith, of Edmonton.

At the International Hay and Grain Show, Chicago, the Grand championship in wheat was captured by Jos. H. B. Smith, of Wolf Creek, west of Edmonton, in the Athabaska Watershed, but in the Peace River Electoral District; seventh by E. J. Shank, of Athabaska; fourteenth by G. W. Randall, of High Prairie; fifteenth by Dr. Frith; and sixteenth by the Beaverlodge Superintendent with the sample forwarded from Toronto.

In oats at Chicago, Jos. H. B. Smith was fourth and Robert Cochrane fourteenth. In early oats E. J. Shank, of Athabaska, was first and Jos. H. B. Smith second.

P. U. Clubine was first in Chicago in small yellow peas. Messrs. Shank and Cochrane also won places in timothy seed, and Cochrane sixth on alfalfa seed.

Many further honours were captured at the ensuing provincial seed fairs and summer exhibitions, while from the Peace River Block of British Columbia a number of exhibitors acquitted themselves well at the Provincial Grain and Seed Show in Vancouver, J. C. Washington, of Dawson Creek, winning first and special in medium or late oats, with James M. Watson, of Kilkerran, second; G. H. Hifferman, of Rolla, was second in wheat; James Paul and Son, Dawson Creek, were first in peas A.O.V., and James P. Henderson, of Dawson Creek, first in fall rye. These winnings were doubtless the result to some extent of a very successful local seed fair previously held in Dawson Creek.

SUMMARY MR. TRELLE'S WINNINGS, THREE CROP YEARS

At this time it is appropriate to include a summary of Mr. Herman Trelle's winnings from the crop of three successive years, 1926-27-28. Mr. and Mrs. Trelle—for they work together—exhibited at thirteen major shows and exhibitions, in which they entered a grand total of fifty-six exhibits, comprising wheat, oats, peas, and potatoes, winning a total of 186 awards, trophies and specials, comprising:—

- 43 Championships, including 14 International sweepstakes, 7 of which are world championships.
- 22 Trophies (gold and silver cups and shields.)
- 15 Miniatures and medals.
- 45 Cash special prizes totalling about \$6,000.
- 54 First awards.
- 3 Second awards.
- 2 Third awards.
- 1 Fifth prize.
- 1 Sixth prize.

Grand total 186

HOMESTEAD ENTRIES AND SOLDIER GRANTS

During the calendar year 1929, 59.8 per cent of the homestead entries in the three Prairie Provinces were registered in Alberta, including the Peace River Block of British Columbia, which (pending transfer of the resources to provincial control) pertains to the Grande Prairie and Peace River agencies. Of the Alberta total, 9,833, or 93.1 per cent, were represented by filings at the three northern agencies, viz., Edmonton, Grande Prairie, and Peace River. At the two latter the filings were 5,413, which is 51.2 per cent of the Alberta total and 30.7 of the total for the three provinces. Lack of further railroad construction in 1929 accounted in part for the fact that entries fell off 108 from the high mark of 1928, while at the Edmonton office filings increased from 3,504 up to 4,420. In the Peace River region, homesteaders are farther ahead of steel-head than is economic. More construction is promised for 1930.

The relation between railroad construction and homesteading is somewhat indicated by the fact that during 1929 the Prince Albert agency in Northern Saskatchewan had the largest entry with 4,914, Edmonton second with 4,420, the Peace River agency third with 3,079, and the Grande Prairie agency fourth with 2,334. Alberta, by the way, has five land agencies, while Saskatchewan has only two, and over three-quarters of Saskatchewan's entries were at Prince Albert.

During last year and this the total of homestead entries and soldier grants in the two northern agencies has been 10,934. Granting that a considerable percentage of the entrants would fail to hold their quarters and that many entries were for second homesteads by resident settlers who had completed duties on their first homesteads prior to January 1, 1925, it is still evident that by homestead entry alone a very large addition to population and production has occurred in two years.

A large further increase is represented by purchases of patented land, school land, and Indian reserves.

The preponderance of filings this year was north of the Peace, a heavy movement going up from Grimshaw into the Battle River district and beyond.

SALES OF INDIAN RESERVE LANDS

That compactness of settlement and resultant accessibility of commercial and professional services are large factors in establishing raw-land values was well illustrated by prices realized for five parcels of Indian reserve lands auctioned at Fairview, Alta., north of Peace River, on June 15, 1929. Although

homesteads are still available at \$10 per quarter section, plus simple residence and settlement duties, these Indian lands, with no improvements whatever, brought an average price of \$19.71.

In 1928 an auction sale of school lands in July had averaged \$18.11 per acre, notwithstanding that July is too late a date at which to buy and still get much seasonable breaking done in the year of purchase.

GRAIN SHIPMENTS

By courtesy of R. H. Bell, District Freight Agent, Canadian National Railway, Edmonton, and John Callaghan, General Manager of the Northern Alberta Railways, which were taken over jointly July 2, 1929, by the Canadian Pacific Railway and Canadian National Railway transcontinental systems, statistics of grain and livestock shipments from the Alberta territory north of the latitude of Edmonton are presented. The old Dunvegan lines (serving the Peace, part of the Athabasca and part of the North Saskatchewan watersheds), shipped during the crop year August 1, 1929, to July 31, 1930, nearly six and a half million bushels of wheat and over three and a half millions of coarse grains, totalling 9,989,738 bushels. The Alberta and Great Waterways line running north by northeast from Edmonton to Waterways, near Fort McMurray, shipped about three-quarters of a million of wheat and over three hundred thousand bushels of coarse grains, making an aggregate of 1,060,801 bushels. The Athabasca branch of the Canadian National Railway accounted for almost a million and a half bushels of wheat and over three hundred thousand of coarse grains, aggregating 1,827,007 bushels.

The grand totals of all lines north of Edmonton are 11,779,758 bushels of wheat; 5,237,893 of coarse grains, and 17,017,651 of wheat and coarse grains combined.

LIVE STOCK SHIPMENTS

While population and grain acreage in the Peace River region increased rapidly, the production of livestock remained almost static, aggregate shipments showing a tendency to decline. This spells contraction on the part of the average established settler since the production of newcomers should more than take care of the increase in local consumption. Some allowance should possibly be made for increase in truck delivery from points conveniently accessible to Edmonton by highway, viz., the Edmonton-Athabasca and Pembina-branch sectors. Still the condition is not healthy for were the truth known it is hard to say how much of the dwindling shipments may represent continued liquidation of breeding stock.

Considering first the old Dunvegan lines we note that cattle shipments were 5,350 head against 10,300 in 1928, a decrease of nearly one-half. Hogs nearly held their own with 28,160 as against 30,000. Sheep were shipped to the number of 1,445 as against 1,700, and horses to the number of 780 as compared with 1,080 in 1928. The totals of all live stock stand as 35,735 head in 1929 against 43,080, a decrease of 7,345 head or 17 per cent.

Taking all shipping points in Alberta north of Edmonton, we find the following comparisons:—

	Cattle	Hogs	Sheep	Horses	All live stock
1928.....	24,725	74,107	4,831	2,173	105,836
1929.....	15,847	76,598	5,165	1,697	99,307
Increase (+) or Decrease (-).....	-8,878	+2,491	+334	-476	-6,529

It will be observed that the net decrease in numbers was over six per cent but the reduction in weight would be greater since the decreases were in the heavy classes of stock and the increases in hogs and sheep.

SUMMARY PRESENTING STATISTICS OF LIVE STOCK SHIPMENTS FROM ALL THE RAILWAYS IN ALBERTA NORTH OF EDMONTON IN 1929

	Number of head of each class					Number of cars
	Cattle	Hogs	Sheep	Horses	Total	
Dunvegan line of N.A.R. tapping chiefly Peace River District.....	5,350	23,160	1,445	730	35,735	622
A. & G. W. Railway of N. A. R. running northeastwardly from Edmonton.....	750	4,880	170	220	6,020	104
Coronado branch (St. Paul line), Canadian National Railways.....	5,138	29,716	2,154	259	37,267	
Bonnyville branch, Canadian National Railways.....	1,307	4,802	574	16	6,699	
Athabasca branch, Canadian National Railways.....	1,141	1,534	101	130	2,906	
Whitecourt branch, Canadian National Railways.....	1,584	5,912	666	228	8,390	
St. Albert to Magnolia branch, Canadian National Railways.....	577	1,594	55	64	2,290	
Total all lines north of Edmonton.....	15,847	76,598	5,165	1,697	99,307	

On A. & G. W. and Dunvegan lines the following estimates were used to arrive at number of animals per carload:—

Cattle and calves.....	25 head per car
Hogs.....	30 head per car
Sheep.....	35 head per car
Horses.....	20 head per car

DAIRYING

Production of creamery butter in Alberta north of Edmonton overcame the shrinkage registered in 1928 and stood at 1,202,878 pounds, the highest figure since 1926, when it was 1,419,490 pounds. The factory selling value averaged four-fifths of a cent a pound less than in 1928, being 34.8 cents, but the total value was \$418,934.84, being slightly the greatest since 1926.

The Pouce Coupe creamery had such a small make that it had to bring in \$3,125.36 worth of butter to supply the home demand, its price therefore being above the general level.

All told, the production north of Edmonton, including the Pouce Coupe creamery in British Columbia, amounted to 1,212,353 pounds, worth \$422,857.49. Two creameries were closed, viz., Grande Prairie and Sangudo, while two new ones were opened, viz. Vilna and Barrhead. The tendency has been for a reduction in creamery production in the areas where grain raising has been safest.

POULTRY

Turkey shipments were less than in 1928. The Grande Prairie Co-operative Poultry Producers shipped two cars of dressed turkeys, totalling a net weight of 58,468 pounds. A produce company shipped part of a car. W. R. Roberts, Manager of the Grande Prairie Co-operative Live Stock Marketing Association Ltd., estimates the total turkey shipment from the district around 70,000 or 75,000 pounds.

The co-operative shippers received a local net price of 25 cents for specials, over 12 pounds, and 23 cents for Grade A over 12 pounds.

There has never been enough dressed poultry, other than turkeys, to make up a minimum car and there are practically no eggs shipped to outside points.

METEOROLOGICAL RECORDS AT BEAVERLODGE, 1929

Month	Temperature, degrees Fah.						Precipitation				Evaporation		Sunshine		Sleighting			
	Maximum		Minimum		Mean		Rain	Snow		Total precipitation		1929	Average 8 years	1929	Average 7 years	1929	Average 14 years	
	High-est	Low-est	High-est	Low-est	1929	Average 14 years	1929	Average 14 years	1929	Average 14 years	in.	in.	in.	in.	hours	hours	days	days
	°	°	°	°	°	°	in.	in.	in.	in.	in.	in.	in.	in.	hours	hours	days	days
January	43	9-77	-44	-4-87	2-45	7-89	26-0	14-82	2-6	1-45				72-1	81-7	31	31-0	
February	44	23-11	-31	1-32	12-22	13-72	6-0	7-46	0-6	0-79				96-5	112-6	28	28-1	
March	52	36-58	-15	17-58	27-08	22-03	5-0	12-41	0-5	1-27				172-9	146-97	18	26-57	
April	70	46-53	-3	23-53	35-03	36-60	11-0	4-55	1-17	0-72				201-5	210-87	2	9-14	
May	77	60-39	23	37-00	48-70	48-22	2-05	1-87	2-05	1-50				184-8	277-77	0	0-43	
June	81	68-43	30	44-1	56-27	55-33	2-17	1-62	2-17	1-90				247-5	263-87	0	0	
July	82	72-32	35	46-84	58-58	59-72	3-54		3-54	2-34				281-2	292-54	0	0	
August	87	71-29	36	45-45	58-37	57-27	1-20		1-20	1-74				216-6	239-34	0	0	
September	80	62-27	26	39-07	50-67	48-87	2-38	25-0	3-39	4-89				201-3	187-39	0	0	
October	73	56-90	22	32-88	44-89	38-79	0-70		4-38	0-70				201-0	151-16	0	1-43	
November	57	39-3	4	24-87	32-09	24-61	0-46	8-75	7-98	1-34				90-5	96-24	5	7-29	
December	54	17-81	-27	1-77	9-79	10-81	8-5	13-09	0-85	1-37				72-8	74-57	18	24-64	
Average, 1929		47-06		25-80	36-35	35-32												
Total, 1929							12-58	90-25	21-61	21-16				2,038-70		102		
Average yearly total								71-07	16-78	19-76				2,134-52		128-60		

PRECIPITATION AT REPRESENTATIVE POINTS IN THE PEACE RIVER DISTRICT, 1929

Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Beaverlodge.....	2.60	0.60	0.50	1.17	2.05	2.17	3.54	1.20	4.80	0.70	1.34	0.85	21.61
Elmworth.....	*1.82	*0.26	0.65	0.93	1.22	2.11	3.00	1.00	4.04	0.59	1.56	1.20	19.46
Baldonnel (Fort St. John Dist.)	0.70	0.30	0.50	0.95	2.35	2.57	2.04	1.37	1.87	0.16	0.20	1.10	14.11
Goodfare.....				†1.23	3.03	2.24	4.60	1.23	2.76	0.35	1.14	0.80	.....
Pouce Coupe.....	1.51	0.92	†0.44	0.65	2.34	1.93	1.50	1.83	1.96	0.14	0.74	0.93	14.89

*Observer absent—calculated from Beaverlodge figures based on the formula:—

$$\frac{\text{Elmworth—Jan. 1929}}{\text{Beaver—Mar. 1929}} = \frac{\text{Elm, Jan. 1928 + 1927}}{\text{BL, Jan. 1928 + 1927}}$$

Similarly with the figures for February substituting February for January in the formula.

†Observations commenced with April.

‡Precipitation missing—calculated from Beaverlodge figures based on the formula:—

$$\frac{\text{Pouce Coupe—Mar. 1929}}{\text{Beaverlodge—Mar. 1929}} = \frac{\text{Pouce Coupe—Feb. 1929 + April 1929}}{\text{Beaverlodge—Feb. 1929 + April 1929}}$$

The method used in the case of Elmworth could not be used in this case as the available records for Pouce Coupe commenced with 1928, and it was thought that one year would not give a sufficiently accurate basis for calculation.

¶Maximum thermometer broken for March and first seventeen days of April. The figure for April was calculated directly from the Beaverlodge figures. The figure for March was calculated according to the following formula:—

$$\frac{\text{Pouce Coupe—Mar. 1929}}{\text{Beaverlodge—Mar. 1929}} = \frac{\text{Pouce Coupe—Jan. 1929 + May 1929}}{\text{Beaverlodge—Jan. 1929 + May 1929}}$$

ACKNOWLEDGMENT

The staff was strengthened by the appointment on September 14, 1929, of E. C. Stacey, B.A., M.Sc., as assistant. Mr. Stacey had previously been employed on the Station for six years, excepting two winters during which he took post graduate work at the University of Alberta. During his period of employment he acquired a pretty complete grasp of the agronomic work and has latterly had charge of it under the superintendent's general supervision. He has contributed substantially to the preparation of the report.

Mr. P. Flint continued in charge of the garden work and is chiefly the author of the horticultural review, having also assisted with other sections.

Several graduate and undergraduate students in agriculture served efficiently.

FIELD HUSBANDRY

TOPOGRAPHY AS AFFECTING THE OCCURRENCE OF SUMMER FROST AND WINTER LOW TEMPERATURES

Keen interest continues to attach to the night-temperature readings taken systematically since July, 1926, on the eastern slope of a ridge with a fall of 134 feet in 214 rods. The data obtained down to the end of 1928 were pretty well synopsised in the Beaverlodge Sub-station's report for that year (see pages 12 to 18, inclusive).

The further data accumulated during 1929 go to reinforce the inferences already drawn, although petty depredations of the mischievous and the curious resulted in the loss and breakage of one instrument after another until only two were left, these being placed at the two extremes in altitude.

In August a series of unprecedented spreads led to a rechecking of the thermometers. Through this it was discovered that the thermometer at the lower elevation (on the edge of a slough) had been for some weeks reading several degrees too low. It was accordingly substituted and all records between the dates of June 16 and August 24, inclusive, were discarded. The periodic occurrence prior to June 16 of a normal frequency of readings in which there was no spread between Nos. 1 and 6 leads fairly confidently to the assumption that both instruments were probably registering correctly down to the former date. Between June 16 and August 24 there was only one spread as little as three degrees, whereas formerly, and again since then, from the date when observations were first commenced there have always been occasional periods of rainy or muggy weather when all the instruments on the line would read virtually alike. When these consistencies ceased to occur and unusually wide spreads prevailed suspicion was aroused.

In the 295 days of supposedly trustworthy readings during 1929 there have been 110 nights when the thermometer at the slough read ten or more degrees lower than the thermometer on the hill; forty when it read fifteen or more lower and twelve when it read twenty or more lower than its fellow. Expressed in percentages the figures would be, respectively, 37.3 per cent, 13.6 per cent and 4.1 per cent. The largest spread was 28 degrees on February 19, when the weather was just moderating after a three-day cold spell. As a rule at such times the temperature relents first on the hill top. The comparative readings on that occasion were -30° and -2° . This is the widest disparity encountered since the readings have been taken. January had a spread of 24 degrees, March, 22, and November, 20. As usual, somewhat the greatest spreads were met with in the coldest months but May exhibited a difference of 16 degrees on two occasions; June 14 degrees on each of two nights. A spread of 6 degrees was exhibited during the only week of August for which the readings are considered dependable and a spread of 13 degrees was twice exhibited during September. The significance of these spreads is great, whether from the standpoint of personal and animal comfort or from the standpoint of liability to frost. The slough basin is a very cold place in which to live and a very risky area to crop except to hay, pasture and green feed. Half a mile up the slope roses bloomed without autumn protection until October 17.

Harking back a little to obtain more comprehensive records we find that in the 1,192 days of supposedly trustworthy readings from July, 1926, to December, 1929, inclusive, there have been 460 nightly readings showing spreads of ten degrees or more; 158 of fifteen degrees or more, and 39 of twenty or more. Again, expressed in percentage form the relationships are 38.6 per cent; 13.3 per cent and 3.3 per cent, respectively. The fact that during over one-third

of the nights the temperature in the basin is ten or more degrees colder than the temperature on the hillside is eloquent.

THE NUMBER OF NIGHTS IN EACH OF 12 MONTHS, IN WHICH SPECIFIED SPREADS WERE OBSERVED BETWEEN THE FOOT AND APEX OF A RIDGE WITH A FALL OF 134 FEET IN 214 RODS—1929

Month	Ten or more degrees spread	Fifteen or more degrees spread	Twenty or more degrees spread
January.....	14	9	2
February.....	17	16	7
March.....	8	5	2
April.....	4	2	0
May.....	10	2	0
*June to 15th.....	5	0	0
*July rejected.....			
*August from 25th.....	0	0	0
September.....	15	0	0
October.....	17	2	0
November.....	11	1	1
December.....	9	3	0
Total days, 295.....	110	40	12

*A series of extraordinary spreads in August led to a re-checking of the instruments. Through this it was discovered that the thermometer at Post No. 1 had been reading several degrees too low. It was accordingly displaced and all records discarded between the dates of June 16 and August 24, inclusive. The periodic occurrence prior to June 16 of a normal number of readings in which there was no spread between Nos. 1 and 6 leads to the conclusion that both instruments were probably registering correctly down to that date. Between June 16 and August 24 inclusive there were no spreads of less than four or five degrees.

SUMMARY OF MOST EXTREME SPREADS PER MONTH FOR 12 MONTHS BETWEEN SELF-REGISTERING MINIMUM THERMOMETERS SITUATED RESPECTIVELY AT THE FOOT AND AT THE APEX OF A HOG'S BACK RIDGE WITH AN EASTERN SLOPE 214 RODS LONG AND WITH AN ASCENT OF 134 FEET—1929

Month	Date	Tem-	Tem-	Extreme
		perature	perature		spread
		No. 1.	No. 6	
		°F.	°F.	°F.
January.....	23	-44	-20	24
February.....	19	-30	-2	28
March.....	13	-3	19	22
April.....	10	-3	15	18
May.....	{ 20	31	47	16
	{ 21	23	39	16
*June to 15th.....	{ 8	33	47	14
	{ 15	24	38	14
*July rejected.....				
*August from 25th.....	29	49	55	6
September.....	{ 11	40	53	13
	{ 13	31	44	13
October.....	28	10	26	16
November.....	23	-2	18	20
December.....	{ 3	16	34	18
	{ 20	-26	-8	18

* A series of extraordinary spreads in August led to a re-checking of the instruments. Through this it was discovered that the thermometer at Post No. 1 had been reading several degrees too low. It was accordingly displaced and all records discarded between the dates of June 16 and August 24, inclusive. The periodic occurrence prior to June 16 of a normal number of readings in which there was no spread between Nos. 1 and 6 leads to the conclusion that both instruments were probably registering correctly down to that date. Between June 16 and August 24 inclusive there were no spreads of less than four or five degrees.

Reinforcement of the above comparisons is arrived at by comparing the extreme temperatures and likewise the average minima registered at the two levels. The lowest reading of one instrument does not always occur on the

same night as the lowest reading of the other, but averages of the two should certainly check up on errors due to wind or accident. In one of these comparisons it is observed that during 9 $\frac{3}{4}$ months of 1929 the slough thermometer has averaged 7.47 degrees lower than the instrument on the hill.

SOIL TEMPERATURES

In 1922 a Friez soil and water thermograph was installed on the Beaverlodge Substation with its bulb buried three inches beneath the surface of land which was then in summer-fallow and has been kept in that condition ever since. With the exception of one winter when it had to be sent away for repairs as the result of an attempt to adjust it for low readings, the thermograph has been kept in continual operation.

It was calibrated when installed and has been checked once or twice since. It always appeared to be registering correctly until April 24, 1930, when as a precaution it was again checked, the bulb being immersed in a pail of water containing an accurate thermometer. It was then found that the thermograph read five degrees too low, and adjustment was accordingly made for further readings.

Just when or how the error developed and whether it came about gradually or suddenly there is no means of determining, hence doubt is thrown upon the accuracy of the recent readings, particularly those of the past year or two.

Fortunately the error that was discovered shows the thermograph to have been registering too low rather than too high hence the discovery tends to strengthen rather than to weaken such deductions as have usually been drawn from the accumulating data. For instance, it has been observed that year by year until 1928—and more emphatically 1929—the summer soil temperatures have attained higher and higher readings, the surmise being that this was in some way due to the cumulative effect of cultivation, either local, immediately over the bulb, or general, throughout the district, or perhaps both. If the thermograph has latterly been reading five degrees too low it would mean that the observed trend toward higher summer soil temperatures has been greater than is indicated in the following tabular summary or at least that the increase noted in the earlier years has perhaps been substantially sustained down to date, allowing for an abnormally large percentage of high readings in 1927.

SOIL THERMOGRAPH DATA, 1929

Showing number of days in each month of 1929 that the soil temperature, as registered by a Friez thermograph with bulb three inches beneath the surface of summer-fallowed ground, rose at any time above the respective degrees specified.

Month	Days above 32 degrees Fah.	Days above 40 degrees Fah.	Days above 45 degrees Fah.	Days above 50 degrees Fah.	Days above 55 degrees Fah.	Days above 60 degrees Fah.	Days above 65 degrees Fah.	Days above 70 degrees Fah.	Days above 75 degrees Fah.
January.....	0	0	0	0	0	0	0	0	0
February.....	0	0	0	0	0	0	0	0	0
March.....	0	0	0	0	0	0	0	0	0
April.....	15	9	0	0	0	0	0	0	0
May.....	31	28	15	5	0	0	0	0	0
June.....	30	30	30	29	18	13	3	0	0
July.....	31	31	31	31	28	18	7	2	0
August.....	31	31	31	31	25	14	4	0	0
September.....	25	22	20	19	11	0	0	0	0
October.....	25	11	1	0	0	0	0	0	0
November.....	0	0	0	0	0	0	0	0	0
December.....	0	0	0	0	0	0	0	0	0
Total.....	188	162	128	115	82	45	14	2	0

SUMMARY OF SOIL THERMOGRAPH DATA, 1922-1929 INCLUSIVE

Table showing the number of days in each month that the soil temperature as registered by a Friez thermograph, with bulb three inches beneath the surface of cultivated ground, rose at any time in twenty-four hours above the respective degrees specified.

Calendar years	Days above 32 degrees Fah.	Days above 40 degrees Fah.	Days above 45 degrees Fah.	Days above 50 degrees Fah.	Days above 55 degrees Fah.	Days above 60 degrees Fah.	Days above 65 degrees Fah.	Days above 70 degrees Fah.	Days above 75 degrees Fah.
1922*	—	—	—	116	90	40	0	0	0
1923†	—	177	158	120	79	26	2	0	0
1924†	—	138	131	112	70	30	14	1	0
1925	—	166	140	116	86	65	38	11	0
1926	216	168	144	122	97	70	48	16	6
1927	185	161	140	120	95	69	53	30	15
1928	178	150	137	118	96	71	36	15	1
1929	188	162	128	115	82	45	14	2	0

*Installed May, 1922. †Instrument despatched for repairs towards end of summer. ‡From May 13-December 31.

Considering the 1929 data as recorded, it is not surprising, in view of the instrument error discovered, to find fewer days than usual in which the soil temperature registered above 70 degrees, although even at that there were more high readings than in the early years, during which the thermograph is believed to have been registering correctly.

On 188 days during 1929 the needle touched a point above freezing; on 162 days it rose above 40 degrees F.; on 115 days it was over 50; on 45 days above 60 and on 2 days it scored over 70° F.

July had the highest average monthly mean temperature of 54.89 degrees F. June and August were the only other two months with an average monthly mean above 50, May and September having 41.2 and 43.97 respectively.

These figures in themselves are of little interest to the average layman. However, when one considers the effect the soil temperature has on the soil bacteria, and therefore on the productiveness of the land, these records become significant.

It has been held that all plants except the legumes can absorb the essential element nitrogen only in the form of nitrate. The presence of nitrates in the soil depends to a very large extent on a certain group of bacteria engaged in ammonification and nitrification, a process consisting of breaking-down of the protein present in the soil and formation of ammonia, nitrites and nitrates.

These nitrifying bacteria cease to function below 41 degrees F., the optimum temperature for their activity being 99 degrees F.

The free-living nitrogen-fixing azotobacter is also adversely influenced by low soil temperatures.

There is yet another set of very important bacteria. These are engaged in humus formation. The greatest amount of crude fibre is broken down and converted into humus when the soil temperature is about 70 degrees F.

Reviewing these facts one comes to the conclusion that in the Peace River region temperature is a limiting factor in nitrification, nitrogen-fixation and humification.

The lowest temperature recorded during the year was 12 degrees F. on January 3. This is the lowest ever registered by the instrument when there was snow over the bulb and is probably attributable in part to mal-adjustment.

The lowest atmospheric temperature was -44 on January 28. At that time the soil thermograph read only 19-20 degrees F. An additional fourteen inches of snow in two falls, occurring on 13th and 19th, respectively, undoubtedly had much to do with preventing the soil temperature from following the atmospheric sharply downwards. There had, however, been considerable snow on the level on January 3, although it is possible the spot where the bulb is buried may not have been thickly blanketed at that time.

METHODS OF SEEDING MEADOW CROPS

An important project commenced in 1925 is directed towards finding the best way of applying and covering meadow-crop seed on Western farms; comparing nurse-crop with non-nurse-crop seeding; and six-inch with twelve-inch spacing of the nurse crop, the quantity of grain per acre in the latter case being exactly half that employed in the former.

Five successive seedings have been made and in 1926 the experiment was amplified by introducing into each method three different depths of covering.

The further results obtained in 1928 and 1929 bear out earlier indications, pointing to the economy of using nurse crops rather than seeding alone, in spite of the fact that in the year after seeding a very much heavier crop of hay can invariably be obtained from the non-nurse-crop plots—often two or three times as much. This advantage does not continue very noticeably into the succeeding season, however, and at the end of two or three years it is found that while the non-nurse-crop plots have produced substantially more meadow hay than the others this is insufficient to compensate for the two to four tons of oat hay obtained from the nurse crop in the initial season.

The 1925 seeding continued to give very satisfactory yields considering the season. From over a ton to a ton and a half of cured hay per acre was harvested from these plots in 1929, representing the fifth year of cropping for the nurse-crop plots and the fourth year of cropping for the others. No conspicuous differences were noted in the 1929 crop from the various plots of the 1926 seeding but the limiting effect of the nurse crop on succeeding yields was quite definite in the crop from the more recent seedings of 1927 and 1928. From the 1929 results it would seem that by the time the second hay crop has been harvested the depressive effect of the nurse crop has been lost.

METHODS-OF-SEEDING TEST, 1925 SEEDING

Presenting results in pounds of cured hay per acre of the 1926, 1927, 1928 and 1929 crops along with the 1925 yield of oats used as nurse crop, average duplicate plots

	Oat hay per acre in 1925	Grass hay per acre in 1926 (after- math not taken)	Grass hay per acre in 1927 (after- math not taken)	Grass hay per acre in 1928 (after- math not taken)	Grass hay per acre in 1929 (after- math not taken)	Total hay four years	Total crop five years
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Seeded with 2 bushels oats per acre, 6-inch spacing, meadow-mixture sown ahead of drill.....	5,400.0	1,505.0	7,311.0	3,572.0	2,213.5	14,601.5	19,701.5
Seeded with 1 bushel oats per acre, 12-inch spacing, meadow-mixture sown ahead of drill.....	4,133.0	2,874.0	7,678.0	3,639.0	2,520.5	16,711.5	20,844.5
Seeded with 2 bushels oats per acre, 6-inch spacing, meadow-mixture sown with grain in drill-box.....	3,273.0	1,528.0	6,897.0	3,898.0	3,038.0	15,361.0	18,639.0
Seeded without nurse crop, covered with drill disks....	.....	4,729.0	5,804.0	4,283.0	3,094.0	17,910.0	17,910.0

NOTES

1. Seeded in duplicate on June 15, 1925, on summer-fallowed land.
2. The South-range plot seeded with oats in 12-inch drills had, by mischance, double the intended quota of grass seed.
3. Grasshoppers consumed the grasses in 1925 but left a fairly regular stand of legumes, which made a rank growth. Sweet clover was knee-high September 8 in the non-nurse-crop plots. Both legumes made a good growth where seeded with oats in 12-inch drills, a weaker stand where seeded ahead of the oats in 6-inch drills and the poorest stand where seeded with oats in the drill box.
4. The nurse crop was bound September 8. The oats seeded in 12-inch drills yielded 81 per cent as much dry matter per acre as oats in 6-inch drills.

NOTES—*Concluded*

5. The plots where the grasses and legumes had been seeded with oats through the drill runs made such a weak stand in the spring of 1926 that they required considerable handweeding to preserve the stands.

6. In 1926 the plots were hand-weeded just before haying and cut July 8. A good aftermath grew on these plots but was not removed.

7. In 1927 these plots were, through pressure of work, left standing until August 1 and 3. The result was an exaggerated yield but poor quality of hay.

8. In 1928 the plots were cut on July 6, yielding a good crop considering the season and the duration of the meadow stand. The composition was alfalfa, rye grass and brome in about equal proportions.

9. In 1929 the plots were cut on July 4, averaging a little less than a ton and a half of cured hay per acre.

METHODS-OF-SEEDING TEST, 1926 SEEDING—NORTH RANGE ONLY

Presenting results in pounds of oat hay per acre in 1926, along with the 1927, 1928 and 1929 yields of meadow hay

	Cured oat hay per acre 1926 crop	Grass hay per acre in 1927 (aftermath not taken)	Grass hay per acre in 1928 (aftermath not taken)	Grass hay per acre in 1929 (aftermath not taken)	Total hay crop three years	Total crop four years
	lb.	lb.	lb.	lb.	lb.	lb.
Meadow mixture seeded with oats in drill box (oats in 6-inch drills)—						
Lever 6th notch.....	5,487-0	4,976-0	3,743-0	2,206-0		
Lever 4th notch.....	4,987-0	5,335-0	3,740-0	2,403-0		
Lever 2nd notch.....	5,454-0	5,618-0	3,749-0	2,189-0		
Average.....	5,309-3	5,326-3	3,744-0	2,266-0	11,336-3	16,645-0
Meadow mixture seeded ahead of drill (oats in 6-inch drills)—						
Lever 6th notch.....	6,871-0	5,884-0	3,395-0	1,923-0		
Lever 4th notch.....	7,573-0	6,175-0	3,161-0	2,584-0		
Lever 2nd notch.....	5,998-0	6,193-0	2,942-0	2,604-0		
Average.....	6,814-0	6,084-0	3,166-0	2,370-3	11,620-3	18,434-3
Meadow mixture seeded ahead of drill (oats in 12-inch drills)—						
Lever 6th notch.....	5,086-0	6,533-0	2,757-0	2,613-0		
Lever 4th notch.....	5,000-0	6,115-0	3,185-0	2,052-0		
Lever 2nd notch.....	5,433-0	5,947-0	3,510-0	2,080-0		
Average.....	5,173-0	6,198-3	3,150-7	2,248-3	11,597-3	16,770-3
Meadow mixture seeded alone, covered with drill disks.						
Lever 6th notch.....		5,660-0	3,400-0	2,325-0		
Lever 4th notch.....		7,856-0	2,988-0	2,091-0		
Lever 2nd notch.....		3,728-0	3,010-0	2,045-0		
Average.....		7,414-7	3,132-7	2,153-7	12,701-1	12,701-1

NOTES

1. The layout was amplified two hundred per cent over the 1925 seeding by including a trial of three different depths of setting the single-disk drill used to sow some of the seed and cover the rest. An extremely shallow depth was represented by the second notch of the drill lever, a medium depth by the fourth notch and about a three- or four-inch depth by the sixth notch. It must be borne in mind, however, that the grass and clover seed cast ahead of the drill and covered by the disks would be buried at varying depths according to chance, no matter how deeply the levers might be set.

2. Seeded June 21, 1926, on practically fallowed land. Timely rains ensuring prompt germination, growth of both meadow and nurse crop was good, but the latter was grass-green when flattened by September frost and snow.

3. On September 23 the oat nurse crop in the north-range series was reaped with a binder, whose table was set low yet missed some of the growth. Weather interrupting, the south range was not cut until late and its mown crop was snowed under, smothering the meadow plants in places, so that it was rejected from the yield comparisons.

4. It was again noted in connection with this seeding that the oat nurse crop seeded in 12-inch drills yielded (on the average of all depths) 75 per cent as much oat hay as the oats seeded in 6-inch drills with double the amount of seed per acre. The twelve-inch drills also afforded a much freer opportunity to both meadow seedlings and weeds.

NOTES—*Concluded*

5. In 1927 the plots were weeded as required and mown August 1, when over-mature. Hay yields were good but quality deteriorated and little aftermath grew.
6. Somewhat the largest yield of hay in 1927 was produced by seeding alone and the lowest by seeding through the grain runs.
7. In 1928 the test was cut July 6, averaging about a ton and a half of cured hay per acre.
8. In 1929 the test was cut July 4, averaging a little better than a ton of cured hay per acre.

CUTTING ALFALFA ONCE VERSUS TWICE PER ANNUM

In 1928 a block of Grimm alfalfa was sown on land which had been producing alfalfa pretty regularly since 1918, the last stand having been ploughed up in 1927 on account of some patches of winter-killing, this being attributed to the lack of aftermath during the trying winter of 1926-27. It was decided to reseed the whole area and conduct a demonstration upon the cumulative effect of cutting alfalfa once versus twice per annum.

Although the original seeding of alfalfa on this area was a failure from lack of effective inoculation, natural inoculation had gradually crept in, and long before 1928 the whole area was abundantly stocked with nodule bacteria. The present seeding was therefore well inoculated. Germination was prompt. Few of the old plants persisted into the new stand. The area was not clipped in the year of seeding but was hand-weeded to some extent.

Through a misunderstanding, the intended procedure was not followed precisely in 1929, the outline being confused with that of a previous project of a somewhat similar nature. The first cutting from the plots to be cut twice per annum should have been taken at the same date as the single cutting from the plots to be cut only once per annum. Instead, the first cutting was taken June 25, 1929, just as bloom was commencing, while the other area was mown on July 9, when the plants were in full bloom. On August 14 the aftermath was mown on the early-cut plots. The stand was then left to go into the winter with whatever growth it would make before freeze-up.

A former test on the effect of cutting alfalfa at different stages of maturity on the subsequent growth gave indications that at Beaverlodge it was more economical to take one hay crop per year than possibly to weaken the stand and induce winter-killing. The present test was outlined to obtain more specific information on this important point by taking the first cutting of the entire area when it will produce the greatest quantity of palatable hay and the second cutting of half the plots by the middle of August, which date is considered to be the latest at which it is permissible to crop alfalfa at Beaverlodge.

In 1929 the twice-cut plots yielded 1,891 pounds of cured hay per acre plus 1,269 pounds of aftermath. The single-cut plots produced 2,284 pounds of cured alfalfa hay per acre.

PHOSPHATE EXPERIMENTS

Triple phosphate supplied by the Trail smelter was applied experimentally in 1929 to wheat, oats, meadow crops and potatoes on the Beaverlodge Station.

FERTILIZERS WITH REWARD WHEAT ON BREAKING

The test with wheat was conducted in triplicate on an extremely variable podsolized type of soil in which the black loam ranged from two or three inches down to six or more in depth, but averaged only three or four inches. Beneath this was mostly a whitish-gray or light-brown sub-surface with a tight-clay soil underneath it. This land had been broken early in June, 1928, and was then well worked. After being lightly spring-toothed on April 23 it was seeded April 27 in a seed-bed that was excellent except for being slightly dried out in the surface layer. The crop emerged May 15, but its subsequent development was repeatedly threatened by dry weather, since there had been but a scant carry-over of subsoil moisture.

Careful notes were taken of the behaviour of the respective plots after they emerged but no consistent differences could be found in height and colour as between treated and untreated plots. Nor were there any decided differences in date of heading, ripening or appearance at harvest. It was fancied that there might have been a slightly greater uniformity of heading from certain of the treated plots as compared with the checks, but these supposed differences did not carry throughout all the replications. The plots were all harvested with the binder on August 24, border drills being excluded from the areas taken for computation, leaving the plots as harvested 100/902 aere.

FERTILIZER TEST WITH OATS ON SPRING PLOUGHING

The test with oats was conducted on a piece of spring ploughing which had grown oats in 1928 after variety plots of cereals in 1927.

Neither on May 30 nor on June 10 was any difference discerned in the plots, but on July 3 three plots appeared rather darker in colour than the rest, these being two plots of superphosphate plus nitrate, and one of the plots seeded with ammonium phosphate mixed with nitrate. The differences, however, were scarcely maintained until harvest, for moisture appeared, with the oats as with the wheat, to have been distinctly the limiting factor in production.

Due probably to accidental factors the check plots averaged slightly heavier yields than any of the fertilized plots but the differences were in no cases large enough to be positively significant.

FERTILIZERS ON MIXED GRASS MEADOW

On April 29, 1929, fertilizers were drilled on plots of mixed brome and timothy meadow in its third year of cropping. The soil was somewhat variable, having originally ranged from three to five inches of black-brown surface loam, and had been cropped pretty regularly since it was broken in 1911 or 1912. The test was conducted in triplicate according to the following plan:—

Check.

Nitrate of soda at 155 pounds.

Nitrate at 60 pounds plus superphosphate at 110 pounds.

Ammonium phosphate at 110 pounds.

Superphosphate at 60 pounds.

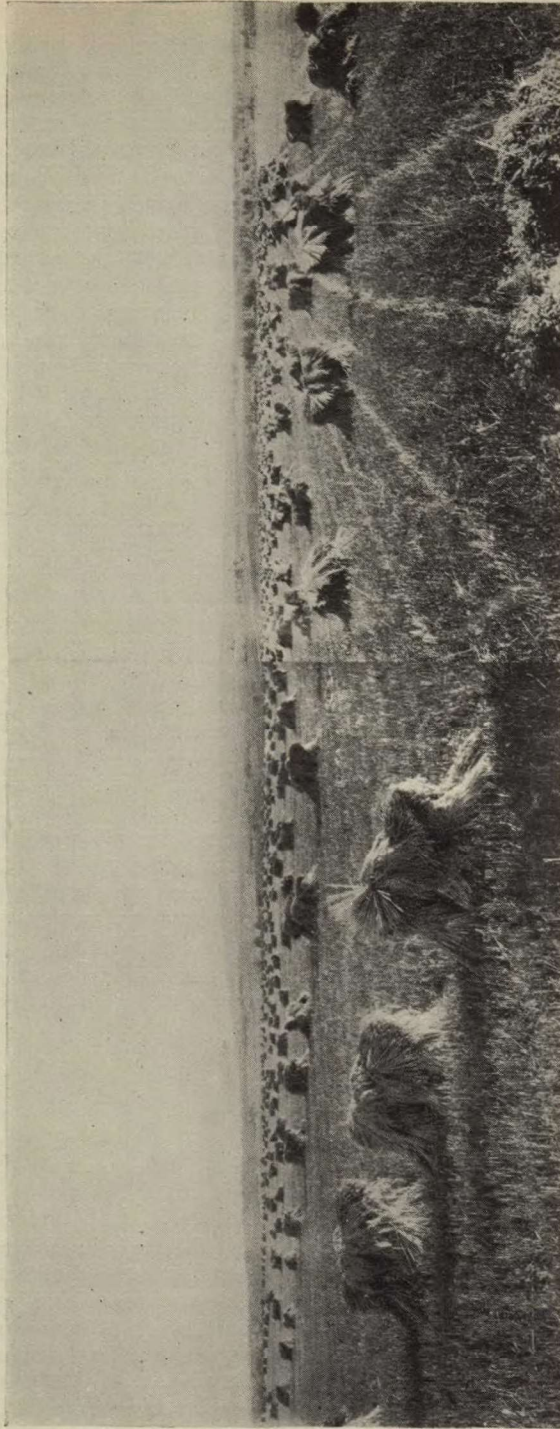
Superphosphate at 110 pounds.

Superphosphate at 155 pounds.

On May 19 the nitrate-fertilized plots showed a noticeable increase in growth, while three days later the ammonium-phosphate plots evinced some response. Observations were taken on May 20, 30, June 10, 25 and July 4 and 11, and it was noted that the plots treated with nitrate of soda at 155 pounds exhibited the greatest growth, but those given superphosphate at 110 pounds with nitrate at 60 pounds soon caught up to them. As the season progressed it became difficult to notice any marked differences among the plots, dry weather restricting the growth of all. However, the nitrate of soda at 155 pounds, the superphosphate-plus-nitrate, and the ammonium phosphate in set 3 seemed to be the best in the whole experiment. It was noted that the best plots were in a hollow and the poorest ones on a knoll.

PHOSPHATE IN POTATO DRILLS

A small-scale test was conducted by distributing superphosphate at 200 pounds per acre in the furrows opened to receive potato sets. Directly on the fertilizer were planted five varieties, viz: Early Rose, Irish Cobbler, Mitchell's Excelsior, Bliss Triumph and Gold Coin. The potatoes were planted May 11 and dug October 1 and 2.



Field of Banner oats on homestead of W. D. Albright, Beaverlodge, Alberta. Estimated at 90 bushels per acre, although cut on the green side. (Photo by W. D. Albright)

The experiment was run in duplicate on land that had been sown to a broadcast stand of alfalfa in 1923 and was broken in 1928. The plough and spring-tooth cultivator appeared to be only partly effectual in ridding the land of persistent alfalfa plants and handpulling was resorted to after the potato crop was well advanced. Whether this had any appreciable influence on the results is not known. It was observed that in every instance the fertilized rows were more forward, grew ranker tops at an early stage of growth and bloomed earlier than the unfertilized. In the case of precocious varieties this may have been to their disadvantage, for the June precipitation proved inadequate to make up for the extremely arid subsoil and the most advanced plots received a set-back from which they did not fully recover. The later varieties did not seem to be unduly affected by moisture conditions. At harvest the early kinds showed but slight increase in yield from the fertilized plots as compared with the unfertilized. In fact one of them yielded actually less. The later-maturing Gold Coin, however, gave a very substantial increase of 65 bushels 15 pounds per acre, from the fertilized row.

Representative samples of the crop were sent to the Dominion Chemist, Central Experimental Farm, Ottawa, who seemed to find no consistent differences in the dry-matter content of the crop from fertilized and unfertilized areas.

CHEMICAL WEED DESTROYERS

A scattering infestation of couch grass having been discovered on an area to which it was believed to have been introduced as an impurity in western rye grass seed, it was decided to try two of the chemical weed destroyers much in the public attention. These were a proprietary preparation called Atlacide, manufactured by the Chipman Chemicals Ltd., 200 Huron and Erie Building, Winnipeg, Man., and sodium chlorate, supplied at the suggestion of H. Groh, Division of Botany, Central Experimental Farm, Ottawa, by John Hunter, 5850 Buffalo Ave., Niagara Falls, N.Y.

Atlacide was applied in the form of dust with a duster can as per directions and sodium chlorate as a spray.

While the observations in this test are too incomplete and irregular to inspire much confidence it seems reasonable to conclude that chemical weed destroyers of this class are far too expensive for general use, although they may have a place on railroad rights of way and for the extermination of small patches where neither cultivation nor the tar-paper method is feasible.

Tar paper was applied in 1927 to a small patch of twitch grass found in an alfalfa meadow. Except where gaps in the paper occurred from mechanical cause it proved effectual in killing the couch grass.

SOIL FERTILITY

NITRATE APPLICATIONS TO OLD MEADOW

In 1918 a flat-bottomed draw, so situated as to be subject to wash, was seeded to a mixture of western rye grass and alfalfa, the latter without artificial inoculation. An excellent catch of the mixture was obtained. The rye grass was cut for seed during the next two years, producing excellent crops. The alfalfa, while evenly distributed, was for the first two cropping seasons short and weak in growth, attaining not more than half the height of the grass. A somewhat trying winter ensued and considerable of the alfalfa disappeared. Patches, however, persisted and in the dry, early summer of 1921 these were observed to be dark-green and vigorous, completely over-topping the grass, which by this third cropping season had declined to a low productiveness.

The digging of a two-and-a-half-foot underdrain trench across this area revealed a tight chocolate-clay subsoil with the alfalfa tap roots all penetrating to that depth and being from an eighth to three-eighths of an inch thick at the bottom of the ditch. One was traced to a depth of four and a half feet, with probably a foot or more of the fine end broken off.

Every alfalfa plant persisting was plentifully studded with nodules throughout the upper six and a half or seven inches of its root system. Presumably, natural inoculation had taken place and those plants on which it had occurred had the vigour to endure when the other plants succumbed.

The stand has been left undisturbed for eleven years and most of the alfalfa plants persisting in 1921 are still to be seen, never failing to produce two or three times the quantity of herbage grown on the plots where grass alone exists. Not only do the alfalfa plants far surpass the grass in hay production from the usual cutting but they also throw a strong aftermath, which sometimes is taken and sometimes left. Inferentially, the alfalfa plants draw moisture from the subsoil and nitrogen from the air while the grass is restricted both as to moisture and soluble nitrogen.

From time to time nitrate of soda has been applied in narrow strips across this area at right angles to the previous application so as to avoid possible complications by residual effect. Except in one or two extremely dry seasons the grass has always shown a prompt increase in growth and a darkening of colour, whereas no benefit in either respect has ever been evident in the alfalfa.

On May 7, 1929, the nitrate dressing was repeated on two strips, with the usual result at first, although drouth diminished the spread towards haying. One hundred and sixty pounds of nitrate of soda per acre was applied and at haying a five-foot mower swath was cut from each plot 72.6 feet long, amounting to 1/120th acre per plot. Following is the yield result. It will be seen that the fertilized areas yielded 28.3 per cent more hay than the unfertilized. Had the meadow consisted of grass alone the percentage increase would have been considerably greater for the sprinkling of alfalfa was fairly evenly distributed throughout the plots and tended to even up the production to a considerable extent.

SODIUM NITRATE ON MEADOW, BEAVERLODGE, 1929

Pounds cured hay per acre

	Set 1	Set 2	Average duplicate plots
Nitrate of soda at 160 pounds.....	1,524	1,513	1,518.5
Check.....	1,092	1,275	1,183.5

NITRATE TEST WITH RAPE

Dwarf Essex rape was sown on May 30 and 31 in rows and also broadcast on a very exposed knoll which had been seeded to alfalfa but which was broken in 1927. This area was cropped to hemp, fibre flax and Liberty oats on different portions in 1928. Germination of the rape seed was satisfactory but subsequent growth indicated that the preceding cropping had produced residual effects. By fall the crop was short and stunted. The effects of the previous cropping were probably accentuated by the inadequacy of precipitation during the growing season. Especially is this surmized since the former crops, and more particularly the hemp, are rather exacting in their moisture requirements.

Part of the stand was treated with nitrate of soda broadcast at 160 pounds per acre on July 4. On this area the rape crop was decidedly poor. Quite

early the plants assumed a reddish cast and wrinkled appearance. It is thought that the addition of nitrate of soda to the former alfalfa sod produced an excessive supply of nitrate in the soil out of proportion to the moisture available, resulting in a burning of the roots such as may ordinarily occur from excessive fertilizing.

Growth being generally so poor and no marked differences being apparent, the yields were not taken.

CEREALS

SCOPE AND TECHNIQUE

The cereal work was conducted according to the methods adopted in 1927 and amplified somewhat in 1928.

A few fortieth-acre drilled plots are sown to secure data for certain long-term averages and to complete series of cultural tests but with the exception of these the cereal work is conducted according to the more delicate and elaborate rod-row method.

The employment of seven-row plots with two buffer rows on either side, the rejection of the ends of the test rows, the use of isolated seed plots and the octuplicate seeding of each variety for test purposes constitute a few of the essential features of the cereal work at Beaverlodge.

In addition to variety testing the cereal work includes:—

A rate-of-seeding test with spring grains conducted with drilled plots.

Dates of planting of both spring and winter grain.

A stage-of-harvest test with Reward wheat.

A stripe-rust nursery.

A farmers' seed drill survey in co-operation with A. R. Judson, District Agriculturist, Grande Prairie, and Jas. Travis, Assistant Agriculturist, Pouce Coupe, B.C.

A dozen co-operative tests with cereals.

The collection of samples of wheat grown in field crops. These were sent to Dr. F. J. Birchard, Chemist in Charge of the Grain Research Laboratory, Board of Grain Commissioners, for protein analysis.

SEASON AND PREPARATION

The cereal plots were sown on summer-fallow after cereal plots in 1927. Prior to seeding, the land was lightly spring-toothed and harrowed. Seeding commenced on April 20 and the variety-test peas and wheat were sown on April 23 and 24 respectively. Germination was prompt but the dearth of subsoil moisture left the crop in a very precarious position. Timely rains saved the situation and a very good average crop was harvested from the plots. Ripening was slow on account of cool weather and occasional showers. Harvesting commenced on August 17 and there was still some crop standing when the rain and snowstorm of September 21-24 caught it. Fall wheat and rye over-wintered with but slight loss.

GRADING AND PROTEIN CONTENT OF PEACE RIVER WHEAT, 1929

Early in the autumn of 1929 twenty-two samples of wheat taken from bin and stook were collected by the Beaverlodge Station, some of them through the co-operation of Jas. Travis, British Columbia Assistant Agriculturist in the Peace River Block, and R. E. English, Alberta Provincial Government Weed Inspector north of Peace River, and were forwarded to Dr. F. J. Birchard,

Chemist in charge of the Grain Research Laboratory, Board of Grain Commissioners, Winnipeg, for grading and protein determination. The samples were collected at the instance of L. H. Newman, Dominion Cerealist, who has been appointed a member of the New Grain Standards Board. The intention was to obtain good, medium, and poor lots of at least Garnet and Marquis. There were twelve samples of Garnet, eight of Marquis, one of Reward and one of Red Bobs. All the Garnet graded No. 2 Northern and its average protein content was 12.77 per cent. Of the Marquis two lots graded No. 1 Northern, one No. 2, four lots No. 4 and one No. 5. The average protein content of six Marquis samples was 12.35 per cent, two of the eight having been wet and consequently not analyzed. The single sample of Reward graded No. 1 Northern and carried 14.0 per cent protein. The solitary sample of Red Bobs graded No. 1 Hard, but had only 10.1 per cent protein.

An expression of surprise that Reward with a protein content of 14.0 per cent should grade No. 1 Northern, while Red Bobs with a protein content nearly four per cent lower should grade No. 1 Hard, led Dr. Birchard to retest the Red Bobs sample, with the same result. In comment he remarked:—

"It is our experience that Reward wheat is a high-protein variety, and it is not surprising to me to know that this particular sample had a protein content four per cent higher than Red Bobs. As protein content is not a factor in grading this would naturally not affect the grade."

Examination of the results reveals wide variation in the protein content and scant accordance of grade therewith. The two highest protein tests, both 15.3 per cent, were yielded by a No. 4 Marquis from Berwyn, and a No. 2 Garnet from Beaverlodge. The two samples of No. 1 Marquis tested 10.8 per cent and 13.1 per cent respectively. Garnet exhibited not only one of the two highest protein contents, 15.3 per cent, but also the lowest one of the twenty lots tested, viz. 9.7 per cent. Both, it will be remembered, were allowed the same official grade, yet the one had less than two-thirds as much protein as the other.

While protein content is by no means the only factor in the milling value of wheat, such disharmonies as these cited would raise anew the question whether it ought not to be considered as one factor in grading.

GRADING OF THE EXPERIMENTAL WHEATS

The prolonged period of ripening was responsible for a number of immature kernels in many of the samples and a few varieties received a lower grade from this cause. In fact this appears to have caused some confusion regarding the grading inasmuch as varying degrees of importance attached to this factor might have led to the difference of opinion.

Renfrew was graded No. 1 and Reward No. 2 at Edmonton yet it would appear that this grading should be reversed.

Though Red Fife was graded No. 2 and Ruby No. 1, neither sample appeared equal to the Reward, which was graded No. 2. In these opinions concerning the grading assigned to Renfrew, Red Fife, Ruby and Reward the Dominion Cerealist concurs with the Station staff.

It is noteworthy that the same official who graded the plot harvest of Reward as No. 2 had earlier in the winter graded a machine-threshed bin sample of the same variety grown on the same farm and certainly on no better land, as No. 1 Northern, pronouncing it almost good enough for No. 1 Hard.

FARMERS' SEED DRILL SURVEY

Co-operating with A. R. Judson, District Agriculturist, Grande Prairie, and Jas. Travis, Assistant Agriculturist, Pouce Coupe, the Station seeded a number of samples of grain taken from the seed drills of farmers in the Grande

Prairie and Pouce Coupe districts. Thirty-seven samples of wheat were collected and of these when grown on the Station, eighteen proved to be Garnet, six belonged to the Bobs group, four were Ruby and nine Marquis. Three samples of Ruby were fairly good but one was decidedly off-type, showing at least 5 per cent bearded heads. Two of the Bobs group were good but four were impure. Three Marquis samples were directly descended from registered seed and along with one other sample were quite uniform, but the other five were off-type or impure. Garnet samples were uniformly good. This would indicate quite clearly that the further seed grain supplies are removed from the attention of those directly interested in producing seed grain the less valuable they become. The large percentage of Garnet samples indicates also that there is a recognized need of early varieties in this district and that those who grew Huron and other less desirable varieties up to the last year or two have discarded these in favour of the newer varieties. Mention should be made here that there were no samples of Reward collected since no farmers had more than a few acres sown and hence it could not be classed as a commercial variety.

MILLING AND BAKING TESTS ON WHEAT SAMPLES FROM BEAVERLODGE EXPERIMENTAL STATION, CROP 1929

A large number of wheat samples from the varietal test plots were studied for milling and baking qualities in the laboratory of the Dominion Cerealists at Ottawa. Among these were the varieties Early Triumph, Garnet, Marquis, Red Bobs No. 222, Ruby and Reward. Concerning them the Cereal Division reports:—

“All of the six gave a very good account of themselves and were superior to samples of the same varieties grown in 1928. In fact, these samples were above the average for most varietal test samples received from other Dominion Experimental Farms and Stations in the Prairie Provinces, and above the Winnipeg standards for the crop year. These six samples were more than sixty-five pounds in weight per measured bushel, contained crude protein contents ranging from 13.4 to 17.1 per cent, and produced test loaves which demonstrated very fine bread-making qualities. In a study of these varieties over a period of six years, Reward and Marquis led in those qualities which characterize strong wheats for milling into flours for bread-making purposes.”

A CONTROL TEST OF REWARD WHEAT

During the winter of 1928-29 the Cereal Division of the Central Experimental Farm, Ottawa, obtained check samples of Reward wheat from different Experimental Farms and Stations taking part in the Reward wheat distribution of 1929. The samples were sown in a series of check plots and examined during the growing season for purity and smut content. Thirteen plots were thus grown, five of them representing various lots of Beaverlodge seed while another represented the crop of Herman Trelle. The Beaverlodge samples and Mr. Trelle's sample showed up particularly well in respect to purity, every one of the six rating over 99 per cent true Reward type, while one sample of Beaverlodge seed, representing one season's selection, rated 99.81 per cent pure and Mr. Trelle's was 99.89 per cent pure. Of the remaining seven lots only two proved more than 99 per cent true to type while one fell down to 95 per cent.

In the matter of loose smut the position of the Peace River samples was still more enviable. Every one of the six showed a clean slate in the control test. The only other control sample that showed a zero count was from Morden. From one Manitoba source (not an experimental station) the percentage of loose smut ran as high as 4.64. The second-worst infestation was 2.98 per cent while in the remaining four cases the percentages ran half of one per cent or less.

As a matter of fact the Beaverlodge Reward distributed in 1929 was not absolutely free of loose smut for a systematic roguing of 25 acres discovered

four heads. This represents such a trifling percentage that there would be slight chance of the control samples containing any infected heads. From the standpoint of Peace River the outcome of the Cereal Division's control test is highly gratifying.

There is some reason to hope that loose smut may not perpetuate to any great extent in our climate, though the point is not proven as yet.

COMPARISON OF YIELDS OF ROD-ROWS AND DRILLED PLOTS

Until 1928 it was found that the performance of varieties when tested in hand-sown rod-row plots or in machine-sown drilled plots was essentially the same. However in 1928 the disparity amounted to 23.57 per cent, the smaller plots tested in octuplicate yielding more than the unreplicated drilled plots. In 1929 the difference was 20.47 per cent. It is possible that the lack of replication of the drilled plots may, in part, account for this. The packing by trampling of the rod-rows at seeding time may also contribute to their earliness and yield. It is noteworthy, however, that the greatest disparity is found in the less important crops, peas and flax. On the basis of the wheat, oats and barley crops the spread is only 10 per cent.

SOME LONG-TERM-AVERAGE YIELDS

To supplement the tables of comparative yields of the cereal varieties under test, long-term-average yields of the more important varieties are carried forward from year to year. Since the variety testing is conducted by means of the rod-row system a few plots are sown each year by means of an ordinary drill and harvested by practices similar to those in commercial work so that the record of the drill plots need not be interrupted. Border drills have been excluded from these plots since 1922.

Over a period of fifteen years Marquis wheat has averaged 36 bushels 34 pounds. For eight years Reward has average 32 bushels 41 pounds compared with 35 bushels 18 pounds from Marquis.

Banner has averaged over eleven years 89 bushels 30 pounds, outyielding Victory by five bushels and maturing 2.3 days earlier over ten years.

The ten-year average of Hannchen barley has been 50 bushels 39 pounds; O.A.C. 21, 43 bushels 11 pounds, and Eureka 44 bushels 11 pounds. In the same period Hannchen ripened in 115.7 days, O.A.C. 21 in 108.8 days and Eureka in 110.3 days.

Arthur peas have yielded 25 bushels 33 pounds over the fifteen-year period. The nine-year average for this variety is 32 bushels 15 pounds, only 21 pounds less than for Chancellor. In eight years Chancellor has matured nearly a week earlier than Arthur.

The twelve-year average of Premost flax is 12 bushels 51 pounds.

VARIETY TESTS

The variety tests of cereals included forty-three varieties, stocks or strains of spring wheat, twenty-one winter wheats, twenty-nine oats, twenty-two barleys, seven peas, three flaxes, and three kinds of spring rye.

WHEAT.—The prolonged period of filling and ripening permitted both early and late varieties to produce according to the start they had obtained earlier in the season. The yields at the best are not more than average due to the growth being checked several times in the early stages. The cool harvest weather was responsible for a noticeable number of immature kernels, especially in the later varieties. Marquis yielded 37 bushels per acre, Garnet 38 bushels

17 pounds and Early Triumph 39 bushels 9 pounds. Reward wheat, ripening six days earlier than Marquis and a day later than Garnet, yielded 33 bushels 23 pounds.

OATS.—Victory headed the list at 88 bushels per acre, Banner yielded 76 bushels 29 pounds and Legacy 68 bushels 15 pounds. Legacy had outyielded Victory in 1928. After being allowed the customary 30 per cent for hull Liberty yielded only 58 bushels per acre. After careful consideration it would seem that the early varieties must have been harvested before they were properly filled. Liberty and Legacy were cut following two or three fine days when they were judged to be ripe. Following this the weather was not so favourable for several days and the Banner and Victory were not harvested until a week or ten days later than the early varieties. This should not explain the very high yield of Victory over Banner this year for both these varieties were harvested on the same day.

BARLEY.—Ripening was quite uneven and the results rather irregular. O.A.C. 21 matured in 111 days and yielded 42 bushels 36 pounds per acre while Bearer, the latest-maturing variety and heaviest yielder in 1929, ripened in 128 days yielding 54 bushels 5 pounds. Hannehen yielded 50 bushels 23 pounds. No extensive shattering occurred.

WINTER WHEAT AND RYE.—The twenty-one varieties of winter wheat wintered with little killing on a rather exposed clay knoll which had previously been sown to Sweet clover. Yields varied from 33 to 40 bushels. No varieties were outstanding. Winter rye yielded 55 bushels per acre.

A Glume Blotch caused by *Septoria nordorum* was found on several varieties, especially Turkey Red, and identified by the Dominion Laboratory of Plant Pathology at Edmonton. Apparently, outside of discolouring the glumes and awns this disease does not as a rule cause much trouble. The same Laboratory reported that the leaves and culms of specimens of Nebraska Selections of Crimean wheat were very heavily attacked by the organism *Erysiphe graminis* causing the disease powdery mildew. The root systems of these specimens were badly riddled by root-rotting organisms so that the bases of the culms were blackened and the secondary root systems practically dead. No doubt this and the mildew explain the poor growth of some of these selections and certain varieties under test as well. Leaf rust occurred on the winter rye but did no appreciable damage.

PEAS.—The suitability of the Chancellor variety was again demonstrated by its ripening two days earlier than the six other varieties under test, besides being the heaviest yielder.

ONE-SET SERIES.—Further reduction was made in the list of grain varieties under test by the removal of twenty-two varieties of lesser importance to the field museum where their behaviour may be demonstrated to interested visitors without entailing the elaborate care which must be given varieties under replicated test.

The following comprise the 1929 withdrawals from the replicated plots:—

Wheat.. . . .	Duchess.. . . .	Not valuable.
	Master.. . . .	" "
	Chelsea.. . . .	" "
	Crown	" "
	Major.. . . .	" "
	Vermillion.. . . .	Poor milling and baking qualities.
	Aurore.. . . .	Not valuable
	Axminster.. . . .	Poor milling and baking qualities.
	Producer.. . . .	Shatters. Not superior to Garnet.
	Orchard Strain.. . . .	Too late.
	Red Bobs.. . . .	Superseded by selections.
	Quality (Whitley).. . . .	Not superior to other strains of Quality.

Oats	Alaska	Low yield.
	Daubeney	" "
	O.A.C. 3	" "
	Kanota	Colour objectionable; poor yielder.
	Longfellow	Late, coarse.
Barley	910 H.	Too early, poor yielder.
	Feeder	Poor yielder.
	Fenil	" "
	Himalayan	Not valuable.
	Michigan Black	Colour undesirable.

WHEAT—VARIETY TEST

(Rod-rows 1928 and 1929, drilled plots previously)

Variety	Days to mature			Yield of grain per acre			
	1929	Average 8 years 1922-29	Average 10 years 1920-29	1929	Average 8 years 1922-29	Average 12 years 1918-29	Average 15 years 1915-29
				bush. lb.	bush. lb.	bush. lb.	bush. lb.
Early Triumph	132.9	118.4		39 9	39 16		
Garnet Ott. 652	131.0	116.1		38 17	35 34		
Marquis Ott. 15	138.1	121.9	122.7	37 0	36 48	39 21	37 22
Revard Ott. 928	132.3	116.0		33 23	34 22		
Ruby Ott. 623	132.3	115.8	115.3	30 45	31 8	31 57	
Average five varieties				35 42.8			

OATS—VARIETY TEST

(Rod-rows 1928 and 1929, Drilled Plots Previously)

Variety	Days to mature				Yield of grain per acre					
	1929	Average 8 years 1922-29	Average 10 years 1920-29	Average 12 years 1918-29	Grain 1929	Average 4 years 1926-29	Average 11 years 1910-29	Average 12 years 1918-29	Average 13 years 1917-29	Average 14 years 1916-29
					bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.	bush. lb.
Abundance	117.6	111.9	113.4	116.7	72 4	97 21	80 21	83 7	82 0	
Banner, Ott. 40	120.1	113.4	115.2		76 29	116 5	91 10			
Logney, Ott. 678	110.9	103.5			68 15	103 25				
Liberty, Ott. 480	113.3	110.0	111.8	115.4	40 26	71 24	54 33	57 0		
Victory	120.1	115.6	117.5	121.2	88 0	100 13	89 18	90 17	89 26	90 14
Average five varieties					69 8					
Average four hull-retaining varieties					76 12					

BARLEY—VARIETY TEST

(Rod-rows 1928 and 1929, Drilled Plots Previously)

Variety	Days to mature				Yield of grain per acre			
	1929	Average 4 years 1926-29	Average 8 years 1922-29	Average 10 years 1920-29	1929	Average 4 years 1926-29	Average 8 years 1922-29	Average 10 years 1920-29
					bush. lb.	bush. lb.	bush. lb.	bush. lb.
Bearer, Ott. 475	128.1	115.2	115.5		54 5	68 43	52 10	
Charlottetown No. 80	126.3	113.3	113.5		45 1	65 3		
Eureka (hullless)	111.0	106.6	108.3	108.6	49 2	56 16	42 33	44 8
Gold	121.3	113.2			44 46	70 3		
Hannchen	123.9	112.9	114.1	114.0	50 23	67 43	50 13	51 41
O.A.C. No. 21	111.3	104.0	107.1	107.6	42 36	56 32	41 34	45 34
Average six varieties					47 34.8			
Average five varieties, excluding hullless					47 22.2			

Yield of O.A.C. 21 in 1928 not taken but reported as ratio of the 1926-27 yields of the other varieties to the O.A.C. 21 in the same period in proportion to the yields of these varieties in 1928.

PEAS—VARIETY TEST
(Rod-rows 1928 and 1929, Drilled Plots Previously)

Variety	Days to mature			Yield grain per acre				
	1929	Average 6 years 1923-29 (excluding 1924)	Average 8 years 1921-29 (excluding 1924)	Average 10 years 1910-29 (excluding 1924)	1929	Average 7 years 1923-29	Average 9 years 1921-29	Average 15 years 1915-29
					bush. lb.	bush. lb.	bush. lb.	bush. lb.
Arthur, Ott. 18.....	127.8	124.6	125.2	126.6	48 7	37 58	35 3	27 14
Chancellor, Ott. 26.....	123.5	118.2	119.0		53 0	37 4	35 9	
Mackay, Ott. 25.....	128.9	126.5			49 44	39 40		
Average three varieties.....					50 17			

FLAX

(Rod-rows, 1928 and 1929, drilled plots previously)

	Days to mature			Yield of grain per acre		
	1929	Average 5 years 1925-29	Average 7 years 1923-29	1929	Average 5 years 1925-29	Average 12 years 1918-29
				bush. lb.	bush. lb.	bush. lb.
Premost.....	121.0	114.4	119.1	19 48	17 3	13 55

WINTER GRAIN—VARIETY TEST

(Rod-rows, 1928 and 1929, drilled plots previously)

Variety	Days to mature		Yield of grain per acre	
	1929	Average 12 years 1918-29	1929	Average 12 years 1918-29
			bush. lb.	bush. lb.
Winter wheat—Turkey Red.....	365.6	371.5	34 22	28 8
*Winter rye—2nd date.....	373.1	370.7	55 0	42 6

*Winter rye was grown only in the date of planting test since 1925-26 and for above table the yields of the second sowing were chosen.

RATES OF SEEDING

The fifth successive annual seeding of this experiment has demonstrated once again that rates of seeding are not, as a rule, extremely important in affecting crop yields. Instead of showing consistent differences in dates of maturity, length of straw and yield, the results obtained in 1929 indicate that the crops under test suffered from lack of sufficient moisture according to the stand and development of the crop at periods when the moisture supply was low compared with the needs of the crop.

DATES OF PLANTING SPRING GRAINS

Seeding of Marquis and Garnet wheat; O.A.C. No. 3, Banner and Liberty oats, Eureka barley and Mackay and Chancellor peas commenced April 20 and continued at weekly intervals for eight successive weeks. The first seeding of Premost flax was on May 4. In few instances were results obtained that

could be taken as indicating anything very definite, except that there was a well-marked tendency for the later seedings to produce the taller and ranker straw.

Five seedings of Marquis wheat matured to produce from thirty-seven to forty-two bushels of grain, which graded 2 or 3, all with immature or frosty kernels. With the exception of the fifth date, which graded No. 3, seven dates of Garnet graded 2 with yields ranging from forty-three to forty-nine bushels.



Date-of-planting test with Garnet wheat, showing the eighth date on the left and the first date on the right. Eighth date, planted June 8, was five inches taller than the first date planted on April 20. (Photo by W. D. Albright)

The last two dates of O.A.C. No. 3 oats definitely outyielded the earlier seedings by seven bushels although they graded 2 C.W., while the five dates secured the 1 C.W. grade. The highest yield obtained was 88 bushels 3.5 pounds for the seventh date. Seven sowings of Banner yielded from one hundred and sixteen to one hundred and thirty-nine bushels, with the first and third grading 1 C.W. and the remainder 2 C.W. Likewise seven dates of Liberty ripened to yield from sixty-six to eighty-three bushels. It is noteworthy that the fifth date of each variety of oats produced the heaviest yield, save in the very early O.A.C. No. 3, where the last two sowings yielded best of all.

The earliest-seeded plots of Chancellor and Mackay peas yielded the most heavily, with the second sowings next. Six dates of the Chancellor variety ripened and five of the Mackay. Three dates of Premost flax matured to produce seed grading 1 N.W. The crop from the fourth and fifth dates contained 12 and 14 per cent, respectively, damaged seed.

DATE OF PLANTING WINTER GRAIN

Commencing August 1, 1928, seven sowings of Turkey Red winter wheat and winter rye were made in an octuplicate test on a rather exposed location. Four dates of Turkey Red matured between August 18 and 22, 1929, and yielded 46 bushels 39.1 pounds from the first date to 48 bushels 46.8 pounds

from the fourth. Late seedings were later in maturing and yielded less, the seventh ripening on August 27.8 and yielding 37 bushels 51.9 pounds. The grain from the first and second dates graded a good 2 A.R.W. and the remainder 3 A.R.W. with immature kernels.

Five seedings of winter rye yielded approximately 54 bushels, the sixth 38 bushels 47.3 pounds and the seventh 34 bushels 10 pounds. While conditions in 1928 had caused all the winter rye plots to ripen on the same day the plots in 1929 ripened from August 14.8 until August 24.9. Less than the usual amount of shattering occurred.

STAGE-OF-HARVESTING TEST WITH WHEAT

On August 10 when a block of Reward wheat was judged to be in the late-milk stage daily sampling from eight sections of the area was begun. Eight rod-rows a day were harvested for nineteen days. Unsuitable harvest weather set in soon after the test was begun and by the fifteenth date the grain had reached only the early-dough stage with some straw turning colour. By the nineteenth day, when the test was discontinued due to a depletion of standing grain, it was estimated that the straw was still inclined to be green and the kernels in the early- to medium-dough stage. Nevertheless within this period the yields of the grain had increased regularly from 17 bushels 51.5 pounds to 37 bushels 1 pound and the weight per thousand kernels of grain from 20.5 to 33.1 grams. While it is expected that the maximum yield had not yet been attained the grain by the end of the test weighed 69.5 pounds per bushel, having been 60.5 pounds when the test was begun. Apparently the weight per bushel of Reward wheat as grown in Peace River exceeds the legal limit even when quite immature.

The regular improvement of the grading of the samples with a spread of from almost feed to grade 4 is in keeping with the weight per measured bushel of the threshed grain. Had the test been carried to the finish both the yield and grade would have improved considerably, as indicated by neighbouring stands of Reward wheat, which made 1 Northern.

STAGE-OF-HARVESTING TEST WITH REWARD WHEAT, BEAVERLODGE, 1929

Date cut	Weight per 1,000 kernels	Weight per measured bushel	Grade	Yield per acre	Stage of development when cut
	grms.	lb.		lb.	
Aug. 10, 1st date.....	20.5	60.5	6 poor almost feed	1,071.5	Late milk stage.
Aug. 11, 2nd date.....	20.8	61.0	6 poor	1,277.5	
Aug. 12, 3rd date.....	22.3	61.5	6 poor	1,337.3	
Aug. 13, 4th date.....	23.5	62.5	6	1,437.1	
Aug. 14, 5th date.....	24.3	63.5	6	1,547.9	
Aug. 15, 6th date.....	24.0	64.0	6	1,572.0	
Aug. 16, 7th date.....	25.4	64.5	6 good	1,735.9	
Aug. 17, 8th date.....	26.2	65.0	5 poor	1,674.0	
Aug. 18, 9th date.....	28.4	65.5	5 poor	1,773.6	
Aug. 19, 10th date.....	28.7	67.0	5 poor	1,822.3	
Aug. 20, 11th date.....	28.7	66.0	5	1,842.3	
Aug. 21, 12th date.....	28.8	67.5	5	2,108.0	
Aug. 22, 13th date.....	30.3	67.5	5 good	1,895.3	
Aug. 23, 14th date.....	28.9	67.5	4 poor	1,995.1	
Aug. 24, 15th date.....	31.4	67.5	4 poor	1,813.5	Early dough stage, some straw turning colour.
Aug. 25, 16th date.....	32.1	68.5	4	2,028.5	
Aug. 26, 17th date.....	32.3	68.5	4	2,225.4	
Aug. 27, 18th date.....	34.8	69.0	4	2,125.8	
Aug. 28, 19th date.....	33.1	69.5	4	2,221.0	Early to medium dough stage, straw still inclined to be green.

EUREKA BARLEY AND LIBERTY OAT SELECTIONS

Some six selections of Eureka beardless and hulless barley were made in 1922 and from these 23 re-selections were made in 1923. In the same year 12 selections of Liberty hulless oats were made. These have been grown each year since, mostly in replicated plots, to determine whether any difference would show up and whether or not any such differences would be consistent from year to year. To a slight extent, especially in the Liberty selections, consistent differences have occurred, but they have been associated with certain factors which are undesirable. Selection 323 of Liberty was discarded in 1926 as it had become full of smut, the stocks having been grown for some years without fungicidal treatment. The other Liberty selections have produced a number of hulled kernels each year, although such kernels were removed from the seed. No definitely superior Eureka selection was produced.

After summarizing the results to date it was decided to discard all except Eureka Selection 1123 and Liberty Selection 923 and to continue work with these in the future along different lines.

CRIMEAN NEBRASKA SELECTIONS

Twenty selections of Crimean Nebraska winter wheat were received from Prof. T. A. Kiesselbach, University of Nebraska, in 1928, with the request that they be grown until some proved more winter-hardy than others. The results to date have not indicated any significant difference in the selections.

FORAGE CROPS

PASTURING TEST IN SEEDING DOWN

Commencing in 1925 five annual seedings of a pasturing test have been laid down. The object is to test the plan of pasturing new seedings of meadow crops during their initial season in order to keep annual weeds from ripening while the hay plants are establishing themselves.

As only a rough estimate of the impurities in the plots can be arrived at without enormous effort, no accurate allowances for these impurities can be made in computing the yields. The 1926 crop was fairly clean. In 1927 certain stands of the 1926 seeding were interspersed with considerable weed growth. Fortunately further pollution did not occur in 1928.

Except for some volunteer winter rye and some stubble trash the 1928 crop from the 1927 seeding was reasonably clean on at least three of the preparations and this was essentially true of the 1928 seeding as cropped in 1929.

A limited amount of grazing has been secured in the initial year of each seeding and the ensuing crops have, as a rule, been fairly clean. Yields have been satisfactory but the total tonnage of feed produced has not equalled that produced by seeding with a nurse crop of oats grown for green feed, the weight of bundles in that case more than compensating for the reduction in yield of meadow crop.

Insufficient data have been secured as yet to permit many definite deductions being arrived at.

Throughout the various seedings the production of grass-legume mixtures has been greater than from separate seedings of either crop.

PASTURING TEST IN SEEDING DOWN, 1929

Presenting 1927, 1928 and 1929 results in pounds of hay per acre from the average of duplicate plots under each treatment in the 1926 seeding

Designation	Year	Seeded with					Average four preparations, (except winter rye)
		Winter rye to be pastured	A sprinkling of rape to be pastured	No nurse crop	Oats to be pastured	Oats to be cut	
		lb.	lb.	lb.	lb.	lb.	
Alfalfa.....	1927	1,665-0	2,641-0	3,098-0	2,153-0	978-0	2,217-5
Alfalfa.....	1928	3,162-0	4,123-0	3,107-5	3,032-0	2,492-0	3,188-6
Alfalfa.....	1929	2,245-0	3,212-0	2,442-5	2,320-0	1,900-5	2,468-8
Total 3 years.....		7,072-0	9,970-0	8,648-0	7,505-0	5,370-5	7,874-9
Alfalfa and western rye.....	1927	2,280-0	3,524-0	3,865-0	2,096-0	1,263-0	2,687-0
Alfalfa and western rye.....	1928	3,417-0	2,871-5	3,325-0	3,621-0	3,078-0	3,223-0
Alfalfa and western rye.....	1929	2,647-5	2,824-5	2,476-0	2,354-0	2,541-5	2,549-0
Total 3 years.....		8,344-5	9,220-0	9,666-0	8,071-0	6,882-5	8,459-9
Western rye grass.....	1927	2,071-0	3,587-0	4,588-0	1,710-0	1,106-0	2,746-5
Western rye grass.....	1928	3,723-0	2,803-0	3,242-5	2,592-0	2,181-5	3,704-8
Western rye grass.....	1929	2,496-5	1,555-0	1,793-5	1,564-0	1,404-0	1,579-1
Total 3 years.....		8,290-5	7,945-0	9,610-0	5,866-0	4,691-5	7,030-4
Alfalfa and brome.....	1927	1,863-0	2,866-0	3,254-0	1,785-0	1,400-0	2,326-3
Alfalfa and brome.....	1928	2,715-5	2,711-0	3,511-0	4,061-0	1,993-0	3,069-0
Alfalfa and brome.....	1929	2,097-0	1,768-0	2,298-5	2,303-0	1,639-0	2,124-6
Total 3 years.....		6,175-5	7,335-0	9,063-5	8,649-0	5,032-0	7,519-9
Western rye and brome.....	1927	1,105-0	2,301-0	4,036-0	1,258-0	1,011-0	2,321-5
Western rye and brome.....	1928	1,804-0	2,167-5	2,153-0	1,924-0	1,402-0	1,911-6
Western rye and brome.....	1929	1,438-0	1,594-0	1,023-5	1,261-5	1,093-5	1,343-1
Total 3 years.....		4,437-0	5,952-5	8,402-5	4,443-5	3,506-5	5,576-3
Brome.....	1927	1,105-0	2,334-0	4,584-0	1,066-0	909-0	2,245-8
Brome.....	1928	1,413-0	1,554-5	1,324-0	1,332-5	1,532-5	1,560-9
Brome.....	1929	1,168-5	1,174-5	1,429-0	1,060-5	1,176-0	1,210-0
Total 3 years.....		3,686-5	5,063-0	7,337-0	3,459-0	3,707-5	5,016-6
Sweet clover and brome.....	1927	1,455-0	3,530-0	4,207-0	1,078-0	889-0	2,428-3
Sweet clover and brome.....	1928	1,390-5	1,795-0	1,795-0	1,460-0	1,579-5	1,657-4
Sweet clover and brome.....	1929	1,227-0	1,307-5	1,391-5	1,129-5	1,038-0	1,216-6
Total 3 years.....		4,072-5	6,641-5	7,393-5	3,667-5	3,506-5	5,302-3
Sweet clover and western rye.....	1927	1,614-0	4,420-0	4,649-0	1,233-0	1,264-0	2,891-5
Sweet clover and western rye.....	1928	2,369-0	3,385-5	3,010-0	2,026-0	2,207-0	2,679-6
Sweet clover and western rye.....	1929	1,603-0	1,942-5	1,888-0	1,325-0	1,470-0	1,656-4
Total 3 years.....		5,586-0	9,748-0	9,547-0	4,584-0	5,031-0	7,227-5
Sweet clover.....	1927	1,921-0	4,109-0	4,540-0	1,720-0	989-0	2,841-8
Sweet clover.....	1928						
Sweet clover.....	1929						
Total 3 years.....							
Average 8 kinds of crop (excluding sweet clover)		5,958-1	7,735-1	8,772-1	5,780-6	4,716-0	6,751-0
Average 9 kinds of crop.....		5,509-5	7,332-2	8,301-8	5,330-4	4,301-9	6,316-0

NOTES

1. Seeded May 19 on oat-stubble which had been ploughed April 15, floated a day or so later, spring-toothed on May 3, and harrowed on 10th.
2. Through haste entailed by rain the drill used to cover the grass plots had the clover seeder left in gear, scattering a mixture of sweet clover and alfalfa more or less over all. The ones likely to be least affected would be the brome and brome-rye-grass plots in the west range.
3. In addition to the four blocks provided in 1925 there was a fifth one seeded with rape to be pastured. The rape was broadcast with extreme thinness and produced but a very scattering growth.
4. Fencing of the pasturing paddocks having been delayed by pressure of other work, the oats began to head before grazing could be commenced. In the other paddocks some of the weeds were rather far advanced and an occasional stem of rye was showing. Preliminary to the pasturing, therefore, the mower was run over all the blocks except the oats for harvesting. The paddock sown with oats to be pastured was raked and yielded 3,450 pounds cured weight per acre, while in the adjoining date-of-planting supplement the first-date plots yielded 2,989 pounds and the second-date 1,532 pounds. The clippings from the third- and fourth-date sowings shrivelled and were not recovered.
5. Cattle were grazed on the rye paddock during August, amounting as nearly as can be estimated, to the equivalent of one head for 43 days on practically two-thirds acre—112/165 to be exact. The oat paddock, after yielding about one and a half tons of oat hay, carried a few head towards the end of the month amounting to one head for 12½ days. The rape

NOTES—Concluded

paddock was grazed to the extent of only one head for 7½ days. The paddock with no nurse crop carried the equivalent of one head for 24½ days. The oats for harvesting were bound late in September when there was snow on the ground, and the yield was not obtained. It might be estimated at 2½ tons per acre.

6. The rye nurse crop sustained considerable winter injury and supported but eleven nights grazing for one head in early June, 1927. The subsequent growth on this paddock was taken for hay instead of grain as in the case of the 1925 seeding. It produced considerable second growth, which was not cut. The grasses were weak among the winter rye, and, excepting on the sweet-clover strips, the winter rye constituted 80 per cent of the hay.

7. No portion of any paddock of the 1926 seeding was cultivated in 1927 and no hand-weeding was done. The test was cut July 20, 1927. In the two oat blocks (oats pastured and oats harvested) the growth was weak and backward, despite favourable hay weather. In the alfalfa-plus-brome and the western-rye-plus-brome, weeds predominated. In the western rye the crop weight taken included about thirty per cent weeds in both ranges. In both these oat blocks the brome was not yet headed and the sweet clover not in bloom.

8. Alfalfa seemed to have been somewhat affected by the winter and produced a rather light crop in the first year after seeding, although from the non-nurse-crop area it turned off a ton and a half of hay per acre.

9. In 1928 the plots of sweet clover only were cut on July 13. The remaining plots were cut July 23 and 24. Plots consisting of grass only gave low yields mostly averaging from three-quarters to a ton per acre. Those which, from accident or intent, contained a substantial percentage of alfalfa averaged around a ton and a half of hay from the 1928 crop. Considering the aggregate of two-years crop it is clear that the admixture of either sweet clover or alfalfa with the grass has decidedly tended to raise the yields. Most plots carrying sweet clover have given an excellent account of themselves in the season after seeding, using up moisture so completely as sometimes to depress the next season's crop, though the aggregates from the sweet clover combinations show up fairly well.

10. In 1928 the alfalfa, alfalfa-and-western-rye, and alfalfa-and-brome plots were cut July 4 and the west set of western rye plots, on July 13. The remainder were cut on July 16. The plots consisting of alfalfa or a mixture of this legume and a grass continued in 1929 to give noticeably higher yields than the plots of grass only. Little effect of the sweet clover sown with grass could be noticed in the 1929 crop.

The 1928 Seeding

The plots of the 1928 seeding were cut on July 12 except those seeded to grass without legume admixture. The latter were cut on July 16. Average yields were obtained but as the records were lost full particulars are not available. At cutting it was noted that the crop from the winter-rye-to-be-pastured area contained from 30 to 90 per cent winter rye. Brome constituted 70 to 80 per cent of the crop from most of the plots sown to Western rye and brome.

The 1929 Seeding

The 1929 seeding was sown on May 16 where the 1925 seeding had been ploughed up in 1927 and according to the same layout.

The stands seeded without nurse crop, those seeded with winter rye, and those with one block of oats were pastured during the season. On September 2 the nurse crop of oats to cut was harvested.

This experiment was originally planned in the hope of finding a means of controlling annual weeds during the season of seeding without unduly lowering hay yields. So far as annuals are concerned the practice of seeding without a nurse crop and grazing during the fore part of the first summer has promised a fairly successful control unless in the case of very unpalatable species such as stinkweed, which is practically non-present on the station.

In the 1929 seeding part of the area became polluted with couch grass, the seed of which is thought to have been formerly introduced as an impurity in Western rye grass. Since grazing would be futile for the control of this weed the scattering plants had to be forked out and this mutilated the stands so badly that cropping data from this seeding will be of no comparative significance.

Another point of special interest developed: Some time after seeding, examination revealed a conspicuous dearth of meadow plants on the area seeded without nurse crop. What plants there were occurred almost exclusively along the wheel marks.

In the nurse-crop areas the meadow plantlets, though rather weak, were pretty uniformly distributed. Since germination conditions had been good and insect injury was apparently negligible this contrast was unaccountable until slight evidence of soil drifting was noticed. Then it was recalled that there had recently been severe winds which had apparently beaten out delicate, unprotected seedlings growing in loose soil. Those occurring among plants of oats and rye had been to some extent protected. It was afterwards noticed that many stands of field roots and vegetables seeded about the same time as these meadow plots had likewise mysteriously disappeared.

The occurrence commands attention since it is the first of its kind in eleven years' extensive forage-crop work, during which thousands of meadow plots have been seeded at Beaverlodge. Never before have the non-nurse-crop plots failed to establish themselves successfully and produce in the next season considerably more hay than those obtained by nurse-crop seeding. That such a mishap can occur in a non-nurse-crop plot in a windy season and on a bleak site is a point to be considered.

DATE-OF-PLANTING EXPERIMENTS WITH MEADOW CROPS

Conjoined with the pasturing test there is sown each year a date-of-seeding supplement in which the same lines of treatment are carried out except that for this supplement the meadow seeding consists of an experimental mixture comprising four pounds each per acre of alfalfa, sweet clover, Western rye grass and brome. Though this mixture was devised merely for experimental purposes, being much more elaborate than any yet recommended by the Station for commercial use, the yield results have been surprisingly good.

Owing to attacks of cutworms and grasshoppers in the earlier years plus seasonal irregularities and difficulty in controlling the grazing of these successive small additions to the several paddocks fenced to accommodate the main pasturing test, the results from the date-of-planting supplements are irregular and indecisive.

The 1925 seeding was not replicated but in 1926, 1927, 1928 and 1929 duplicate plots were sown to represent each successive date.

DATE-OF-PLANTING TEST WITH MEADOW CROPS, CONJOINED WITH THE PASTURING TEST, 1929.

Average of duplicate plots under each treatment, three years' crop in pounds per acre from the 1926 seeding.

Designation	Seeded with				
	No nurse crop	Winter rye to be pastured*	Rape to be pastured	Oats to be pastured	Oats to be cut
	lb.	lb.	lb.	lb.	lb.
First date 1927.....	4,483.0	1,379.0	3,709.0	1,612.0	1,037.0
First date 1928.....	2,850.5	1,924.5	3,700.0	3,081.0	1,794.5
First date 1929.....	2,489.0	1,579.5	2,236.5	2,118.5	1,645.5
Total, 3 years.....	9,822.5	4,883.0	9,645.5	6,811.5	4,477.0
Second date 1927.....	5,010.0	4,365.0	4,110.0	2,322.0	1,652.0
Second date 1928.....	3,959.5	2,152.0	3,006.5	2,791.0	1,854.0
Second date 1929.....	2,620.0	1,564.0	2,166.5	1,662.0	1,618.0
Total 3 years.....	11,589.5	8,081.0	9,283.0	6,775.0	5,124.0
Third date 1927.....	3,887.0	1,712.0	3,160.0	1,975.0	1,076.0
Third date 1928.....	4,377.6	2,434.5	3,105.5	2,501.0	1,969.0
Third date 1929.....	2,821.0	1,844.0	2,507.0	1,721.0	1,690.5
Total, 3 years.....	11,085.5	5,990.5	8,772.5	6,197.0	4,735.5
Fourth date 1927.....	3,792.0	2,681.0	1,808.0	1,686.0	1,420.0
Fourth date 1928.....	3,627.5	2,697.5	2,948.5	2,782.5	2,718.5
Fourth date 1929.....	2,591.0	2,592.5	1,993.5	1,842.0	1,984.5
Total, 3 years.....	10,010.5	7,971.0	6,750.0	6,310.5	6,123.0

*The 1927 crop of these plots consisted chiefly of winter rye hay.

NOTES

1. In 1926 the first date of sowing was May 19; the second June 7; the third June 21 and the fourth July 5.

2. In the paddock sown with oats to be pastured (but allowed to become too tall ere stock could be turned on, and therefore clipped first with a mower) the yield of oat hay was 2,989 pounds per acre from the first-date plots and 1,582 pounds from the second-date. The clippings from the third and fourth shrivelled and were not recovered.

DATE-OF-PLANTING TEST WITH MEADOW CROPS; CONJOINED WITH THE PASTURING TEST, 1929

Average of duplicate plots under each treatment, 1928 and 1929 crops in pounds per acre from the 1927 seeding

Designation	Seeded with			
	No nurse crop	Winter rye to be pastured*	Oats to be pastured	Oats to be cut
	lb.	lb.	lb.	lb.
First date 1928.....	2,038.5	1,267.0	1,121.0	1,548.5
First date 1929.....	1,410.0	1,400.5	1,672.0	1,485.5
Total, 2 years.....	3,448.5	2,667.5	2,793.0	3,034.0
Second date, 1928.....	2,544.5	1,172.5	1,438.5	1,059.0
Second date 1929.....	1,600.5	1,315.0	1,880.0	1,431.5
Total, 2 years.....	4,145.0	2,487.5	3,318.5	2,490.5
Third date, 1928.....	2,258.5	1,426.0	1,485.5	1,227.0
Third date, 1929.....	1,647.0	1,410.0	1,528.5	1,267.0
Total, 2 years.....	3,905.5	2,836.0	3,014.0	2,494.0
Fourth date 1928.....	2,858.5	1,877.5	1,899.5	1,441.0
Fourth date 1929.....	2,039.0	1,707.0	1,704.5	1,698.0
Total, 2 years.....	4,897.5	3,584.5	3,604.0	3,139.0

*1928 crop chiefly winter-rye hay.

NOTES

1. In 1927 the first date was sown on May 31, the day when the main pasturing test was put in; the second-date on June 13; the third on June 30 and the fourth on July 15. Prior to each sowing after the first one the ground was deeply scuffed to kill weeds and volunteer grain.
2. The oats nurse crop on the first-date seeding was measured in and weighed up with that of the main pasturing test, the yield being 6,312 pounds of cured bundles per acre. The second-date plot was recorded as yielding 10,868 pounds per acre; the third-date 7283 pounds and the fourth 868 pounds. No adequate explanation was at hand to account for the second sowing of the oats yielding seventy per cent more dry matter than the first. It is noticeable that the 1928 hay yield of this plot was especially low.

ALFALFA VARIETY TESTS

In each of the five seedings of the alfalfa variety tests Grimm has been the leading variety. Scarcely any winter injury to these seedings has taken place although for the most part they are situated on the driest and poorest soils of the Station area. One cutting per season is taken, usually when the bloom is 10 per cent out. In 1928 the plants were cut when slightly past 50 per cent in bloom.

From the 1923 seeding Grimm has averaged 2,667.4 pounds of cured hay per acre during five successive seasons. The 1929 yield was 1,919.5 pounds. In this seeding the Cossack and Yellow-flowered Siberian plots have shown up fairly well, yet in 1929 they yielded only 977.5 and 672 pounds respectively. Their five-year-average yield is a little better than a ton per annum. Among the 1923 and 1926 seedings there has been a definite invasion of grasses into the plots of these two varieties, which have been claimed to be extra-hardy. Possibly the grass is one cause of the reduction in yield. Stands of Grimm have remained quite clean.

Yields from the 1927 seeding have averaged a ton and a half of cured hay.

SWEET CLOVER VARIETY TESTS

The 1928 seeding of the variety test with sweet clover was sown June 11 on summer-fallowed land. All varieties were intended to be quadruplicated

but a mishap to the seed in transit rendered it possible to sow only one plot of Dwarf and three each of Zouave and Grundy. Hence only a triplicate test can be considered.

The common Yellow-flowered variety was cut on July 2 and yielded 3,716.3 pounds of cured hay per acre. Common biennial White-blossomed cut six days later averaged 3,835 pounds. In its initial seeding at this Station, Zouave cut on July 2 outyielded the other varieties with 4,407.3 pounds per acre. The remainder were cut on July 5.

A single plot of Dwarf yielded 3,347 pounds of cured hay.

VARIETY TEST WITH SWEET CLOVER, 1928 SEEDING, 1929

Variety	Cured hay per acre			
	Set 1	Set 2	Set 3	Average three plots
	lb.	lb.	lb.	lb.
Arctic.....	4,329	3,463	3,389	3,727.0
Common White-blossomed.....	3,949	3,466	4,090	3,835.0
Zouave.....	4,493	4,073	4,656	4,407.3
Maccor (M. A. C.).....	4,669	4,094	4,214	4,325.7
Grundy (Disco).....	3,523	3,451	3,759	3,577.7
Yellow-blossomed.....	3,010	4,066	4,073	3,716.3

VARIETY TESTS WITH ALSIKE, WHITE AND RED CLOVER

In any but a wet season the white clovers fail to produce a satisfactory yield of forage at Beaverlodge. Stands seeded in 1927 and 1928 wintered well but by haying the plants were, as usual, too short to be clipped with a mower. The single plot of alsike included along with the 1927 seeding of the variety test of white clovers yielded 346 pounds of cured hay per acre. This plot is situated on a rather exposed location. The more protected alsike plots seeded in 1928 along with the variety test of white clovers averaged 1,548.3 pounds per acre from four plots.

The red clovers wintered well and gave satisfactory yields. Plots of the Early Swedish and St. Clet varieties in the 1927 and 1928 seedings produced from a ton to a little better than a ton and a half per acre. The later-maturing varieties yielded up to two and a half tons.

VARIETY TEST WITH RED CLOVERS, BEAVERLODGE, 1929

Yields in pounds of cured hay per acre from the 1928 and 1929 crops of the 1927 seeding.

Variety		Cured hay per acre		
		1928	1929	Total of duplicate plot averages for two years:
		lb.	lb.	lb.
Early Swedish.....	Set 1.....	3,405.0	2,862.0	
Early Swedish.....	Set 2.....	4,427.0	2,399.0	
Average duplicate plots.....		3,916.0	2,630.5	6,546.5
Medium Swedish.....	Set 1.....	4,649.0	6,354.0	
Medium Swedish.....	Set 2.....	5,465.0	3,692.0	
Average duplicate plots.....		5,057.0	5,023.0	10,080.0
Late Swedish.....	Set 1.....	5,050.0	5,849.0	
Late Swedish.....	Set 2.....	5,111.0	3,706.0	
Average duplicate plots.....		5,080.5	4,777.5	9,858.0
Red (Oxdrift).....	Set 1.....	5,332.0	5,560.0	
Red (Oxdrift).....	Set 2.....	4,760.0	4,356.0	
Average duplicate plots.....		5,046.0	4,958.0	10,004.0
Red (St. Clet).....	Set 1.....	3,707.0	2,318.0	
Red (St. Clet).....	Set 2.....	2,936.0	2,339.0	
Average duplicate plots.....		3,321.5	2,328.5	5,650.0
Altaswede.....	Set 1.....	5,020.0	3,321.0	
Altaswede.....	Set 2.....	5,302.0	4,666.0	
Average duplicate plots.....		5,161.0	3,993.5	9,154.5

NOTES

1. Seeded in duplicate June 9, 1927, on an area (rear of Course 1) where the previous season's seeding of these clovers had killed out completely. Good catches were obtained and they wintered well.
2. In 1928 they grew nicely and yielded well. Through pressure of work the early clovers were not out until July 21, when the late ones were ready; some of the early kinds then had 50 to 90 per cent of seed set.
3. Stands still intact in 1929.

VARIETY TEST OF TIMOTHY

Three strains of timothy sown in duplicate plots in 1926 produced average yields ranging from 4,212 to 5,502.5 pounds of cured hay per acre in 1927. At that time the stand was thin. In 1928 yields were a little less than two tons. But in the third cropping year these strains yielded less than half a ton per acre. The stand appeared to be the same as in 1927 but has apparently become root-bound. Except for a decidedly lower initial yield from one of the Boon-strain plots, there have been no marked contrasts between the yields of strains from year to year.

VARIETY TEST WITH TIMOTHY, BEAVERLODGE, 1929

Presenting three years' results in pounds of cured hay per acre from the 1926 seeding.

Variety	Set	1927	1928	1929	Total of duplicate plot averages for 3 years
	lb.	lb.	lb.	lb.	lb.
Timothy commercial.....	1	5,556.0	3,725.0	806.0	
Timothy commercial.....	2	5,449.0	3,610.0	1,016.0	
Average duplicate plots.....		5,502.5	3,667.5	911.0	10,081.0
Timothy (Ohio).....	1	5,711.0	3,890.0	987.0	
Timothy (Ohio).....	2	5,598.0	3,760.0	897.0	
Average duplicate plots.....		5,654.5	3,825.0	942.0	10,421.5
Timothy (Boon).....	1	2,906.0	3,669.0	1,028.0	
Timothy (Boon).....	2	5,518.0	3,577.0	805.0	
Average duplicate plots.....		4,212.0	3,623.0	916.5	8,751.5

NOTES

1. Seeded June 15, 1926, in duplicate plots on summer-fallowed land (Course 5). Stands obtained were somewhat irregular and results inconclusive, one plot of Boon being very poor while its fellow yielded well.

KINDS AND VARIETIES OF GRASSES

The 1929 yields from the 1927 seeding of grasses were approximately two-thirds those obtained in 1928. Brome led with 2,464 pounds as compared with 3,710 pounds in 1928. Western rye grass, the leader in 1928 with 4,129 pounds, dropped to second place with 2,361 pounds per acre. The three strains of timothy included in this test averaged 1,626.5 pounds per acre in 1929 as compared with 2,475 pounds in 1928. Red top, Orchard and Kentucky blue grass yielded in 1929 less than a ton per acre.

In the 1928 seeding Western rye grass leads with 3,525 pounds per acre, with timothy and brome grass next with 2,881 and 2,718 pounds respectively. Brome is slower than Western rye or timothy in becoming established.

BROADCAST ANNUAL CROPS FOR HAY OR ENSILAGE

THE O.P.V. TEST

Banner oats, Chancellor peas, and black vetches (tares) were again seeded in the O.P.V. test on May 2. The test was conducted in quadruplicate on summer-fallowed land.

The oats only were drilled at ten pecks (by weight) per acre; the oats-peas mixture at five pecks of each; the oats-vetch mixture at five pecks oats and thirty-six pounds vetch; the oats, peas, and vetches at five pecks, three pecks, and twenty pounds, respectively.

As usual, the test was divided into two sections, or series. In one case the oats were drilled directly after the peas and vetches. In the other case the drilling of the oats in the mixture plots was deferred ten days. In both series the peas and vetches were drilled somewhat more deeply than the oats.

As in previous seasons, oats sown on the same day as the legumes dwarfed the latter in the mixture plots. A field estimate placed the legume content of mixtures sown May 2 as 35 per cent of the total crop as compared with 52.5 per cent in the mixtures where the seeding of oats had been deferred. On an average of the three combinations the net gain was 7.7 per cent in favour of the deferred seeding of the oats.

As in every previous year since the test was inaugurated in 1928, the oats alone have exceeded the oat-legume combinations. The excess yield this year amounts to 8.8 per cent or exactly the same as in 1928.

CEREAL FOR HAY

Banner oats, Fenil, Alberta Beardless, and Eureka barleys and Ruby wheat were seeded May 2 in quadruplicate, excepting the wheat, which was merely duplicated. The preparation was surface-worked summer-fallow of 1928 after cereals in 1927. The land was spring-toothed and harrowed in the spring of 1929.

Some shattering occurred and all varieties were fairly ripe when harvested. Dry-matter samples of each plot were taken and the yields are recorded on the basis of 12 per cent moisture. As usual Banner oats leads with an average yield of 4,771.3 pounds per acre. Ruby wheat is low at 3,006 pounds, having shelled badly. The three barleys average 3,767.6 pounds per acre.

MILLET

A duplicate test of millets was sown on May 30 on land which had been under vegetables in 1928 and cereals in 1927. It was spring-toothed early in the spring and harrowed several times. Before seeding it was again spring-toothed and harrowed. Germination was satisfactory but growth was slow. Following a frost of two degrees by the official caged thermometer on September 5, the plots were cut on September 13. Hungarian and Siberian yielded over two tons of cured hay per acre and Common and Golden more than a ton and a half. As usual Hog yielded poorly.

INTERCULTIVATED CROPS

A modification of the rod-row plan of testing was again employed in comparing the intertilled crops in 1929. Excepting corn and sunflowers the rows were sown 18.5 feet long and trimmed to an even rod. The flanking drill on either side of each plot, sown with seed of its own variety, was excluded from the calculations. Corn and sunflowers were tested in quadruplicate; rape, kale and field roots in octuplicate. The Planet Jr. seeder was used throughout.

SUNFLOWERS

Five varieties were sown May 17 on land cropped to field roots in 1928 and cultivated and harrowed early in the spring of 1929. The plants emerged on May 29. Stands were average. Growth was slow. Harvesting was deferred to permit the crop to attain its maximum yield and the rain and snowstorm of September 21-24 caught it. The yields as reported were taken October 18 after the crop had been frozen and badly weathered. The low percentage of dry matter from all except the early Mennonite variety indicates the lack of maturity.

CORN

On land cropped to field roots and multiplication plots of cereals in 1928, eleven varieties or strains of corn were sown on May 15. The test was sown in quadruplicate, each plot consisting of five rows 45.5 feet long and three feet apart. Germination and subsequent growth was slow and weak. Stands averaged from 11 to 56 per cent of the normal. Yields taken after the September storm were disappointingly low. The plots were cut October 18.

VARIETY TEST, CORN, 1929

Average quadruplicate plots.

Variety	Per cent normal stand	Yield per acre		Per cent dry matter
		Green weight	Absolute dry matter	
		lb.	lb.	
Gchu (N. Dakota Grown, McKenzie).....	38.8	1,333.0	489.0	36.68
Quebec 28 (McD. Coll.).....	38.8	1,935.0	755.3	39.03
Twitchell (Ottawa).....	46.3	2,002.5	922.0	31.77
Wisconsin 7 x Twitchell (Sumner).....	48.8	1,763.0	669.5	37.98
Northwestern Dent (Brandon).....	56.3	2,042.5	684.5	33.51
Northwestern Dent (Disco).....	46.3	1,956.5	753.0	38.49
Northwestern Dent (Crookston McKenzie).....	22.5	1,027.5	364.8	35.50
Northwestern Dent (S. Dakota McKenzie).....	11.3	430.0	170.3	39.60
Longfellow (J. O. Duke).....	47.5	2,558.5	935.8	36.58
Canada Leaming (Carter).....	58.8	3,203.5	1,065.5	33.26
Leaming No. 9 (J. O. Duke).....	28.8	838.5	352.8	42.07
Average.....	—	1,817.3	651.1	35.83

RAPE AND KALE

Five varieties of kale and one of rape were sown May 9 on a deep black loam which had been cropped to cereals in 1927 and vegetables in 1928. The crop emerged May 24-26. Yields were very satisfactory, only the fine-growing Sheep kale yielding less than five tons of dry matter per acre. Giant rape yielded almost six tons of dry matter. These yields are considerably higher than those obtained from the field roots on an adjoining portion of the same area. The plots were harvested on October 17 and 18.

VARIETY TEST, RAPE AND KALE, 1929

Average of octuplicate plots

Variety	Date of emergence	Per cent of normal stand	Yield per acre		Per cent dry matter
			Green weight	Dry matter	
			lb.	lb.	
Giant Rape (Sutton).....	May 24.8	98.1	72,710.0	11,939.1	16.42
Sheep Kale (Sutton).....	May 25.5	96.3	57,860.0	9,178.0	15.86
Green Marrow-Stemmed Kale (Sutton).....	May 24.9	96.9	71,720.0	11,206.4	15.63
Purple Marrow-Stemmed Kale (Sutton).....	May 24.5	100.0	68,530.0	10,605.8	15.48
1,000-Headed Kale (Sutton).....	May 24.6	98.1	68,200.0	11,454.9	16.80
Imp. 1,000-Headed Kale (Sutton).....	May 24.5	98.5	69,740.0	11,354.0	16.28
Average.....			68,126.7	10,956.4	16.08

FIELD ROOTS

The field-root crop grew alongside the variety test of rape and kale. The mangels and sugar beets were sown May 8 and the swedes, turnips and carrots on May 9. These various crops germinated from May 24 to 30.

For the first week or more following emergence the stands were complete but after several days of continuous winds many of the plants disappeared. The mangels and sugar beets suffered most. In places the entire stand was destroyed. No other explanation than wind is evident although it is the first time in the history of the Station that destruction by this element had been noticed. In an adjoining test new-seeded meadow plants were likewise blown out.

MANGELS.—The uneven stands of the mangels render yield data non-comparable. The Prize Mammoth Long Red variety with a stand of 53.1% yielded nearly two tons of dry matter although the Royal Giant Sugar beet had a greater green weight. The crop was harvested on October 15 and 16.

SUGAR BEETS.—The stands of this crop also were patchy. Yields from 2,858.4 to 3,761.6 pounds of dry matter per acre were obtained. An extremely wide range of dry matter content was obtained, the roots from Fredericksen testing 24.06 and Danish Intermediate 14.76 per cent. The roots were pulled October 15.

SWEDES.—This is found to be the most satisfactory field root crop. Stands were almost complete. The crop was harvested October 17 and yielded thirty tons per acre, or more than twice as much as mangels.

VARIETY TEST FIELD ROOTS, 1929

Average of octuplicate plots

MANGELS

Variety	Date of emergence	Per cent normal stand	Yield per acre		Per cent dry matter
			Green weight	Dry matter	
			lb.	lb.	
Yellow Intermediate (C.E.F.).....	May 26.5	49.4	23,210.0	2,467.0	10.63
Eclipse (McKenzie).....	" 28.3	23.1	23,650.0	1,910.3	8.08
Golden-Fleshed Tankard (Steele Briggs)	" 28.6	19.4	14,190.0	1,417.5	9.98
Giant Yellow Globe (Steele Briggs).....	" 27.5	34.1	28,820.0	2,545.1	8.83
Royal Giant Sugar Beet (Steele Briggs)	" 28.6	52.8	36,850.0	3,516.3	9.54
Prize Mammoth Long Red (Steele Briggs).....	" 28.6	53.1	34,320.0	3,960.8	11.54
Average.....			26,840.0	2,636.2	9.82

SUGAR BEETS

Variety	Date of emergence	Per cent normal stand	Green weight	Dry matter	Per cent dry matter
Fredericksen.....	May 27.9	43.6	11,880.0	2,858.4	24.06
Danish Improved.....	" 28.3	50.5	23,430.0	3,459.0	14.76
Rabbethge & Giesecko.....	" 28.3	48.1	14,850.0	3,419.5	23.03
Horning.....	" 27.8	52.1	17,710.0	3,761.6	21.24
Average.....			16,967.5	3,374.6	19.89

SWEDES

Variety	Date of emergence	Per cent normal stand	Green weight	Dry matter	Per cent dry matter
Bangholm (Nappan).....	May 24.0	100.0	55,000.0	7,433.6	13.52
Ditmars (McNutt).....	" 24.0	99.8	65,010.0	7,061.8	10.86
Average.....			60,005.0	7,247.7	12.08

TURNIPS

Variety	Date of emergence	Per cent normal stand	Green weight	Dry matter	Per cent dry matter
Greystone (Steele Briggs).....	May 24.0	98.1	31,020.0	2,667.1	8.60
Purple Top Mammoth (C.E.F.).....	" 24.0	94.4	38,390.0	3,222.6	8.39
Average.....			34,705.0	2,944.9	8.49

CARROTS

Variety	Date of emergence	Per cent normal stand	Green weight	Dry matter	Per cent dry matter
Improved Short White (Steele Briggs).....	May 30.0	83.5	16,830.0	1,992.8	11.84
Improved Intermediate White (Ewing).....	" 30.0	78.5	20,240.0	2,011.6	9.94
Average.....			18,535.0	2,002.2	10.80

DRY MATTER YIELDS OF VARIOUS ANNUAL FORAGE CROPS

Considerable interest attaches to the yearly summarized comparison of the various groups of annual forage crops in their production of dry matter per acre. Conditions of soil and preparation are seldom identical for all the crops but on the average of several years this will pretty well balance up. In 1929 the comparison is very fair. Wherever possible summer-fallow yields have been selected for the tabulation. The dry-matter content of all the crops compared in 1929 was based on samples taken at harvesting.

Banner oats are credited in the table with but a moderate yield in 1929. In the O.P.V. test they out-yielded the oat-legume mixtures by 8.8 per cent but in the test of Cereals for Hay there was considerable shattering and the oats in that test did not yield so well as those in the O.P.V., hence the average of the eight oat plots in the two tests only equals that of the oat-legume mixtures in the O.P.V. experiment.

Rape and kale soared still higher than in 1928. Although sown on rich soil their average yield of 10,956 pounds of dry matter—238 per cent of the yield of Banner—is remarkable for a year in which crops were more than once in danger of suffering from lack of moisture.

For the first time since the yields have been tabulated in this way Swede turnips produced more dry matter per acre than Banner oats.

The poor stands of the mangels lowered their showing.

Sunflowers fell below previous positions. The corn yields approximated those of 1927.

The comparison partly indicates the relative per-acre values of the various crops. It does not take account of succulence nor certain other factors of feeding value. Nevertheless the percentage ratings are worthy of attention.

DRY-MATTER PRODUCTION OF VARIOUS CROPS, 1929

Variety	Preparation for 1929 crop	Number of plots involved	Yield dry matter 1929	Per cent compared with oats as 100			
				1929	1928	1927	1926
			lb.				
Rape and kale.....	Vegetables.....	48	10,956	238.0	143.3	51.0	58.9
Swedes.....	".....	16	7,248	157.4	73.8	10.0	43.0
Banner oats.....	Summer-fallow.....	8	4,604*	100.0	100.0	100.0	100.0
Oats and legumes.....	".....	12	4,604	100.0	87.5	81.0	84.2
Sugar beets.....	Vegetables.....	32	3,375	73.3	57.0	16.0	25.7
Bald barley.....	Summer-fallow.....	12	3,316	72.0	68.6	72.0	80.5
Turnips.....	Vegetables.....	16	2,945	64.0	64.0	60.0	43.0
Millet.....	".....	10	2,946	64.0	46.0	38.0	56.3
Ruby wheat.....	Summer-fallow.....	2	2,645	57.5	80.3	34.0	80.5
Mangels.....	Vegetables.....	48	2,636	57.3	78.5	25.0	21.1
Carrots.....	".....	16	2,002	43.5	38.3	21.0	7.3
Sunflowers.....	Field roots.....	20	1,744	37.9	51.9	63.0	76.3
Corn.....	Cereals and field roots.....	44	651	14.1	32.3	11.0	21.9

*In O.P.V. test Banner outyielded oat-legume mixtures but yield in this comparison includes the Banner plots in the cereals-for-hay test where considerable shattering occurred and where the yields were lower than in the O.P.V. test, hence the average of 8 plots of oats in the two tests only equals the yield of the oat-legume mixtures in the O.P.V.

SOIL BACTERIOLOGY

RELATIVE EFFECTS OF INOCULATING ALFALFA SEED AT VARYING INTERVALS IN ADVANCE OF SEEDING

Upon the suggestion of the Dominion Agricultural Bacteriologist, a simple experiment was undertaken in 1928 to compare the effect of inoculating alfalfa seed at varying intervals in advance of seeding. The soil-glue method of inoculation was employed, and, after being treated, the samples of moistened, earth-coated seed were held in a room where a moderate temperature prevailed. All the plots were seeded June 19, on land rather remote from any area where alfalfa or sweet clover had ever been grown to any extent, so that the chances of inoculation by natural agency were slight. The site was a fireguard broken out of prairie in June, 1927, and left rather turfy. It paralleled the road fence along the lower east edge of the quarter section on which the experimental work is conducted. There was moisture for germination.



Alfalfa seeded July 1928, with seed treated by the soil-glue method, one week in advance of sowing. Photographed July 15, 1929. Crop in full bloom. Leaves dark green, plants vigorous. Hand held on stake at 2-foot mark. (Photo by W. D. Albright)

The plots were seeded across the fireguard and the quadruplicate sets ran seriatim, affording the fairest possible comparisons of the several seed treatments.

Four plots were seeded without inoculation; four others with seed inoculated immediately in advance of sowing; four with seed that had been inoculated twenty-four hours in advance; four with seed inoculated a week in advance; and still another four with seed inoculated two weeks beforehand.

During the season of seeding these plots received but casual attention and no differences were remarked then nor in the early part of 1929 whether as regards colour of foliage or luxuriance of growth. Neither was any difference in nodulation discovered by the rather casual examinations made.

From about the middle of June onwards increasing differences became manifest. On July 15 very marked contrasts in height, greenness and percentage of blossom were rhythmically evident throughout the quadruplicate test. In practically every set the vigour of the respective plots was rated in the same order by an observer who passed upon them before being informed of the layout.

With a few slight exceptions easily accountable by the lay of the land, conspicuously the tallest and heaviest crop as well as the most abundant bloom were exhibited by the plots inoculated a week in advance of sowing. Second-best were the plots inoculated twenty-four hours before seeding, while those inoculated two weeks before sowing seemed about as good as the latter. In every set decidedly the poorest of all the inoculated plots were those where the seed was sown immediately after being inoculated. In fact they were very little better than the uninoculated and any trifling advantage they might have had was over-balanced by an evident advantage in location possessed by one of the checks. The plots inoculated a week in advance were in full bloom when cut on July 15 and yielded 31.7 per cent more hay than the checks. Those inoculated twenty-four hours in advance exceeded the checks by 24.3 per cent, while the plots inoculated two weeks in advance were benefited to the extent of 20.1 per cent.

INOCULATION TEST WITH ALFALFA, 1928 SEEDING

Pounds cured hay per acre from the 1929 crop

Designation	Cured hay per acre				
	Set 1	Set 2	Set 3	Set 4	Average quadruplicate plots.
	lb.	lb.	lb.	lb.	lb.
No inoculation.....	2,572	2,255	2,266	2,648	2,435.3
Inoculated immediately.....	2,072	2,165	2,601	2,523	2,340.3
Inoculated 24 hours.....	2,410	2,523	3,437	3,737	3,026.8
Inoculated 1 week.....	2,896	2,518	3,562	3,350	3,206.5
Inoculated 2 weeks.....	3,086	2,420	2,992	3,205	2,925.8

Seeing that orthodox recommendations have always been to sow legume seed as promptly as possible after inoculation, these results were startling in their trend. Explanations were sought. It has been discovered during recent years that the nodule bacteria pass through a number of different stages, and show different morphological types, varying from round cells to the elongated or irregular forms typically seen in the nodules. Some forms are actively motile and it has been stated as a result of experiments at Rothamsted that the motile form is capable of better plant infection and resultant nodule formation. The production of this motile stage is supposed to be affected by the composition of the medium, and it has been recommended that in applying ordinary cultures to seed di-calcium phosphate be added to the milk in which the cultures are usually mixed. This phosphate is supposed to hasten the motile stage, contributing to better nodulation and greater yields.

"It is reasonable to presume," remarks Dr. A. G. Lochhead, Dominion Bacteriologist, "that with the soil-glué method employed in the tests described the organisms in the soil would not be in an actively motile form and that the interval of one week before sowing may have given them opportunity to develop the more active stage. The lower yield in the case of seed inoculated two weeks in advance of seeding might easily mean that the bacteria tended to overstep the favourable stage and pass on to one in which their capacity for nodule formation would be lessened. Naturally this is all hypothetical, but it is the explanation which is most probable in the light of present knowledge."

It is possible that different results might have been obtained had the seed been treated with nitro culture applied in the usual skim-milk medium. However, it is to be noted that on the Beaverlodge Station as well as on various farms in the district very puzzling cases of failure have sometimes been experienced when nitro culture was carefully used according to standard instructions. Whereas first-class inoculation has at times been obtained by both nitro-culture and soil-glue treatment applied before seeding there have been conspicuous cases of no apparent benefit whatever. Moisture conditions at seeding may have had much to do with this disparity. Generally speaking, it has seemed to the Superintendent that more abundant and reliable inoculation could usually be expected from reseedling of the legume on the same land than from artificial inoculation on new ground, albeit some cases of the latter have left nothing to be desired. The experimental work is to be repeated and more light may be shed.

Meantime it is to be recorded that an examination for nodules made two weeks after haying discovered no consistency whatever in their occurrence. On that date about as many nodules were found on the plots which had grown indifferently as on those which had grown well and there was a great deal of irregularity in their occurrence in any one plot.

It is conceivable that all or most of the plots were inoculated long before haying but that in certain ones prompt, vigorous and abundant inoculation took place in time to tell effectively on the 1929 crop whilst in others the effect may have been somewhat delayed.

AZOTOGEN

Results in a measure confirmatory of those reviewed under the foregoing section were obtained from a supplementary test designed to try out a proprietary preparation called Azotogen. For this purpose two series of plots were laid out with both alfalfa and sweet clover, making virtually a quadruplicate test of the respective seed treatments. Two plots of each crop were uninoculated, two of each were inoculated by the soil-glue method and two were treated with Azotogen. The average of four yields per treatment revealed no differences worth mentioning. Azotogen produced no observable benefit and the plots sown immediately after inoculation by the soil-glue method out-yielded the checks by only 4 per cent.

SUPPLEMENTARY TEST, INOCULATION ALFALFA AND SWEET CLOVER, 1928 SEEDING

Pounds cured hay per acre from the 1929 crop

	Pounds cured hay per acre		
	Set 1	Set 2	Average duplicate plots
Alfalfa—			
No inoculation.....	3,133	2,272	2,702.5
Inoculated immediately (soil-glue method).....	2,707	2,274	2,490.5
Inoculated with azotogen.....	2,498	2,563	2,530.5
Sweet clover—			
No inoculation.....	3,415	2,710	3,062.5
Inoculated immediately (soil-glue method).....	3,152	3,859	3,505.5
Inoculated with azotogen.....	2,732	3,623	3,177.5
Average of results with both crops—			
No inoculation.....			2,882.5
Inoculated immediately (soil-glue method).....			2,998.0
Inoculated with azotogen.....			2,854.0

FIBRE

HEMP AND FLAX FOR FIBRE

To secure further data on the possibilities of fibre-production in this region a few simple tests were conducted in 1929. Hemp seed, secured from the Division of Economic Fibre Production, was broadcast at the rate of 56, 60 and 70 pounds per acre in duplicate plots on April 27. The seed was covered by drill disks and packed. Good stands were secured but the limited moisture available for the crop caused it to make only very moderate growth. The crop was mown October 25 and left on the stubble until the spring of 1930 to snow-ret. When gathered average yields of 3,326.5, 3,564.0 and 3,357.5 pounds of dry retted straw were obtained from the plots seeded at 50, 60 and 70 pounds per acre, respectively. Samples of the fibre were sent to the Division of Economic Fibre Production for analysis.

J. W. S. fibre flax was tested for combined fibre and seed yield. Duplicate plots at 84, 98 and 112 pounds per acre were broadcast by hand on summer-fallowed land May 22 and covered by the drill. Germination was irregular as all seeds did not reach the moist soil. Consequently the rate-of-seeding aspect of the test was lost.

The crop was pulled and stooked August 30 as the bolls were beginning to assume a brownish cast. Later the seed was pounded out and the straw spread on hay land to dew-ret. Before this took place winter set in. In the spring of 1930 samples of the fibre were sent to the Division of Economic Fibre Production for analysis. The entire test averaged 615.3 pounds of seed and approximately a ton of fibre per acre.

FIBRE FLAX FOR SEED PRODUCTION

Another seeding, with plots at 1 and 2 bushels per acre, was designed for investigation of the commercial possibilities of fibre-flax seed production. The test was drilled May 21. Germination was even and stands uniform. Some hand-weeding was necessary. The plot sown at 2 bushels per acre was the thicker but not in proportion to the seed sown. Following a severe windstorm, which caused considerable shattering, part of each plot was cut September 11, but it was not expected that the plots were mature enough to produce their maximum yield. A second cutting was taken October 24 after the crop had been snowed under and further exposed to shattering winds. It was impossible accurately to estimate the loss from either cutting.

HORTICULTURE

VEGETABLES

A prominent feature of the early spring was the prevailing winds. Exposure of certain parts of the garden area may have given the wind a chance to dry out and chill the soil unduly, also to beat tender seedlings about. Early sowings made poor stands, particularly of onions, carrots and parsnips. The copious showers that followed ensured a better growth from later sowings. The season proved unsuitable for corn. While in 1928 eight hundred ears were gathered, in 1929 only about one hundred were usable. Cabbage and celery, however, showed up better than for some years.

ARTICHOKE.—Burbank's varieties were sown but frost came too soon for them to furnish good results. None of the Burbanks have wintered over at the Station. The Jerusalem variety has proved itself suitable.

ASPARAGUS.—The planting of 1916 still affords an early delicious supply for the table, the first tips being cut on May 12. The following four varieties are utilized in the three-, two-, and one-year-old plantings, viz. Giant Argenteuil, Giant Washington, Mary Washington and Palmetto.

BEANS.—It proved an off year for beans. From lack of moisture the stands were meagre. The first picking was on August 19. Stringless Green Pod was in the lead and seemed much the best for such a season. Bountiful (C.E.F.) was a good second. From Davis White Wax and Masterpiece the results were negligible.

Broad beans failed to reach the usable stage.

In Pole beans, Scarlet Runners made healthy growth and produced the usual long pods. The others were a comparative failure.

BEETS.—With one exception the final yield of the fourteen varieties was fair. The size was uniform and the shape symmetrical when they were taken up on September 30. The Improved Dark Red (Webb) has been quite a failure now for three years.

BORECOLE OR KALE.—The Tall Gem (McDonald), and Dwarf Green Curled varieties each produced handsome, vigorous plants, but there is no local demand.

BRUSSELS SPROUTS.—A quantity sown in the hotbed as early as April 17 and transplanted in good time, failed to mature, while in the variety test very few sprouts matured. Paris Market gave none; Improved Dwarf had only 5 per cent; Dalkeith 10 per cent, and Amager Market 15 per cent.

BROCCOLI.—Sown in the hotbed April 17 and transplanted to the open June 10. Seven good plants of Nine Star variety from Curtis were all that could be desired in growth. They were 2 feet high and spreading in proportion. This is a vegetable which is little known and for which there is no call. It failed to head this season.

CABBAGE.—Eighteen varieties were sown in the hotbed, April 27, and afterwards transplanted to the open. The season proved favourable for the cabbage family.

As is frequently the case the Copenhagen Market leads. The Enkhuizen Glory, through a defective stand, is considerably down in the yield table. Amager Ballhead, usually the best winter cabbage, is lowest, several of the heads not solidifying. On the other hand, Succession, which often fails to head firmly, gave a complete stand of fine, firm cabbages.

CAULIFLOWER.—The three varieties sown in the hotbed April 27 and transplanted to the open, produced better results than for some years. The first was used on August 15.

Snowball, with only three-quarters of a full stand, stood second in yield.

CARROT.—The eight varieties which were sown early failed to germinate well and none of them presented a full stand.

CELERY.—On April 17 the following four varieties were sown in the hotbed and on July 5 were set out in a trench, the plants being spaced six to seven inches apart: Paris Golden (James), Golden Plume (McDonald), Easy Blanching (Dreer), and Golden Self-Blanching (McDonald).

A difficulty has been experienced in the hotbed in securing an even germination and growth in the north and south sides. The north half is usually a failure while the south half furnishes good plants. The north half being more exposed to the sun may be drier than the other.

The trench where the varieties were set out was flooded twice, once with heavy showers and a second time at the September snow storm. The water was soon let off yet from the latter flooding the soil in the trench remained quite sodden.

The results were poor in each variety, but the Golden Plume produced much the largest plants, while Easy Blanching and Paris Golden were the poorest.

In a blanching experiment the Golden Self-Blanching variety was used, thirty plants in a trench, thirty on the level and thirty in boards. Those set out on the level and those in boards became far superior plants to those in the trench. There was possibly three times the development. Many of the second and third lots were 18 inches high and a few 20 inches, but those in the boards were the best blanched of the three.

Another cultural test was laid out, called the Storing test. The Easy Blanching was used, fifteen plants to be stored before frost, fifteen to be stored after slight frost and fifteen after a heavy frost. These were in a trench and did not develop well. However, they were stored to be sampled at Christmas.

CITRON.—This vegetable was a complete failure owing to an early frost.

CORN.—Nineteen varieties were sown on May 11, in quadruplicate rows of 14.52 feet each. It proved an off year for corn. Germination was poor. This was most noticeable in Banting and Malakoff. Pickaninny was far from perfect. Of the nineteen varieties only four produced usable ears. Early Alberta, a flint corn, as in 1928 was the most precocious and produced more ears than any sweet corn. A variety called Gold Nugget, received from North Dakota Agricultural College, had strains A and B. These were second, exceeding Pickaninny and Banting in earliness and yield. The ears also were larger. Alpha was almost ready for use when the frost came.

CUCUMBER.—No great success can be reported from the five varieties sown on May 22. Giant Pera, usually standing well in point of yield, produced nothing this year. Of the other four, Snow Pickling led by a considerable margin. Early Russian and Prolific were fair.

EGG PLANT.—Four varieties, Extra Early Dwarf (Wills), Black Beauty (Graham), N.Y. Purple (McDonald), and White Round (Herb), were sown in the hotbed on April 27 and transplanted to the open on June 10. The growth of most of the plants was fair but there was little bloom and no fruit. They were ruined by frost on September 5.

HERBS.—Pennyroyal, thyme, marjoram, hyssop, sage and rue, though not in a well-drained position, made fair growth.

HORSE RADISH continues to thrive.

KOHL RABI.—The White and Purple Vienna were planted with the usual success.

LETTUCE.—Nine varieties were sown on May 1, but like all the early sowings, were handicapped by the conditions; yet Iceberg and Improved Hanson furnished some fine heads. Grand Rapids holds its place as a leaf lettuce.

MUSK MELON.—On May 22 five varieties were sown, but scarcely produced bloom.

ONION.—On April 29, in quadruplicate sets twelve varieties were sown on a somewhat dry knoll exposed to the sweep of winds. The tilth of this area was not of the best, it having recently been brought into the garden area.

From this combination of causes the onions were almost a complete failure. Yellow Globe Danvers (C. E. F.) gave the highest yield, though this was at the rate of only 2,099 pounds per acre.

Winter onions are easy of propagation and provide usable greens quite early. A clump may be divided into ten or more to set out for the succeeding year.

PARSNIPS.—Germination was poor and stands were very imperfect for the three varieties sown on April 27. Improved Guernsey had to be reseeded and then overtook the others in point of yield, giving 2,833 pounds per acre, while Hollow Crown gave 2,333 pounds and Dobie's Select 2,250 pounds per acre. They were of fair size and good quality.

PEAS.—Of the 23 varieties sown on April 26 a few, as Pioneer, Gregory Surprise, McLean Advancer (Ferry) and No. 6 Invermere, failed to make complete stands.

The first picking of green peas was on July 15 from Gregory Surprise. Three days later, besides Gregory Surprise, the Thomas Laxton, Pioneer and American Wonder furnished a good supply. Picking continued at intervals into September—upwards of a month and a half.

The later varieties had the better chance. This is noticeable in the varieties or strains from Invermere, which appear to be of the Lincoln type. The pods are a good length, curved, and packed with from eight to ten large peas. A strain received from Mr. H. Ripley, of Judah, had not enough seed to make complete comparison with the others. It was an excellent pea, but came in about three weeks behind our earliest.

PEANUTS.—Germination was poor in the four varieties sown. Blossoms failed to appear and frost destroyed all the peanuts on September 5.

POTATOES.—A fertilizer test and the propagation of disease-free stocks comprised the potato work. Incidental to the former a comparison of five varieties is possible. The test was conducted in duplicate on land that had been sown to a broadcast stand of alfalfa in 1923, and had been broken in 1928. The spring-tooth cultivator proved to be only partly effective in ridding the area of persistent plants. Hand-weeding was resorted to after the potato crop was well advanced. The test was planted on May 11 and emergence was normal. June precipitation proved inadequate to make up for the extremely dry condition of the subsoil, and the more precocious varieties received a setback by lack of moisture and windy weather. The later varieties were not so seriously affected. Since the varieties were planted end to end in two continuous rows, the yields as listed may indicate only approximately their relative merit. The latest variety, Gold Coin, gave the highest yield but not the best table quality.

POTATOES, VARIETY TEST, BEAVERLODGE, 1929

Variety	Yield per acre	
	bush.	lb.
Mitchell Excelsior.....	264	15
Bliss Triumph.....	225	20
Gold Coin.....	310	30
Irish Cobbler.....	220	30
Early Rose.....	208	0

Sixty disease-free units of the previous season were again planted in isolated areas. For the most part there was sufficient vigour of growth to permit

careful examination. Very few were found to be diseased and the most typical of the remainder were noted for further propagation.

PUMPKIN.—Pumpkins were represented by two stocks of Connecticut Field (McD.), viz., Beaverlodge-grown and new seed, and also by four strains of Sugar Pumpkins. Two hills were allotted to each.

The fruit had nicely begun to ripen when frost necessitated its gathering. Most were ripened inside and some fine pumpkin pies resulted.

The Sugar pumpkin is much smaller in size than the field pumpkin, but the pies are all right.

RADISH.—French Breakfast (Graham) Scarlet White Tip (Graham) and Saxa (Rice) were sown on May 12. Germination was only fair but each variety yielded good radishes. French Breakfast is always good and Saxa, a recent acquisition, is to be recommended.

RHUBARB.—Again the seed of Ruby and Royal Albert was sown but the ground proved to be not well drained so the new plants were unequal to those of former years. From the old plantation the first stalks were used on May 14.

Ruby rhubarb forced by placing a box over the plant, was, by May 23, three times the size of adjoining plants.

Of the two varieties, Royal Albert and Ruby, the latter is the more attractive. From its performance here and reports from Ottawa, Ruby is recommended above all others as superior for combination of yield, quality, colour and flavour.

SPINACH AND SWISS CHARD.—The four varieties of the former and two of the latter furnished good plants, but scarcely equal to those of former years.

SQUASH.—Twelve varieties were planted May 22 in two rows of hills eight feet apart, giving two hills for each variety seven feet apart in the rows.

From Golden Hubbard (0-11014) Acorn (Buckbee) Des Moines (Stokes) and Perfect Gem, no fruit was gathered. In Long White Bush Marrow one hill did not germinate. The other yielded 17 pounds 14 ounces. English Vegetable marrow, as is frequently the case, gave the best results, with 40 pounds 8 ounces. Summer Asparagus squash, producing a green fruit closely resembling the marrows, is more prolific, though smaller than they. It gave 31½ pounds. Golden Hubbard (McDonald) with some good specimens, came next, yielding 21 pounds. Results were not so good as in some former years.

AN EXPERIMENT IN THE TRANSPLANTING OF TENDER VEGETABLES

On May 20, squash seed was sown in loose soil in berry boxes, and on inverted sod, all in the hotbed. Two plants of each, out of the four planted, were found to be fairly even when transplanted to the open on June 25.

TOBACCO.—A number of seedling tobacco plants were sent from Summerland, B.C., to determine their seed-producing capacity here. About twelve plants of Halley's Burley variety were set out on June 6. Some soon succumbed, but others made vigorous growth, attaining a height of from 2½ to 3½ feet. Frost, however, came too early to allow them to blossom perfectly.

TOMATO.—On April 23, thirty-four varieties of tomatoes were sown in the hotbed, being afterwards transplanted to rows 12 feet long, quadruplicated. The rows were spaced 2 feet apart. Heavy winds prevailed at transplanting and afterwards, abusing the plants considerably. The frost of September 5 blackened them somewhat, though very little injury was observed on the fruit. Heavier frosts precluded general ripening and the tomatoes were picked green. As far as the notes go the following were in the lead in point of earliness:—Viking from

N. Dakota Agricultural College, Avon Early (Ferry) Select Earliana (Moore) Australian and Penn State Earliana (Burpee), while colour was showing in Sunnybrook Earliana (Burpee) Canadian (McKenzie) and Alacrity x Earlibell.

Australian, a new variety at this Station, is considerably in the lead. The Viking and Fargo, leading in 1928, are again well up. These two varieties have been introduced by North Dakota Agricultural College. The Canadian (Rice), one of the best at Ottawa, was originated at the Ontario Agricultural College, Guelph, Ontario, and is of the Earliana family.

A STAKING TEST WITH TOMATOES

A staking experiment was set out to ascertain the comparative earliness and yield from vines staked versus not staked. To the observer those not staked were the more advanced in point of ripeness. Through an oversight, the fruits of this test were not picked when the variety test was gathered, hence were caught with a severe frost; consequently yields could not be taken.

STARTING IN CANS

Five Alacrity and five Success plants were placed in cans in the hotbed on May 23, and, when grown, transplanted to the open. These were observed to have some advantage over others in size of plant and in earliness, but the advantage was not marked.

DATE OF PLANTING VEGETABLES, 1929

What is the best time to sow the common vegetables? Weekly plantings were again made to test this point.

In the following table, 100 indicates the highest yield of each respective vegetable. The yields of the others are in proportion.

PERCENTAGE RATINGS OF YIELD FROM DIFFERENT DATES OF PLANTING VEGETABLES, 1929

Kind of vegetable	First date, April 20	Second date, April 27	Third date, May 4	Fourth date, May 11	Fifth date, May 18	Sixth date, May 25	Seventh date, June 1
Peas.....	88	100	91	57	58	32	54
Corn.....	78	100	56	0	0	0	0
Squash.....	36	80	67	91	100	49	60
Pumpkin.....	6	9	85	100	60	66	39
*Parsnip.....	55	17	90	34	72	59	100
Carrot.....	18	17	15	21	61	67	100
Bean.....	0	38	16	54	85	51	100
Radish.....	75	100	100	100	100	100	75
Lettuce.....	80	30	5	15	100	100	100
Onion.....	0	10	20	40	50	50	100
Beet.....	63	54	43	19	63	68	100

*In parsnip, Guernsey was substituted for Hollow Crown in the last sowing.

Besides the above, cabbage and cauliflower were also sown, but it was an off year for outside sowing of these vegetables. Nothing resulted down to the fifth date. In the sixth there was about half a stand and the seventh was complete. It will be seen that the majority of vegetables this year are best in the late sowings. The first sowings were poor in several instances, notably in onion, bean, carrot and pumpkin.

Only the early-planted corn amounted to anything in production of edible ears, since there was not time for the others to mature ahead of the light frost which arrested maturity somewhat on September 5.

PROTECTION FROM EARLY FROSTS

Project 637 to determine the advantage of protection from early frost was laid out. The rows of each of seven vegetables were 20 feet long, and it was decided if necessary to protect five feet with Hot Kaps, five feet with plant protectors and five feet with newspapers, the other five feet to have no protection.

As there was no injury from frost in the spring of 1929, the information sought was not forthcoming.

PRE-SOAKING VEGETABLE SEED. (Project 654.)

Eleven of the common vegetables were used. One row was sown with unsoaked seed, another with seed soaked one day, another with seed soaked two days, and another with seed soaked three days. The whole test was seeded on May 15.

The germination was very poor in some vegetables, notably in beet, parsnip, carrot and radish, and only fair in onion and corn. Thus the results are unreliable.

The non-soaked and one-day-soaked are clearly better than those soaked two days or three days, and between the former the results are comparatively even, with the balance tipping toward the non-soaked. In 1928 there was considerable advantage from soaking one day. The surface soil was quite dry this year when seeding was done and it is possible that the soaked seed failed to make sustained progress, and if so it may have suffered in consequence. The explanation is, however, purely speculative.

MULCHING VERSUS CULTIVATION

The use of mulching paper as a substitute for cultivation in keeping down weeds has received attention of recent years. In some instances the mulching method has been claimed to have produced earlier and more vigorous growth of many inter-tilled crops than that obtained by clean cultivation.

In a district where cool, dry, windy weather often retards germination and early growth there seemed some prospect that the mulch paper might be of advantage in the kitchen garden, hence tentative trials of cultivation substitutes have been conducted at Beaverlodge.

In 1929 a simple project was laid out in which Thermogen paper and Hot Kaps were to be used against bare cultivation. Thermogen is supposed to be a black asphalt paper. (Tar paper is not satisfactory.) Hot Kaps are tough, tissuey dome-shaped covers placed over the individual plants and pressed half an inch or so into the ground by a special tool, soil being placed on the upturned edges to hold the Kaps in place.

Nine kinds of vegetables were each given the three comparative treatments. Perfectly straight rows were marked, and in those sections where seed rather than transplants were called for the seeds were sown at once. Label stakes one inch wide marked the respective sections of the rows. Each section was seven feet long.

The Thermogen paper was laid down along these stakes, gaps an inch wide being thus left over the rows of seed. Cabbage, cauliflower and tomato plants were started in hotbeds and transplanted later into the inch-wide space between the edges of Thermogen. Potato sets were likewise planted in the gaps between the edges of the paper.

In the Hot-Kap row no protection was given until the seedlings had emerged, at which time Kaps were placed over the plants. Cabbage, cauliflower and tomato plants in this row were covered with Kaps when set out. The Hot-Kap row was cultivated on the area not spanned by the Kaps. When the plants were large enough to require it the Kaps were slit open.

The check row was treated in the usual way and given clean cultivation.

At successive dates observations were made as to the comparative growth of the plants variously treated. Finally some of the crop was weighed.

Hot Kaps brought the plants on rapidly at first, but they soon outgrew their protection. Thermogen mulch paper kept down the weeds, except in the inch space along the row, and thus spared the expense of cultivation.

Cucumber, carrot and cabbage grew better under Kaps than between mulch paper, though in carrots the paper won out in the finish. Squash, tomato, beet and potato seemed to do better in the Thermogen row. Both capped and mulched rows were on the whole considerably ahead of the check, even although it happened to be an outside row. Other things being equal, an outer row is considered to possess an advantage in that it may draw moisture and plant-food from an extra width. Yet in the case of no vegetable except beets was the check row observed to have an advantage over either of the others.

The accompanying table presents for each treatment of each vegetable a percentage rating based upon observations at four successive dates, and also the final yield, where taken.

The cucumber fruits were very small and frost destroyed them. No tomatoes were gathered.

In the Hot-Kap row one cauliflower plant failed after another, until the gardener decided that no fair comparison could be obtained, hence yields of cauliflower were not taken. The onions made poor stands in all cases and at the last there was not an onion left in the paper row, though at the first note-taking on July 22 this row was judged the best of the three. It is doubtful whether there was a pound of onions from the whole test.

Yield data where obtained, did not in all cases support the summer observations. In beets a conspicuous reversal seems to have occurred. As late as August 27 the check row was judged twenty per cent inferior to the Thermogen row yet according to the records it finally yielded almost twice as much, turning out an almost incredible crop. This may have been partly due to the character of the season, which was such as to favour crops that did not approach maturity too early. With due allowance for this, however, an error in weight-taking is suspected.

The gardener's general impression was that mulching might increase yields in a dry season, but that its advantage in a wet one was more debatable.

A seven-foot section of row is too small an area for fair comparison. Where only two or three plants can be accommodated, as in the case of squash, an excessive percentage of experimental error is represented by one or more gaps. Again, the two beets at the ends of a seven-foot row may draw from six or ten inches extra length, hence yields may be in some cases exaggerated.

The economy of either Thermogen or Hot Kap is decidedly open to question. A roll of Thermogen 130 feet long cost retail \$2.40 in Edmonton (express extra). This would be \$268.06 per acre, besides transport. Whether it would last two seasons is debatable. It spared the work of cultivation but required considerable time to lay it. The edges had to be covered with earth to make it remain in place, and it was found necessary to use stones as well. Altogether the cost is such that it could be profitable only with highly valuable intensive crops, or perhaps in limited garden areas badly infested with some such weed as stink-weed or shepherd's purse.

Hot Kaps entail more work than Thermogen and save less, since cultivation is still required. In 1929 they gave results less successful than Thermogen.

HOT KAPS, MULCH PAPER OR CULTIVATION

Comparing seven-foot sections of nine vegetable crops variously treated; appearance rated by relative percentages at four successive dates and final yields taken where obtainable; Beaverlodge, 1929

Crop	Treatment	Appearance at successive dates: 100 representing best in each case				Average	Weight per acre
		July 22	July 29	August 16	August 27		
							lb.
Cucumber.....	Caps.....	100	100	100	100	100	.....
	Paper.....	35	85-1	90-1	70	70	.....
	Check.....	85	85	95	75	85	.....
Squash.....	Caps.....	70	50	80	40	60	3,888
	Paper.....	100	100	100	100	100	11,018
	Check.....	40	40	50	35	41	6,870
Tomato.....	Caps.....	90	90-	90-1	90	90	.....
	Paper.....	100	100	100	100	100	.....
	Check.....	90	90	100	85	91	.....
Cauliflower.....	Caps.....	90-1	90	85			.....
	Paper.....	100	100	100	not fair		.....
	Check.....	60	75	85	probably		.....
*Beets.....	Caps.....	95	95	80	80	87	22,814
	Paper.....	100	100	100	100	100	39,406
	Check.....	60	50	70	80	65	77,775
Onion.....	Caps.....	95					.....
	Paper.....	100					.....
	Check.....	5					.....
Carrot.....	Caps.....	100	100	85	80	91	17,629
	Paper.....	60	95	100	100	89	19,703
	Check.....	50	60	50	50	52	14,518
†Potato.....	Caps.....	80	90	90	90	87	31,110
	Paper.....	100	100	100	100	100	31,110
	Check.....	85	88	100	75	87	27,480
Cabbage.....	Caps.....	100	100	100	100	100	50,942
	Paper.....	95	96	90	80	90	40,443
	Check.....	80	85	90	90	86	40,637

* Accuracy of weight-taking questioned by Superintendent.

† Through a misunderstanding the Kap and paper rows of potatoes were weighed together. They had been considered about equal.

NOTE.—In the table the designation -1 indicates that one plant was discovered missing on that particular date of observation.

FRUIT

CURRANTS

Besides the results of the 1916 plantation it is gratifying to report yields of the first fruits of the 1927 and 1928 plantations of stock, all, with one exception, from Morden Experimental Station. These latter have made healthy, satisfactory growth and have wintered well. The only loss of bushes was two of the Perfection red received in 1927. It was thought that a pile of coal ashes near them adversely affected the soil.

In spite of three applications of Black Leaf 40 the aphid was very much in evidence.

The 1927 plantation above referred to is arranged in three sets of ten varieties each, all black currant. The second has a row of black currants, six sets of three varieties each. Next west are two rows of red currants. Two sets of eight varieties each are at the south ends of the rows. These have been compared in this report. There are two other sets not included on account of an error in the planting of same.

RED CURRANTS (1916 PLANTING), 1929

Thirteen years' crops. Average per bush each variety

Year	New Red Dutch	Cumberland Red 0-492	Victoria Red	Fay Prolific	Wilder
	lb.	lb.	lb.	lb.	lb.
Aggregate 1917-1919.....	5.08	6.50	4.58	0.04	0.00
1920.....	7.00	4.83	6.17	0.30	0.00
1921.....	12.04	9.21	10.46	2.64	0.58
1922.....	9.42	4.88	5.31	1.79	0.15
1923.....	4.22	1.43	1.25	0.43	0.20
1924.....	15.60	12.78	15.60	5.07	6.77
1925.....	8.65	6.20	5.90	2.82	3.40
1926.....	6.67	8.44	12.34	4.17	7.67
1927.....	11.82	7.89	9.14	2.02	6.05
1928.....	9.58	7.18	8.00	3.86	2.92
1929.....	14.78	11.43	14.56	5.26	5.35
Average of 13 years.....	8.07	6.21	7.18	2.18	2.55

WHITE AND BLACK CURRANTS. (1916 PLANTING), 1929

Thirteen years' crops. Average per bush each variety

Year	Large White 0-551	White Cherry 0-356	Collins Prolific 0-565	Topsy 0-568
	lb.	lb.	lb.	lb.
Aggregate 1917-1919.....	1.29	0.73	2.38	3.07
1920.....	0.17	0.83	4.33	6.33
1921.....	0.88	2.08	5.57	6.22
1922.....	1.63	1.50	0.29	1.24
1923.....	not rec'd	not rec'd	0.70	2.00
1924.....	11.05	12.19	0.95	0.95
1925.....	4.74	2.95	3.30	3.85
1926.....	7.81	15.75	1.33	1.71
1927.....	6.28	9.08	3.18	1.43
1928.....	4.74	5.89	2.38	2.45
1929.....	7.14	10.06	6.82	8.15
Average 12 years.....	3.81	5.09	.....	.....
Average 13 years.....	.....	.....	2.40	2.88

GOOSEBERRIES

The bushes of the Oregon Champion continue their growth and increase of yield. There were 33 pounds 10 ounces picked from 4 bushes, averaging nearly 8 pounds 7 ounces per bush, or 12,255 pounds per acre, assuming that each bush drew from an area 5 feet by 6 feet. The plants were actually planted much closer than 5 feet but there are some gaps in the rows.

Besides the Oregon Champion four other varieties are represented in the gooseberry plantation, all set out in 1927, viz., Pearl, Red Jacket, Smith's Improved and Houghton, but while most are living they have not manifested the vigour of the black currants planted near them at the same time. They have killed back considerably and have not yet come into bearing.

SASKATOONS

The two hedges of saskatoons, one pruned, the other unpruned, continue to attract the favourable attention of visitors and resolutions are made to duplicate them at home. The long stretch of white blossom in spring is a

gratifying sight. This bloom was nearly over by June 5. Fruit was ripening on July 24 and continued to be gathered from the pruned hedge until the middle of September. From the unpruned row, estimated as drawing from an area of nine square rods, there were picked $77\frac{3}{4}$ quarts, which means 1,382 quarts per acre, but not half were thus gathered.

The twelve White saskatoon bushes received from the Canadian Pacific Railway Irrigation Station at Brooks, Alta., through the courtesy of A. Griffin, Superintendent Operations and Maintenance, Engineering Branch Department of Natural Resources, in November, 1928, and set out in the spring of 1929, are all thriving.

STRAWBERRIES

On May 31, the first blossoms appeared in the early Dakota variety and it was not long till the whole patch was white with bloom. The first ripe strawberry was plucked July 2. The first systematic picking was on July 8. The last was on August 16. Results are meagre compared with the promise the bloom indicated.

For some years past the Station has been less successful with strawberries than have various other growers in the district using the same variety. Two possible causes are surmized. Early Dakota, the variety chiefly grown here, is either a selection or a cross of the wild strawberry, which it resembles considerably. Seedlings, tending to revert to the parent stock, often occur, many of these proving barren while most are inferior. Desiring to multiply a maximum number of plants for distribution, the Station for years left certain old rows that would otherwise have been ploughed up. It is more than probable that many inferior seedlings were thus introduced unsuspectingly into the general stock, causing it to "run out" so to speak.

The other surmise is that fusarium or other fungous diseases may have made inroads. A few such have been identified, though their virulence is as yet undetermined by the experts. For the past year or two, inferior or unhealthy plants have been persistently rogued from the plantation and a general improvement seems to have resulted, although some inferiority may still persist.

Among other successful strawberry growers are Mr. and Mrs. W. L. Brainard, of Brainard, Alta. In the spring of 1928, Mr. Brainard kindly supplied the Station with some plants of his stock, which is evidently the Early Dakota variety. They were set out alongside some Early Dakotas transplanted from adjacent beds, and exhibited superior vigour. From one row of the Brainard stock set out in 1928 the yield was 33 pounds $10\frac{1}{4}$ ounces, or 1,233 pounds per acre. Four rows of home-grown plants planted at the same time and to the same length, viz., 297 feet, produced 95 pounds $8\frac{1}{2}$ ounces or 876 pounds per acre. Another four rows, planted in a former year, yielded 74 pounds 14 ounces, or 757 pounds per acre. Thus the Brainard row in point of yield per acre is 41 per cent better than our 1928 plantation and 63 per cent better than the old planting. The former, of course, is the fair comparison.

The suggestion to leave the mulch on longer in the spring on the Senator Dunlap variety so as to save the buds from freezing was carried out, but results were the same—fine plants yet little fruit.

Out of a fine consignment of strawberries from Morden in 1927 of the varieties Portia, Glen Mary, Dr. Burrill, Kellogg Marvel, Easy Picker and Minnehaha, only a few plants remain of the Glen Mary, Dr. Burrill and Kellogg Marvel varieties. The Kellogg Marvel produces a very large, rough berry. Glen Mary fruit is also very large in appearance as of a pair growing together. The reason for the depletion of this plantation is thought to be that the location

has been exposed to the sweeping winds. A few plants of the Mastodon ever-bearing received from the Assiniboine Gardens, Winnipeg, are healthy yet and were in bloom in September, but on account of frost no fully ripe fruit resulted.

RASPBERRIES

The season proved favourable for this desirable fruit. Though there was considerable winter injury even to canes bent over and weighted down, enough wood survived to give a nice yield. The Herbert test row, 231 feet long, after some volunteer sampling, produced 209 pounds 9 ounces or 4,790 pounds per acre, compared with 3,171 pounds in 1928.

Two varieties, Newman, a spineless sort received from Ottawa, and Viking, from Vineland, Ont., set out in 1928, came into bearing this season. The earliest picking was on August 3, and this continued in each variety down to September 17. A nice quantity was gathered from Newman on September 30, after the early snowstorm. The fruit is large in each but Newman bore somewhat earlier and the fruit was judged of better flavour.

Another interesting variety, called Adams 87, received from Winona, Ont., in 1927, is being tested. The fruit, though of good size, is not estimated equal in flavour with Newman, and as yet the yield is quite inferior. For this season Adams 87 produced at the rate of 440 pounds per acre. Conditions, however, are not identical with those in either of the other varieties.

A disease called Spur blight has made its appearance in the Herbert stock. Many canes were taken out and destroyed.

APPLES

For the first time, Beaverlodge Experimental Station is able to report not only blossom but fruit. Four trees were a picture in apple-blossom time, and to see the fruit hanging on the trees was a great attraction to the numerous visitors.

An Osman crab had altogether 41 apples, 31 of which together weighed 16 ounces. Two Florence crabs received from Morden in 1926 bore a good



The first apples ever ripened at the Beaverlodge Sub-station. Osman and Florence crab.
(Photo by W. D. Albright)

supply. From one of these 21 apples weighed $14\frac{1}{2}$ ounces. This tree was a curiosity on July 5. One limb was loaded with these apples, then about the size of marbles. At the same time another limb was out in full bloom. Some small fruits set from this much-belated bloom, but these, of course, did not mature. An Olga, also received from Morden in 1926, bore a good quantity of apples, but they were stripped off during one of the summer picnics.



Osman crab apple tree in bloom, June 4, 1929, four years after transplanting on May 25, 1925. (Photo by W. D. Albright)

PLUMS

Plum trees did not suffer so severely in winter as in many years. Eleven of these, from Boughen in 1922, of *Prunus nigra* and *Prunus americana*, were fairly well covered with bloom, which emitted a delightful fragrance. On some of them a substantial supply of fruit set, especially on the lower branches. A few were fairly well laden. Some trees ripened their fruit well, others not at all. From one *nigra* 8 pounds 5 ounces were used, proving of good flavour.

Among the 1928 plantings of stock from Morden, of the varieties Crec, Opata, Waneta, Kaga, Oka and Assiniboine, only one tree has died out of twenty-seven received. Of the six varieties, the Opata is the healthiest. Three of this variety bloomed in the spring and fruits set on one to the number of six.

Six Tom Thumb cherries received from Morden in the spring of 1929 are thriving. Three of them had small clusters of fruit this year. It coloured but did not quite ripen. The six *Prunus tomentosa* received from Morden at the same time are also doing well.

SANDCHERRIES

Winters are severe on Select and Champa, but injury is not noticeable on Hudson Bay, this being of a procumbent nature. Hudson Bay and Champa bore fairly heavy crops of fruit. Select was not so well laden as formerly.

GRAPES, PEARS, AND CRABS

Besides all the foregoing, over 100 native grape vines have been planted, all making healthy growth. The ten Amur grape vines, also from Morden, are doing well. A pear tree (*Pyrus ussuriensis*), said to be the hardiest of all the pear family, was received from F. L. Skinner, of Dropmore, Man. It still survives and has made fair growth.

Six Hopa crabs received from Brooks in the fall of 1928 and set out in spring are all thriving.

ORNAMENTAL SHRUBS AND TREES

FLOWERING SHRUBS

Every season intensifies the interest and satisfaction in this division of the experimental work. The Station has been enriched this year by valuable donations sent from the Canadian Pacific Railway Irrigation Station at Brooks, Alta., through the courtesy of A. Griffin, Superintendent, Operations and Maintenance, Engineering Branch, Department of Natural Resources; by the Central Experimental Farm, Ottawa; and by the Dominion Experimental Station at Morden, Man. A limited lot of hardy material was obtained from F. L. Skinner, of Dropmore, Man., and a small personal order was placed with the Prairie Nurseries, Estevan, Sask.

Siberian flowering almonds opened the blooming season on May 21, and by the 24th were a mass of pink.

Spiraea Van Houttei, set out a year ago in a situation where deep snow banks covered it after Christmas, wintered well and bloomed profusely on June 1, and was photographed in full bloom June 23. *Spiraea arguta* (snow garland), set out in 1916, and conceded to be hardier than the Van Houttei, bloomed about the same time as the latter.

The yellow flowers of the Siberian pea tree (*Caragana arborescens*) appeared early in June and on June 10 the Tartarian honeysuckle was well out. A few white-flowering Tartarian honeysuckles afforded variety among

the prevailing rose-pinks. By June 13 the mixed row of earaganas and honeysuckle were a full-bloom contrast of yellow and pink.

Mountain ash was blooming on June 5. Its red clusters of fruit afforded a rich dash of autumn colour.

Cinquefoil, set out in 1928, commenced to bloom that season and recommenced this year on June 15, continuing throughout the summer and late into the autumn, the young bushes being continually clothed with yellow petals.

On June 15 the Common lilae (Condorcet) had fully unfolded its effective mauve spikes, followed by the Georges Bellair. The Chinese lilae (*Syringa villosa*) was not full until June 27.

The white flowers of *Clematis recta* and the yellow of *Clematis tangutica* were well out on July 8.

On July 3, ninebark, planted 1928, displayed a bloom similar to that of spiraea.

The graceful, hardy tamarix had good colour on July 18. At the same time Elderberry was well out.

Around July 24, the spring plantings of *Spiraea billardii*, *froebeli* and *sorbiifolia* commenced to bloom, the first being most advanced. They continued throughout August.

Of shrubs received from Morden and Ottawa in 1928 the following, although not yet blossoming, are thrifty and growing well: *Sambucus*; Salt bush (*Habitmodendron*); Lead plant (*Amorpha fruticosa*); Niobe willow; Golden and Alpine currant; *Viburnum lantana*; *Celastrus orbiculatis*; Japanese barberry (*Berberis thunbergii*); Canoe birch and Hawthorn (*Crataegus*).

Mention may be made of some shrubs whose bark lends colour. Such are the Red dogwood (*Cornus alba*); Variegated dogwood (*Cornus alba variegata*); Golden willow; Britzensis willow (*Salix alba britzensis*); Russian olive (*Eleagnus angustifolia*); Silverberry (*Eleagnus argentea*) and Buffalo berry or bulberry (*Shepherdia argentea*). The last three are of a gray or silvered appearance. All these shrubs with coloured bark afford relief from the prevailing monotonies, and by contrast render the shades of summer green and winter gray more pleasing to the eye. All those mentioned are fairly hardy and vigorous, with the partial exception of the Britzensis willow and the Russian olive, which appear to be half-hardy.

ROSES.—One has only to watch the numerous visitors when among the roses to know what is the paramount attraction. There is something in a full-blown rose that has a great appeal to the human family. To find that roses can be raised in this latitude is a pleasant surprise to many. Their hardiness, their promptness in coming into bloom—for many bushes bloom the year of setting out—and the long blossoming period of the best of them make roses a desirable asset in the garden. For over four months, June 13 to October 17, roses were blooming, one kind after another. The first to make a display was *Rosa spinosissima* or Scotch rose. It bristles with spines. Its white blooms are single. This white colour began to show on June 13, and on the 27th twenty roses covered one small bush, but they were soon gone.

The Red-leafed rose (*Rosa rubrifolia*) just a little later than the foregoing, had but a single flower. The bushes of this variety make rapid growth. Planted only in 1928, the highest is now four feet tall. Their red foliage is a pleasing contrast amid the prevailing green.

Two full-blown roses adorned the Agnes, an origination of the Central Experimental Farm, Ottawa, being a cross of *Rosa rugosa* with the Persian Yellow. This hardy rose continued blooming until July 24.

On July 13, a Harrison Yellow disclosed its colour.

Half a dozen Hansa roses were received from Morden in 1929 along with one purchased by the Superintendent from Estevan. All were blooming on July 24 and continued late into October. The roses appear to be semi-double, $3\frac{1}{2}$ to 4 inches in diameter.

Cabbage roses were blooming from July 29 through August, being about $3\frac{1}{2}$ inches in diameter.

Moss roses failed to blossom.

The bloom of F. J. Grootendorst is small, a full red $1\frac{1}{2}$ inches across.

Very few among the 1929 plantings have died, the main regret being the loss of a Sir Thos. Lipton.

The most intense interest centred in three bushes, a Hugh Dickson, a General McArthur and a Souvenir de Claudius Pernet, all planted in 1927 and blooming for the third season. The first of these to present a full-blown rose was General McArthur on July 11, the colour red. Then on July 17 the broad, cream, fragrant roses of Souvenir de Claudius Pernet appeared. Hugh Dickson had six full red blooms on July 24. The last named continued blooming through August and September into October; the other two did the same except for a rest period intervening. The heavy snow storm of September did them comparatively little damage. The top branches of Hugh Dickson were touched by frost. There was still bloom on each on October 17, but frost was now showing some effect on buds and flowers, and a hard one on the morning of October 18 pretty well finished them though some buds showed colour until October 24. Thus for over three months these three roses one or another or all together were a constant source of delight.

The foliage of Hugh Dickson and of Souvenir de Claudius Pernet was somewhat marred by the development of what is called Leaf Spot, caused by a fungus. While the damage is not considered serious, yet the appearance is injured and many of the leaves fall. All that was done was to gather these fallen leaves and burn them. It will be necessary to treat in the coming year by dusting with 9 parts of powdered sulphur to 1 part arsenate or lead.

DECIDUOUS TREES

About a hundred oaks (*Quercus macrocarpa*) raised from acorns are all growing well, as are also the half dozen Shingle oaks (*Quercus imbricaria*). Then a row of Green ash (*Fraxinus lanceolata*) has become robust.

POPLARS.—All the poplars seem to thrive. There is one specimen of North-western poplar growing well. This and six Chinese poplars were introduced in 1928. The latter manifest the same vigour as all the other poplars. One peculiarity noted was that while all the others dropped their leaves early, the Chinese retained theirs, green as ever, until late fall. Their leaves also are rounded in form, not elongated. The Russian poplars in the windbreak are attaining ample proportions. They are possibly the most rapid growers of all the trees. Balm of gileads, of the same family, are conspicuous for hardiness, ease in transplanting and vigorous growth. A couple of basswood (*Tilia americana*) still hold their own.

ELMS.—Two rows of elm seed (*Ulmus americana*) were sown in 1928. Many hundreds germinated but the winter was too severe for most. Only 31 remain, but that is something. Five elms set out a few years ago were attaining a good height. Three of the best of these were seriously injured, two by tying of the trunks too tightly. Succeeding growth left the places where they had been tied smaller and weaker, and the wind snapped them off. Another handsome young elm had the trunk broken in half by the weight of snow in the September storm.

MAPLES.—In the foremost place among the maples stands the Manitoba maple or box elder (*Acer negundo*). Notwithstanding some winter injury the many rapid-growing trees of this species are an acquisition. Ginnalian maple (*Acer ginnala*) is decidedly ornamental in autumn when its foliage has become a flaming red. The Silver maple (*Acer saccharinum*) is represented by four specimens of healthy development and symmetrical form.

BIRCH.—(*Betula*) The various species of *Betula* are proving hardy. Very few signs of mortality are seen in this plantation and that mortality is almost entirely confined to the Canoe birch, three or four of whose trees have succumbed. Six little birch trees (*Betula pubescens*), were received from Dropmore, and seven from Morden (name not given). Besides these there came from Morden 48 seedlings grown from seed from Arnold Arboretum, which seeds J. F. Rock collected in Western Asia. Most of these are making good. The highest is 4 feet, the lowest about 12 inches. It is interesting to note the difference in the leaves from the crinkled deep green one looks for in birch to a smooth plain leaf of a paler shade.

EVERGREENS

The growth of Scotch pine and white spruce is more noticeable each year, although actually the increase in height was somewhat less than for two or three years previous, owing presumably to dry subsoil conditions. Some of the spruce planted in 1919 when ten or twelve inches tall have attained a height of 12 feet. Many of the branches of the Scotch pine became brown at the ends but this seems not to have been serious, as none of the trees have died. Jack pines are thriving.

Of the two Norway spruce planted in the lawn one has succumbed and the other seems undecided. It retains some verdure still.

Of 100 *Picea borealis* and 100 *Pinus sylvestris* from Dropmore planted in the spring, about 75 per cent of the former are living and 75 per cent or more of the latter are dead. These were but tiny seedlings about three inches high.

Six Mugho pines were sent from Morden. Three of these survive but their existence is precarious.

The Bull pines and Austrian pines received from Ottawa and planted in 1928 are represented now by a single specimen of each.

A few *Arborvitae* were planted at the same time as the former. One American arborvitae (*Thuja occidentalis*) survives. Three junipers in the lawn are healthy and growing.

INJURY BY SEPTEMBER SNOW STORM AND FROST

The four-day storm of rain and snow which, setting in September 20, accumulated a total depth of ten or twelve inches of soft, slushy snow on the level, bore the full-leaved trees, shrubs and hedges almost or quite to the ground. Most of them were shaken two or three times and, thanks partly to this release, the majority straightened up later as though nothing had happened. Some breaking occurred, of course.

Notes taken about October 12 indicated that the following trees and shrubs were broken considerably:—

Apple trees, Buffalo berry, Silver maple, Ohio buckeye, some plum trees, chokecherry, elm, caragana, and Manitoba maple. Raspberries were laid flat.

Champa sandcherries frozen before ripe, sumac and grape vines frozen; some leaves of Virginia creeper frozen; Heartnut tops injured.

FLOWERS

The long and varied panorama of flower-bloom was opened by the modest but pretty row of blue from the small bulbs of *Scilla* on April 29. The floral scenes followed one another until October 25, and even then pansies, snapdragon, stocks and *linaria* persisted with considerable freshness. In fact, some of them bloomed well into November.

PERENNIALS AND BIENNIALS

TULIPS.—Tulips of the *Chrysolora* and *Keizerskroon* varieties presented their rich colours on May 20, followed by *Duchesse de Parma*, *Artus* and *Cottage Maid* on the 21st. These are all early single tulips. *Chrysolora* is yellow. *Keizerskroon* and *Duchesse de Parma* have considerable resemblance, a mingling of yellow and red. *Artus* is red while *Cottage Maid* mingles white and pink. On May 27 *Murillo* appeared.

The Darwins, always later but the best of the tulip family, made a fine array on June 3. There were *Clara Butt*, a rich scarlet, *Aphrodite*, a fine pink, *Angelica*, dark purple, and *Isis*, rich deep red. To these were added *Bartigon*, another fine shade of red, until 150 tulips were in full bloom at one time in the perennial border east of the Superintendent's residence. On June 21 the show was almost over.



Spirea Van Houttei planted 1928, blooming June 23, 1929. The bushes had been covered with snow banks during the winter. (Photo by R. E. Leake)

ICELAND POPPIES.—These appeared on May 21, almost as soon as the tulips, but, unlike them, continued their bloom until hard frost.

COLUMBINES.—These were full-budded on May 27. One variety having fine, purple blossoms with white centre, was in flower on June 3. The zenith was reached on the 22nd. Their freshness is retained longer if the dead bloom is cut off.

FORGET-ME-NOT (*Myosotis*).—The forget-me-not revealed its first modest blue flower on May 31. June 5 saw an abundance of blue colour in this the third year of bloom.

IRIS AND PEONY.—Through June the foliage of iris and peony developed rapidly. On June 26 twelve yellow blooms of iris were full in one border, while varieties Honorable, mostly yellow, and Mrs. H. Darwin, with white standard and streaked purple falls, were blooming in another. Besides these last two Loreley, Innocenza, Jacquesiana, Sherbet, Perfection, Prosper Laugier, Madame Chereau, Rhein Nixe, Deuil de Valery Mayet, Mithras and Camelot on July 8 displayed the best charms of the iris. When all others had faded, a belated bloom appeared August 24 on Mithras, having yellow standard and falls of streaked purple and yellow.

Peonies begin to bloom when irises are at their best. On July 8, four pink blossoms were fully opened, also four other very handsome ones with white outer petals, cream inner, with a dash of red at the heart. Special mention may be made of the bloom on July 9 on a single plant of Adolphe Rosseau, a lovely maroon. This is the only bloom from the planting in the fall of 1928, which included such choice varieties as Claire Dubois, Duchesse de Nemours, Festiva Maxima and Felix Crousse. The peonies commenced to fade on July 17.

LILY OF THE VALLEY.—Out of 12 roots of Lily of the Valley from Ottawa in May, 1928, but three survived. One of these displayed its graceful little white flowers during June.

DIANTHUS.—Among herbaceous perennials the family of pinks holds an important place. On June 21 White pinks were out. A row of *Dianthus deltoides* made an outstanding display with its mass of deep pink bloom. One of the pink family, Sweet William, with its tufts of varied colours, gave much delight.

PYRETHRUM.—On June 22 these flowers made a rich show. This desirable perennial is early and hardy, and blooms most of the summer. If allowed to go to seed the plants become repulsive, but by removal of the dead bloom their freshness is retained.

HOLLYHOCKS.—Some roots which had been wintered over in the cellar were planted on April 29. These had bloomed well in 1928 but the same roots were a disappointment in 1929. The plants in the border which bore such handsome flowers in 1928 and which were left out over winter gave the same results, but the hollyhocks sown late in 1928, the small plants transplanted in the fall, gave excellent results in 1929. This was puzzling until it was learned that at Morden, Man., hollyhock had a tendency to act as a biennial and gave best results from July seeding. The first bloom appeared on August 12. Then bud after bud burst until these stately plants were clothed in colour, some of them 7½ feet tall.

SOME ADDITIONAL PERENNIALS FROM MORDEN.—Perennials were received from Morden in the spring and planted May 22. Of these *Achillea (wilczk)* and *millefolia roseum*, *Iris (glomerata)* the Sedums and Ribbon Grass are well represented. Mortality was greatest among the Campanulas, only one of these blooming this year. The White Queen aster, though late, unfolded its flowers. Perennial phlox displayed its modest white bloom through September well into October. *Eryngium* had two good plants, one over 2 feet tall.

LILIES.—Lilies cannot be overlooked as they were a feature of the garden for the first time. Planted in the fall of 1928, 8 inches, 10 inches by 12 inches deep, they made good sturdy plants. *Lilium umbellatum* was much the earliest, the bloom appearing on July 6. On August 23 *Lilium canadense* had one bud fully opened and nine others to follow. Six full-blown lilies were noted on *Lilium willmotii*. On October 7 *Lilium tigrinum* was blooming well. This was eventually among the very last of the flowers to succumb.

DAHLIAS.—The frost-free season proved too short for dahlias grown from seed, but one variety was well in bloom when destroyed on September 5 and another was showing colour. Two cellar-wintered bulbs developed well on a raised bed east of the house and although unprotected by artificial means escaped the frost until late in September.

SWEET ROCKET AND DELPHINIUM made their usual display.



Perennial border of peonies and irises in bloom, and roses blooming or budded on July 13, 1929. Virginia creeper on the stucco wall of the house. (Photo by W. D. Albright)

SIBERIAN PERENNIAL LAVATERA.—One plant of this flower has graced the lawn for four successive seasons and has been an object of great admiration. Though growing from the roots each year, like hollyhock, to which it is akin, it becomes almost shrublike, covered with pink bloom. It has an advantage over the shrubs in that its blooming period is so much longer.

GLADIOLUS.—Though planted earlier than before, viz. on May 3, the season yet proved too short or too adverse for a complete display of this gorgeous flower. As usual, Maiden Blush was earliest and had abundant bloom on September 19. At the same time Prince of Wales, which has never failed to unfold its handsome flowers, was making a fine show. Argo had some good bloom though not equal to that of 1928. The red colour of Alice Tiplady was showing well. There were two white gladioli to bloom handsomely, White Giant and Albania, the latter received locally from Mrs. Geo. Finch, Wembley. The rich scarlet of Scarlano was missing this year. Baron Hulot as usual was too late.

ANNUALS

SWEET PEAS.—These flowers, so easy to grow, requiring so little care, but so delightful to young and old, should find a place in every home garden. In the two ten-rod rows which flanked the main flower garden the sweet peas were sown on April 27. After germination their growth was slow but steady till their

tips reached above the four-foot wire supports. Then they were two walls like a procession of colour framing in the numerous species and varieties of the flower family. Perennial sweet peas (*Lathyrus latifolius*) were early sown in the hot-bed and transplanted to each of the four sides of the sunshine recorder. They attained about a foot in height and were all healthy, but failed to bloom this year. Some choice perennial sweet peas received from Geo. Robinson, Sexsmith, were sown on July 16 in a cold frame, but this being so late no results can be reported.

BEDS.—Again the poppy bed at the front was a great attraction. The brilliant colours of *Eschscholtzia*, of the Shirleys and of the French *Ranunculus* poppy were happily blended. These were flanked by a row each of *calendula* and *linaria* as a border.

Another bed had as a background the deep green of hemp, the plants of which were 8 to 10 feet tall. In front of the hemp in semi-circular rows were the gladioli. The main body of the whole was made up of smaller beds judiciously arranged. There were two circular beds of *petunia*, then an ellipse of snapdragon (*antirrhinum*) in the centre. Though the flowering of these was slow it was gratifying in the end. The tall varieties were in the centre, the Tom Thumb outside and the intermediates between.

At the front was a circular bed of asters (*Queen of the Market*) with early and good bloom. *Kochia*, with its bushy green foliage, added grace. A row of *calendula* with golden and orange hue brightened up one side. *Clarkia*, which blooms early and late and blooms abundantly, was seen on either hand.

A bed of *linaria* was the earliest to make a display with its brilliant colours. This was self-sown. It was attractive throughout the summer. One may have a bed of this showy flower year after year just by digging it up and thinning out when the plants are growing.

Another bed composed of choice Vicks asters sprinkled with *salpiglossis* was gratifying to the eye.

Zinnias were rather disappointing. Their growth was so tardy and the first frost left them bedraggled.

Evening primroses, seed of which was received from Mrs. O. H. Johnson, of Beaverlodge, though not of the gorgeous kind, was yet pleasing.

Edelweiss produced fair plants but no flowers.

Mimulus was among the most attractive.

Phacelia, many plants of which were self-sown, furnished a good display with its blue flowers amid a foliage of pale green streaked and flanked with brown.

The flowers on the raised bed east of the residence were striking in their persistent blooming through October. The last note was on the 29th, "Frost of the preceding two nights about finished *nemesia* and *calendula*, but *phacelia*, pansy, stocks and snapdragon have greenness still and some bloom."

As a matter of fact they bloomed well for a week or two in November.

BEES

In the autumn of 1928 six hives of bees had been consigned to winter quarters, two in the east side of a quadruple out-door wintering case and four in the cellar of the Superintendent's residence. Of these four, two were quite strong, another was rather weak and the fourth consisted of two weak nuclei, brought together in one hive with a tight division board.

In all colonies excluders were used, top and bottom, to keep out mice. In all cases, folded newspapers were placed over the colonies to absorb moisture. The cellared hives were carried in on November 6; the out-door colonies packed on November 9, after having been fed sugar syrup to the saturation point.

Over the dual-colony hive a board was fitted to prevent visiting back and forth. The board became accidentally shifted during the winter and may have had something to do with the loss of the two nuclei through undue chilling. The other weak colony also yielded up the ghosts, leaving a fifty-per cent count of surviving colonies from cellar wintering. The out-door colonies both survived, thus reversing previous experience with the two systems.

SPRING NOTES

On March 14, 1929, the out-door bees were flying. By April 30 they were bringing in plenty of anemone pollen, so three of the hives were carried out of the cellar, the bees in the fourth one being a little too willing. Examination the next day revealed that one of the out-door colonies had brood on four frames, a fair amount of capped worker brood and enough bees to well cover about three frames. Its companion colony had three frames with some brood (including a certain amount of capped worker) and bees to cover perhaps three frames. One of the cellared hives had bees to cover six or eight frames and had one frame of brood. The remaining cellared colony was moved out the next morning and five days later was found to have several frames with eggs and brood in all stages; also enough bees to cover five or six frames. Thus, the two surviving cellar-wintered colonies emerged with double the strength of the out-door ones in adult population but with only a fraction of their strength in brood.

Throughout May the colonies built up well, but sacbrood was discovered on May 21 in one of the out-door-wintered colonies. This was afterwards controlled by natural agency, and on July 8 there was little in evidence. On May 20 the bees worked the Manitoba maple; on the 22nd the sandcherry. On June 3 the saskatoons were blooming.

All the colonies were supered June 4 with drawn combs containing a certain amount of old honey in granulated condition.

Not until June 24 was the wintering case removed from the colonies that had been quartered in it and the queen excluder taken from beneath them. The cellared colonies were protected until then by rough board shelters, which are found valuable for late-spring and early-autumn protection. On July 19 one of these two colonies was put on scales.

DOUBLE-STOREY COLONIES WITH BALCONY ENTRANCES

Upon the strength of a partially successful experiment in 1926, attempts were made to requeen, or in some cases to make increase, by raising brood frames above the honey supers, providing each upper-storey chamber with an independent "balcony" entrance and protecting the virgin to be later hatched here from the jealousy of the reigning monarch by having one queen excluder directly beneath the upper brood chamber and another directly over the lower chamber, in which the old queen was confined. Usually there will be several honey supers

sandwiched between the two brood chambers. Preferably each upper brood chamber thus segregated is furnished with a ripe or at least a well developed queen cell, though eggs will do if the time factor permits. The hope is that a virgin may hatch in the upper storey, leave the balcony entrance at mating time, return there and set up housekeeping. Sometimes it works. Something doubtless, depends upon conditions.

All four over-wintered colonies were treated in this way, two of them on July 24 and two others July 26. Half the colonies developed dual monarchies. In the other two cases the plan failed. The risk is not great since in case of failure the full bee strength is available to carry on with the old queen.

THE HONEY CROP

The honey yield was disappointing. There was only a small area of sweet clover in bloom nearby and the weather was not particularly favourable for in-gathering excepting on certain days in July. The best twenty-four-hour increase was 18.75 pounds on July 24, the second-best 15 pounds on July 18 and the third-best 13.5 pounds on August 6. During the four days July 16 a.m. to July 20 a.m. the average daily increase was approximately 8½ pounds. By months, the latter half of July registered an average daily gain of 5.16 pounds, August a total gain of 9 pounds or 0.29 pounds per day, the first half of September a total gain of 4 pounds or 0.26 pounds daily. On September 8 the twenty-four-hour net intake was 2.5 pounds.

On account of being all left on the hives until late in the season, the honey was quite well ripened but the yield correspondingly restricted by evaporation. A certain amount of granulation occurred, although less than in some previous seasons.

As the bulk of the honey was derived from sweet clover, the colour and flavour were good but, as in some former seasons, there was a distinct elusive flavour evidently attributable to some other plant. A quantity of the honey was bottled and sent to the Apiary Division for test. Two pails were likewise sent by courtesy of E. D. Prevost, Wanham, Alta.

A few sections of comb honey were fairly well filled, best results being obtained where the comb sections had been alternated with shallow extracting supers.

HONEY PRODUCTION PER COLONY, 1929

Colony	Sections comb honey	Extracted honey	Total honey yield
		lb.	lb.
201.....	0	20.5	29.5
202.....	0	96.5	96.5
203.....	9	29.0	38.0
205.....	1	13.0	14.0
Total.....	10	168.0	178.0

Average per producing colony, 44.5.

The net result of the season's work was a production of 178 pounds of honey or an average of 44.5 per producing colony, and an increase of three over the spring count. Against this must be set about 120 pounds of sugar used for autumn feeding. It seems clear that the financial showing could probably have been improved by paying less attention to increase and concentrating upon surplus production.

EXTENSION AND PUBLICITY

Extension work showed healthy expansion.

Correspondence numbered 2,398 letters received and 2,682 despatched, besides 363 circulars.

Three hundred and eighty-six packets of nursery stock and many samples of ornamental seeds were sent out.

Thirty-three addresses were inflicted upon rural audiences aggregating 1,382 auditors. A dozen or more of these talks were at meetings held jointly with A. R. Judson, District Agriculturist, in the interest of the good-seed movement represented by the Peace River Co-operative Seed Growers Limited. The remainder were lantern-slide lectures by the superintendent, occasionally reinforced by his assistant. The majority of these were at evening meetings with an average duration of 2½ to 3 hours and an average attendance of fifty or more.

Fully a hundred good negatives were added to the Station's photographic files, while hundreds of prints were distributed for publication, for official record and other appropriate use. From the best negatives several dozen new lantern slides were made for the Station by the Natural Resources Intelligence Service of the Department of the Interior, with which an harmonious co-operative relationship exists.

Scores of articles were written and thousands of copies of mimeographed memoranda handed out.

An Illustration Station was supervised.

Twenty-two samples of grain were collected from farmers for protein test by the Grain Research Laboratory at Winnipeg.

The Substation co-operated with Mr. Judson, representing the Alberta Department of Agriculture, and with the Consolidated Mining and Smelting Company, in conducting co-operative tests to investigate the effect of triple phosphate on various soils and crops.

A seed fair was judged at Dawson Creek, B.C.

Thousands of visitors were shown over the work individually, in parties and in crowds. Among the more important events was a picnic staged by the Grande Prairie District Association of the United Farmers of Alberta, when an audience of fully eight hundred was addressed by Hon. J. E. Brownlee, Premier of Alberta, Dr. R. C. Wallace, President of the University of Alberta, and others. Most of the three hundred excursionists of the Canadian Associated Chambers of Commerce also visited the Station in early September, while on a tour of the Peace River district. Throughout the summer the pages of the visitors' register were adorned with the signatures of the great.

Throughout the year the mailing list grew steadily and rapidly by accession of homesteaders and newcomers generally.