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DOMINION OF CANADA  
DEPARTMENT OF AGRICULTURE  
DOMINION EXPERIMENTAL FARMS

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# EXPERIMENTAL SUB-STATION

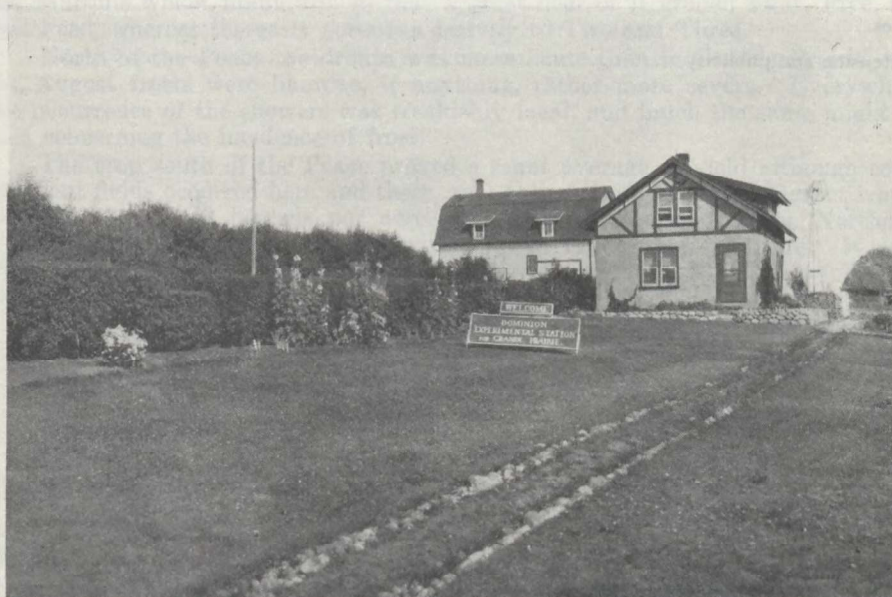
BEAVERLODGE, ALBERTA

REPORT OF THE SUPERINTENDENT

W. D. ALBRIGHT

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FOR THE YEAR 1928



Experimental building and Superintendent's residence, in September, 1928.

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Printed by authority of the Hon. W. R. Motherwell, Minister of Agriculture,  
Ottawa, 1929

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# DOMINION EXPERIMENTAL SUB-STATION BEAVERLODGE, ALBERTA

REPORT OF THE SUPERINTENDENT, W. D. ALBRIGHT

## INTRODUCTION

A late seeding was followed by the earliest harvest on record. A rough, stormy April concluded a moderately cold winter during which the aggregate snowfall was 80.5 inches. Scarcely any seeding was accomplished until the last day of the month, but it progressed rapidly during the first week of May, which in the Grande Prairie district proved to be a hot month with enough showers to favour prompt germination and rapid early growth.

Notwithstanding this very favourable start, wireworm injury was extensive in some of the older and more exclusively wheat-growing areas and a few cases of soil-drifting also occurred.

Midsummer was hot and dry, reducing the hay crop to small proportions and ripening cereals, especially the early varieties of them, hastily, somewhat at the expense of yield and sample. High winds just before harvest caused considerable shattering of certain early sorts, and August frosts caught most of the Marquis wheat immature, so that a great deal of it graded Four, Five, Six and Feed, whereas the early sorts ran heavily to Two and Three.

North of the Peace the drouth was more acute than in Grande Prairie, and the August frosts were likewise, if anything, rather more severe. Everywhere the occurrence of the showers was freakishly local, and much the same might be said concerning the incidence of frost.

The crop south of the Peace proved a scant average in yield although some excellent fields occurred here and there, well authenticated cases of Garnet wheat running 47 and 49 bushels per acre, and grading Two and Three Northern, respectively. There were also oat yields up to 110 bushels per acre. It may thus be said that the region south of the river experienced a fair crop following two successive bumper ones.

Harvesting commenced early in August and a little threshing was done before the month was out. Combines were tried for the first time, giving variable results, not wholly unsuccessful where the swather was employed, but tending otherwise to delay the harvest unduly in a season when cool, showery weather was interspersed with frost.

Unprotected hollyhocks bloomed on the hill until September 26, and a General McArthur rose until October 10, latterly without frost protection.

A wonderfully fine, dry autumn permitted fall work to be done better than it had been for years, and was also very favourable for construction of the Whitelaw-Fairview and Wembley-Hythe railroad extensions, the latter being started on July 6. The construction train reached Beaverlodge on November 24, and Hythe on December 9.

On the Experimental Station there were no zero temperatures until December and then only six, with  $-24^{\circ}$  the lowest. Automobiles ran numerously on Christmas Day. Indeed there was scarcely any snow at all until the last four days of the month.

## PEACE RIVER PROMINENT IN WORLD COMPETITION

Although less spectacular than in 1926, Peace River's record in national and international grain competition was quite as good as ever before, a gratifying feature being that Herman Trelle, of Wembley, had several supporters in upholding the credit of the region. In Western Canadian shows his record has been such a sweeping procession of triumphs that a trained accountant would almost be needed to compile it. At the Royal Winter Fair, in Toronto, he won the 1928 championship for spring wheat and field peas, second prize in oats and third in Early Ohio potatoes. This was followed up at the International Hay and Grain Show, Chicago, with the grand championship in peas, championship in spring wheat and reserve championship in wheat, spring and fall. He was also second in oats.

Robt. Cochrane, of Grande Prairie, the timothy seed grower, won seventh place in spring wheat at the Royal, and at Chicago third prize in small yellow field peas, ninth in timothy seed and eleventh in alfalfa seed.

A new contestant in big competitions was Percy U. Clubine, of Wembley, who was Mr. Trelle's runner-up at Toronto in the peas class, securing second. He had not entered for Chicago.

Mr. Trelle and Mr. Clubine both showed Chancellor peas, a variety bred by Dr. Chas. E. Saunders. Both had obtained their stocks of it from the Beaverlodge Station, Mr. Trelle in 1927 and Mr. Clubine in 1928. Mr. Cochrane's Reward wheat had also been obtained from Beaverlodge in the spring of 1928.

Like Mr. Trelle, Mr. Cochrane followed up his successes at the larger fairs by a series of winnings at western exhibitions.

Inspired by these victories and by the growing demand for Peace River seed grain, a movement has been started to organize the business by forming a co-operative company, known as the Peace River Co-operative Seed Growers Limited, to assemble locally, clean, inspect and merchandise registered and Number One Commercial seed grain.

## BIG JUMP IN HOMESTEAD ENTRIES

The rising tide of Peace River development is reflected by homestead entries. A tabulation checked by the Acting Commissioner of Lands, Department of the Interior, Ottawa, shows that in the calendar year of 1928, 60·8 per cent of all the homestead entries in the three Prairie Provinces were in Alberta and 55·8 per cent of the total was represented by filings in the three Northern Alberta agencies, viz., Edmonton, Grande Prairie and Peace River, while 34·1 per cent of the grand total was represented by filings in the two Peace River agencies, i.e. Grande Prairie and Peace River. The actual number of homestead entries and soldier grants filed in 1928 at the two Northern agencies was 5,521, as against 1,323 in 1927, being an increase of over 317 per cent from one year to the next.

It should be explained that the two Peace River agencies comprehend the Peace River Block of British Columbia, which is thus included in the figures cited above.

## SCHOOL LAND AND OTHER SALES

Another index is the price realized from the sale of school lands auctioned at six centres along the Dunvegan lines in Alberta during the month of July. Notwithstanding that this was too late in the summer to permit breaking being done to best advantage in the season of purchase, these sales averaged \$18.11 per acre, indicating the opinion of land seekers as to the value of raw land in settled communities of the Peace River region.

Purchases of patented land were also numerous, while opportunities to rent or work on shares were eagerly snatched up by throngs of newcomers from the Lower Prairies and the Western States.

Throughout much of the year northbound trains were packed to the point where standing room was sometimes at a premium. Population largely increased and it was conservatively estimated that the amount of breaking done in 1928 represented an increase of fifteen to twenty per cent over the acreage in crop.

#### GRAIN SHIPMENTS

Over the Dunvegan lines, wheat shipments from August 1, 1928, to July 31, 1929, representing the crop year of 1928, amounted to 4,913,779 bushels and coarse grains 1,514,280 bushels, making a total of 6,428,059. This, of course, is a considerable falling off from the record-smashing crop of 1927, several of the sectors having a very light yield to ship. It is worthy of note that the Grande Prairie Spur (Roycroft to Hythe) held up pretty well, shipping 2,914,050 bushels as against 3,392,171 bushels from the previous crop.

The Alberta and Great Waterways Railway, running northeastwardly from Edmonton, shipped 895,890 bushels of grain as against 1,297,805 bushels from the 1927 crop.

The Canadian National lines in Alberta loaded from points north of Edmonton 3,916,341 bushels wheat and 1,272,249 bushels coarse grains, making a total of 5,188,590 bushels.

Thus the aggregate shipments from points in Alberta north of Edmonton, including also the Peace River Block of British Columbia, amounted to 9,445,215 bushels wheat and 3,067,324 bushels coarse grains, or a grand aggregate of 12,512,539 bushels.

GRAIN SHIPMENTS BY DISTRICTS ON RAILROADS IN ALBERTA NORTH OF THE LATITUDE OF EDMONTON, BETWEEN AUGUST 1, 1928, AND JULY 31, 1929, REPRESENTING THE CROP OF 1928

Railway	Wheat bush.	Coarse grains bush.	Total bush.
Dunvegan lines.....	4,913,779	1,514,280	6,428,059
Alberta & Great Waterways.....	615,095	280,795	895,890
Canadian National lines*—			
St. Albert subdivision.....	328,185	203,625	531,810
St. Paul subdivision.....	1,897,038	747,711	2,644,749
Athabasca subdivision.....	1,317,858	301,365	1,619,253
Whitecourt subdivision.....	373,230	19,548	392,778
Total Canadian National lines.....	3,916,341	1,272,249	5,188,590
Grand total all lines north of Edmonton.....	9,445,215	3,067,324	12,512,539

\*As the Canadian National Railway figures were given in carloads, the following table was used to convert carloads into bushels:—  
Wheat 1,287 bushels.  
Coarse grains 1,629 bushels.

#### PEACE RIVER LIVE STOCK SHIPMENTS INCREASED

Although it would puzzle a visitor to decide where the animals had been raised, so few being now in evidence to a person driving through the region, it is encouraging to find that live stock shipments originating along the Dunvegan lines during the calendar year of 1928, showed a substantial increase over the 1927 figures, this holding true for all classes of animals. Analysis of the figures

reveals a decrease in shipments originating on the trunk end of the line, from McLennan south, but a large increase from the two northern forks, representing the Peace River watershed. Whether any part of this increase may have represented liquidation of breeding stock it is not easy to decide. Probably for the most part it reflects the producing activity of a rapid population increase, overbalancing the still perceptible swing of the old-established settlers from live stock to grain production.

An increase was also shown on the Alberta and Great Waterways line, but the Canadian National Railway lines north of Edmonton (with the single exception of the St. Paul branch) registered such a sharp contraction in live stock shipments that the total for all Alberta lines north of Edmonton stands at 105,836 head against 103,254 head in 1927.

#### BUTTER PRODUCTION

The 1928 creamery butter shipments from points along the Dunvegan lines were little more than half those of 1926 although the value compared a little more favourably than the production. Allowance, of course, must be made for the greatly increased home consumption due to influx of population, but it is evident that Peace River farmers show no anxiety to milk cows so long as grain crops and prices are reasonably good. What may happen some year when frost devastates the grain fields, or a world-glut flattens the price of wheat, remains to be seen.

The five Alberta creameries and one Pouce Coupe creamery shipped in 1928, over the Dunvegan lines, 322,037 pounds of creamery butter worth \$117,735.41. Total shipments from 14 creameries north of Edmonton amounted to 1,037,225 pounds with a factory selling value of \$369,810.58.

#### PRODUCTION IN 14 CREAMERIES NORTH OF EDMONTON

	1926		1927		*1928	
	Quantity	Value	Quantity	Value	Quantity	Value
	lb.	\$	lb.	\$	lb.	\$
Five Alberta creameries shipping over Dunvegan lines.....	601,268	194,888 82	427,506	150,779 00	306,533	111,495 86
Eight Alberta creameries shipping over C.N.R. and A. & G.W. lines from points north of Edmonton.....	818,222	257,854 61	770,260	266,217 63	715,188	252,075 17
Totals thirteen creameries....	1,419,490	452,743 43	1,197,766	416,996 63	1,021,721	363,571 03
Average price per pound.....		31.9 cts.		34.8 cts.		35.6 cts.
Decrease from previous year.....			15.62%	7.9%	14.7%	12.8%
Pouce Coupe creamery.....	31,589		22,696	7,951 40	15,504	6,239 55
Average price per pound at Pouce Coupe creamery.....						40.24 cts.
Total 14 creameries.....	1,451,079		1,220,462	424,948 03	1,037,225	369,810 58

\*In 1928 there were two new creameries in operation, viz. High Prairie and Elk Point, while the creamery at Berwyn was closed.

#### POULTRY PRODUCTION

A. R. Judson, District Agriculturist, estimates that around 115,000 pounds of turkeys were shipped from the Peace River region in 1928. Of these 12,000 pounds were shipped co-operatively from north of the Peace and 76,297 pounds from the Grande Prairie district, the latter being under Mr. Judson's supervision. On this shipment of 76,297 pounds the net returns to the shippers were as follows:—

## RETURNS FROM CO-OPERATIVE TURKEY SHIPMENTS

	Grade A	Grade B
Over 12 pounds.....	31 cents	28 cents
10-12 pounds.....	29 "	26 "
8-10 ".....	27 "	24 "
6- 8 ".....	23 "	20 "

Over 10 pounds—Grade C..... 19 cents  
 Under 10 pounds—Grade C..... 16 cents

No other poultry than turkeys was shipped out and not nearly enough eggs were laid to supply the home demand.

## THE METEOROLOGICAL RECORDS

The meteorological records show that 1928 was four degrees above the thirteen-year average in temperature; 1.59 inches below it in precipitation; 250 hours above the six-year average for bright sunshine and 2.24 inches above the seven-year average for evaporation. Excepting August, the summer of 1928 might be characterized as unusually warm and dry, although not disastrously so at Beaverlodge.

And this was supposed to have been a summerless year!



METEOROLOGICAL RECORDS AT BEAVERLODGE, 1928

Month	Temperature, degrees Fah.				Precipitation, inches			Evaporation		Sunshine		Sleighting				
	Maximum		Minimum		Mean		Rain	Snow	Total pre- cipitation	Inches	Hours	Days				
	High- est	Mean maxi- mum	Low- est	Mean mini- mum	1928	Aver- age 13 years	1928	Aver- age 13 years	1928	Aver- age 7 years	1928	Average 6 years	1928	Aver- age 13 years		
January.....	46	28-35	-41	10-90	19-63	8-31	0-02	4-0	13-41	0-42	1-36	114-4	83-30	31	31-0	
February.....	47	33-55	-15	14-76	24-16	13-84	0-02	2-0	7-57	0-20	0-80	173-3	115-28	29	28-2	
March.....	61	37-06	-11	17-74	27-40	21-64	0-02	11-0	12-97	1-12	1-33	163-7	142-65	21	27-23	
April.....	68	40-40	-2	21-37	30-89	36-72	0-15	29-0	4-05	3-05	0-68	174-5	211-85	15	9-69	
May.....	91	67-13	23	39-32	53-23	48-18	0-92	.....	2-01	0-95	1-46	324-5	293-27	.....	0-46	
June.....	84	68-67	30	45-80	57-24	55-25	2-26	.....	1-74	2-26	1-88	241-9	266-60	.....	.....	
July.....	83	73-52	40	48-48	61-00	59-81	2-16	.....	.....	2-16	2-25	319-9	294-43	.....	.....	
August.....	78	68-65	33	43-03	55-84	57-19	1-48	.....	.....	1-48	1-78	241-6	243-13	.....	.....	
September.....	86	65-73	25	37-37	51-55	48-73	0-84	.....	1-72	0-84	1-39	2-08	253-2	.....	.....	
October.....	61	46-23	9	27-94	37-09	38-32	0-72	1-10	4-71	0-83	1-12	168-4	142-90	.....	1-54	
November.....	59	41-47	1	21-57	31-52	24-09	.....	1-00	7-91	0-10	0-94	125-0	97-2	.....	7-46	
December.....	47	30-03	-24	13-19	21-61	10-89	.....	14-0	13-44	1-40	1-41	99-90	74-9	3	25-15	
Average, 1928.....	.....	50-07	.....	28-46	39-26	35-25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total, 1928.....	.....	.....	.....	.....	.....	.....	8-60	62-10	.....	14-81	.....	21-80	2,400-3	99	.....	.....
Average yearly total.....	.....	.....	.....	.....	.....	.....	.....	.....	69-53	.....	16-40	.....	.....	.....	.....	130-73

\*From April 26th. † To October 27. ‡ 7-year average. ††6-year average.

MEAN TEMPERATURES AT REPRESENTATIVE POINTS IN PEACE RIVER DISTRICT, 1928

Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
Beaverlodge.....	19.63	24.16	27.40	30.89	53.23	57.24	61.0	55.84	51.55	37.09	31.52	21.61	39.26
Lower Beaverlodge.....	15.34	20.54	25.94	31.12	53.05	57.8	61.74	56.11	51.26	37.04	29.22	19.66	38.24
Elmworth.....	18.13	18.40	22.39	29.82	51.29	54.9	57.91	54.44	48.9	34.47	27.78	19.33	36.48
Fort St. John.....	19.44	27.36	27.54	33.57	53.62	60.53	63.28	56.92	52.65	36.87	32.52	20.97	40.44
Pouce Coupe.....	18.53	24.46	25.31	29.17	50.66	*57.00	61.82	53.43	49.56	36.76	30.08	19.40	38.02

Observers: Dominion Experimental Station, Beaverlodge, Alta.; V. C. Flint, Lower Beaverlodge, Alta.; G. S. Moyor, Elmworth, Alta.; J. W. Abbott, Fort St. John, B.C.; A. C. Chalmers, Pouce Coupe, B.C.

\*Pouce Coupe temperature records for first few days in July are missing—average for 26 days only.

PRECIPITATION, 1928

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.....	0.42	0.2	1.12	3.05	0.95	2.26	2.16	1.48	0.84	0.83	0.1	1.40	14.81
Lower Beaverlodge.....	0.4	0.25	1.08	2.32	0.81	1.33	1.11	1.30	0.50	0.86	0.2	1.0	11.16
Elmworth.....	0.32	0.15	1.1	1.49	0.80	3.37	1.55	1.05	0.62	0.69	0.1	1.4	12.64
Fort St. John.....	0.42	0.30	1.24	0.49	0.60	1.76	2.46	1.80	1.01	1.5	.....	0.55	12.13
Pouce Coupe.....	0.4	0.17	1.63	4.18	1.09	3.25	2.61	1.12	0.81	0.86	0.03	0.75	16.90

### ACKNOWLEDGMENT

Valuable assistance in compiling this report has been rendered by E. C. Stacey, B.A., M.Sc., who has, under the superintendent, had practical direction of the field work in cereals, forage crops, field husbandry and chemistry; and by P. Flint, who has had special charge of the horticultural work, keeping full and accurate notes.

### FIELD HUSBANDRY

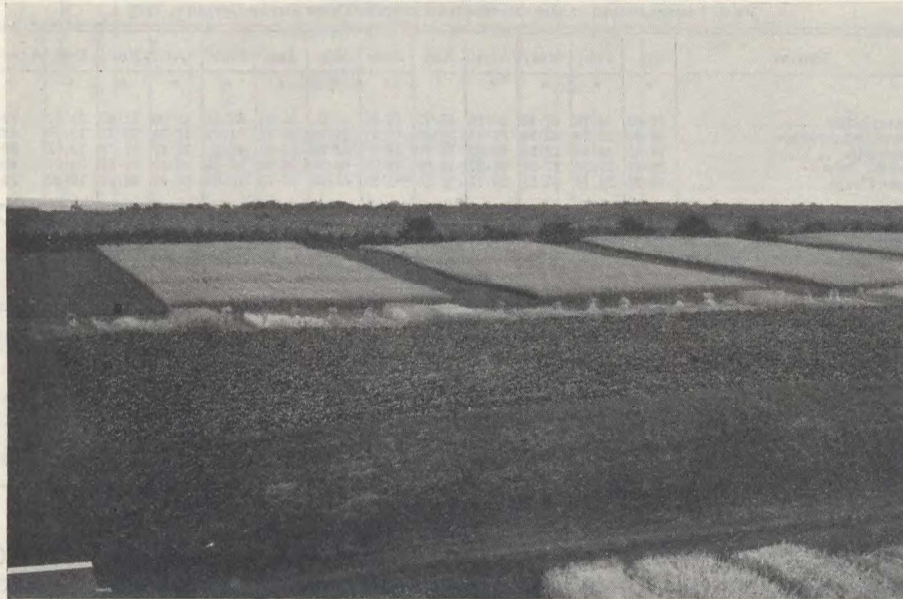
#### METHODS OF SEEDING MEADOW CROPS

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.

The further results obtained in 1928 bear out earlier indications, pointing to the economy of using nurse crops rather than seeding alone as practised in this test, 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 experiment excites considerable interest on the part of visitors, one of whom remarked that he had adopted the practice of mixing his meadow seeds with the grain in the drill box and then taking the spouts out of the grain runs and casting the seed forward so that both grain and meadow seeds should fall broadcast in front of the covering disks. In a dry time this plan of broadcasting the grain would delay its germination but that should be all to the good of the meadow seedings, which frequently suffer severe competition from the grain, the latter usually obtaining a head start.

Subsequent to the interview referred to, a correspondent in the agricultural press told of soaking sweet clover seed and then sowing it mixed with grain, to which the damp clover seed was inclined to stick, resulting in a more even seeding. It is proposed to test experimentally both these modifications of practice.



The methods-of-seeding test, showing blocks of oats used as nurse crops. Small increase plots of cereals in the foreground.

Remarkable yields of hay were obtained in 1928 from the 1925 seeding, ranging from one and three-quarters to two tons per acre. For a fourth crop of hay this would be good in any season but is extraordinary in a summer as dry as that of 1928. The situation of the plots may have been somewhat favourable to saturation by snow moisture and something may be due to the good cropping qualities of alfalfa and to the residual effect of the sweet clover, which latter constituted a substantial percentage of the growth in 1925 and 1926. No other hypothesis seems adequate to account for yields of one and three-quarter tons from a fourth-year crop when many a new grass meadow produced only half a ton or so.

#### METHODS-OF-SEEDING TEST, 1925 SEEDING

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

	Pounds oat hay per acre in 1925	Pounds grass hay per acre in 1926 (after- math not taken)	Pounds grass hay per acre in 1927 (after- math not taken)	Pounds grass hay per acre in 1928 (after- math not taken)	Total hay three years	Total crop four years
					lb.	lb.
Seeded with 2 bushels oats per acre, 6-inch spacing, meadow mixture sown ahead of drill.....	5,100	1,505	7,311	3,572	12,388	17,488
Seeded with 1 bushel oats per acre, 12-inch spacing, meadow mixture sown ahead of drill.....	4,133	2,874	7,678	3,639	14,191	18,324
Seeded with two bushels oats per acre, 6-inch spacing, meadow mixture sown with grain in drill box.....	3,278	1,528	6,897	3,898	12,323	15,601
Seeded without nurse crop. Covered with drill disks.....		4,729	5,804	4,283	14,816	14,816

## 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.
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 hand-weeding 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.

## METHODS-OF-SEEDING TEST—1926 SEEDING

## North range only

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

	Pounds of cured oat hay per acre 1926 crop	Pounds of grass hay per acre in 1927 (after-math not taken)	Pounds of grass hay per acre in 1928 (after-math not taken)	Total hay crop two years	Total crop three years
Meadow Mixture seeded with oats in drill box (oats in 6-inch drills)—					
Lever 6th notch.....	5,487	4,976	3,743	8,719	14,206
Lever 4th notch.....	4,987	5,385	3,740	9,125	14,112
Lever 2nd notch.....	5,454	5,618	3,749	9,367	14,821
Average.....	5,309.3	5,326.3	3,744	9,070.3	14,379.7
Meadow Mixture seeded ahead of drill (oats in 6-inch drills)—					
Lever 6th notch.....	6,871	5,884	3,395	9,279	16,150
Lever 4th notch.....	7,573	6,175	3,161	9,336	16,909
Lever 2nd notch.....	5,998	6,193	2,942	9,135	15,133
Average.....	6,814	6,084	3,166	9,250	16,064
Meadow Mixture seeded ahead of drill (oats in 12-inch drills)—					
Lever 6th notch.....	5,086	6,533	2,757	9,290	14,376
Lever 4th notch.....	5,000	6,115	3,185	9,300	14,300
Lever 2nd notch.....	5,433	5,947	3,510	9,457	14,890
Average.....	5,173	6,198.3	3,150.7	9,349	14,522
Meadow Mixture seeded alone, covered with drill disks—					
Lever 6th notch.....		5,660	3,400	9,060	9,060
Lever 4th notch.....		7,856	2,988	10,844	10,844
Lever 2nd notch.....		8,728	3,010	11,738	11,738
Average.....		7,414.7	3,132.7	10,547.3	10,547.3

## 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 28 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.

NOTES—*Concluded*

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.
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.

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

Very significant data having been obtained from forty months' readings of self-registering minimum thermometers on the slope of a hog's back ridge where the Station is situated, it seems appropriate to review the observations in detail.

Those who wish to pursue the study more minutely are referred to the previous annual reports of the Beaverlodge Sub-station, pages 59 to 65 of the 1925 report; pages 78 to 86 of the 1926 report (containing diagrams of elevations) and pages 54 to 58 of the 1927 report.

### PRELIMINARY STUDIES

Preliminary trials in 1925 and the early months of 1926 showed that uncaged instruments read appreciably lower than those in like situation and at equal levels but housed in standard Meteorological-Service cages, the average difference in some months having been nearly two degrees Fah.

The preliminary trials also revealed a marked difference at times between the readings of two pairs of uncaged thermometers, one instrument of each pair being at the ground level and one at 3½ feet. Those at the ground had read as much as 8 and 10 degrees Fahrenheit lower than their fellows. This indicates that official weather records are not a trustworthy index of the degree of cold to which crops may have been exposed.

It was further established by the preliminary observations that an air thermograph has lagged somewhat in its readings, hence may not be safely substituted for a thermometer.

### BRIEF OUTLINE OF PROCEDURE

On July 1, 1926, uncaged instruments were placed at four points on a 214-rod slope with a total fall of 134 feet from the apex to the eastern foot of a hog's-back ridge.

On May 1, 1927, six self-registering minimum instruments, all uncaged, were placed on this slope at equal successive rises of 26·8 feet. The first was at the foot of the slope and the sixth on the apex of the ridge. The fifth happens to be at almost exactly the level of the official caged instrument, which is situated on a lawn and about fifteen rods from where the fifth one of the roadside line of instruments is placed. An incidental comparison is possible between the caged official instrument and the uncaged fifth-post instrument on the highway. The comparisons between these bear out the deduction arrived at in the preliminary trials. In the last eight months of 1927 the caged minimum instrument read 1·76 degrees higher than the uncaged one fifteen rods distant. During the first seven months of 1928 the average difference was 2·34 degrees Fah.

Slight errors in the instruments have marred certain of the minor comparisons, while breakages have necessitated a curtailment of the records since July 15, 1928, the extreme altitudes being, however, still represented in the readings.

## WIDE SPREADS BETWEEN SLOUGH AND HILL TOP

The outstanding point is the wide spreads between the minimum readings at the slough and at the apex of the hill. In the 897 days of reliable records from July, 1926, to December, 1928, inclusive, there have been 350 nights when the spread has been 10 degrees or greater; 118 when it has been 15 or more and 27 nights when it has been 20 degrees or more. In other words, fully 39 per cent of the nights have recorded spreads of ten or more, and 13 per cent have had spreads of 15 degrees or greater. The most extreme divergence to date has been 25 degrees on the morning of February 17, 1927. The second-widest spread was 24 degrees on December 26, 1927, and the third-greatest 23 degrees on January 10, of the same year. Like spreads of 23 degrees also occurred on February 29 and December 26, 1928.

May and August have each exhibited a spread of 15 degrees, June 12 degrees, July 13 degrees, and September 18 degrees.

## SPREADS NOT VERY CONSISTENT WITH THE SEASONS

Whilst there is a tendency for the most extreme ranges to occur in the coldest weather, this relationship is by no means consistent. The lowest temperatures on the hill have not coincided with the greatest contrasts between hill and slough readings. Thus in February, 1927, the lowest hill temperature was -31 degrees on the morning of the sixteenth, but the greatest spread occurred the next morning, when the hill reading was four degrees more moderate. Still more remarkable is it to find the widest January spread of 23 degrees on a morning when the hill reading was 19 above zero, whilst the lowest hill temperatures of -29 degrees occurred on the mornings of the seventeenth and eighteenth, when the spreads were only thirteen and fifteen degrees, respectively. Again, the widest December spread of 24 degrees occurred on a morning when the hill temperature was 13 above zero, while on the last day of 1927, when the hill temperature was -41 degrees, the slough reading was -55 degrees, a difference of only 14 degrees.

Take February, 1928. Its coldest morning was the twenty-second, when temperatures of -37 and -21 degrees were found, the disparity being 16 degrees. On the much less severe morning of the twenty-ninth there was a spread of 23 degrees, the respective readings being three below and twenty above zero. Again, in December, 1928, the widest spread occurred on the twenty-sixth, when the hill reading was 15 degrees above zero, but the lowest general temperature occurred on the morning of the third, when the slough thermometer read 44 degrees below and the hill thermometer 28 degrees below, making a spread of only 16 degrees. A spread of 19 degrees was found the next morning, when the respective readings were -32 and -13 degrees.

Nor do the monthly means reveal the winter months to average conspicuously wider spreads than the summer months, although there appears to be a very irregular tendency in such direction. In 1927 December produced the greatest average spread and August the second greatest. During 1928, February, with an official average minimum temperature of 14.76 degrees, showed an average spread of 13.06 degrees between hill and slough, while January, with an official average minimum of 10.90, showed an average spread of only 10.97 degrees. March, with an official average minimum of 17.74 exhibited an average spread of 9.32 degrees. The narrowest spread (5.24 degrees) happened in the exceptionally stormy month of April, when the average official minimum was 21.37 degrees.

It was probably the character of the April weather that accounted for the narrow spreads in that month. There were many dull days, quite a little wind and 29.0 inches of snowfall.

## SPREADS VARY WITH ATMOSPHERIC CONDITIONS

It has been repeatedly remarked that during murky weather or during the progress of a rain or snow storm little or no spread would be found between the readings of any two elevations. Clouds also seemed to have a like influence. Such conditions evidently militated against the phenomenon called by meteorologists "inversion of temperature." This term denotes a condition frequently obtaining at night, whereby within a distance of several hundred feet above the ground surface the colder air is found nearest the ground and the warmer air toward the ceiling of the zone. It is supposed to be most pronounced when the sky is clear, the air calm and dry. The Beaverlodge observations generally accord with this hypothesis although puzzling exceptions have been noted.

Other things being equal, it has appeared as though the drier the air the greater the tendency for inversion of temperature.

Wind has reduced but seldom eliminated the spreads in the readings. The direction of the wind with relation to the local topography may be a factor.

In 1927 it was particularly noticed that when a winter cold snap was setting in little or no difference could be found between the readings on high and low land. The string of instruments would all read much alike. By the second or third day, however, an increasing spread would usually be manifest. A conspicuous example of this was found in December, 1928, as recorded in a previous paragraph.

## GREATEST CONCENTRATION OF COLD AT BOTTOM OF BASIN

The necessity of using instruments of several different makes and the lack of precise calibration of the same, together with occasional accidents, attributed to curiosity on the part of the public, interfere with some of the minor comparisons, although significant data have been obtained. Doubtful readings have always been discarded.

During three successive calendar years it has been observed that relatively the greatest concentration of cold occurred in the bottom of the semi-basin on the edge of which the lowest instrument is situated. In the latter half of 1926, when there were only four observation posts on the highway, it was found upon averaging six months' records that:—

From the lowest to the second post the minimum readings rose 0.62 of a degree per ten feet of rise.

From the first to the third post the minimum readings rose 0.47 of a degree per ten feet of rise.

From the first to the fourth post the minimum readings rose 0.54 of a degree per ten feet of rise.

The position of the third post at that time was such that this one was not exactly comparable with the others.

After the six instruments were installed on May 1, 1927, so as to divide the elevation into five equal rises of 26.8 feet it was found during the remainder of the year that the second post averaged 2.29 degrees higher readings than the first; the third 1.27 degrees higher than the second; and, allowing for one erratic instrument, the spreads diminished steadily to only 0.84 of a degree between the sixth and fifth.

Owing to factors already intimated, the records were somewhat less consistent in 1928, but again there was a marked difference between the lowest and second-lowest posts. For the first seven months of the year the five successive spreads average up as follows: 3.43 degrees; 1.72 degrees; 0.50 of a degree; 1.44 degrees; 1.37 degrees. Instrument No. 4 was known to be erratic. The others were substantially correct.

Taken together, the three years' work appears to indicate diminishing spreads as one ascends the slope. One suggested explanation is that the diameter of the bowl widens toward the top hence one might expect a progressively less intense concentration of cold toward the rim.

## ECOLOGICAL SIGNIFICANCE

The practical significance of these records is undeniable. They point to the advantageous utilization of frost-susceptible regions by devoting the low land, especially in the pioneer stages, to frostharry crops such as hay and green feed, and the high land to wheat, barley, flax, potatoes, gardens and residences. At the slough there is rarely a season when a decent crop of potatoes can be matured. On the elevated slope where the Station plots are located hollyhocks bloomed without protection in 1928 until September 26, and a General McArthur rose showed slight effect of frost until October 11. In half a mile there is probably a greater ecological difference than between Beaverlodge and Lethbridge.

Remarkable as the data seem, they are supported by fifteen years' close observations and by the cropping experience of settlers generally. Drawing upon this, it may be said that the safest cropping areas are elevated slopes adjacent to substantial bodies of open water; Herman Trelle has such a location. Air drainage alone is a great factor and the brow of a hill is usually safer than a flat hill top. Modified exceptions are found where the flat hill top or plateau is air-drained by a deep ravine close at hand, as at Waterhole (now Fairview) north of the Peace.

River flats adjacent to open water are often especially protected from summer frost, but in winter, when the water is ice-bound, the tendency of the cold air to settle into the low places is unmitigated and at that season the deep river channels are subjected to very low temperatures.

The following table records the number of nights in each of 29½ months for which complete records are available, from July, 1926, to December, 1928, inclusive, in which specified spreads were observed between the foot and the apex of a ridge with a fall of 134 feet in 214 rods.

Month	Ten or more degrees spread	Fifteen or more degrees spread	Twenty or more degrees spread
1926			
July.....	8	0	0
August.....	10	0	0
September.....	9	1	0
October.....	15	0	0
November.....	11	3	0
December.....	13	6	3
1927			
January.....	19	11	2
February.....	21	12	6
March.....	17	9	3
April.....	10	4	0
May.....	4	0	0
June.....	2	0	0
July.....	5	0	0
August.....	13	1	0
September.....	6	0	0
October.....	7	0	0
November.....	10	3	0
December.....	18	10	4
1928			
January.....	18	10	4
February.....	23	14	3
March.....	16	9	1
April.....	5	2	0
May.....	7	1	0
June.....	4	0	0
*July.....	5	0	0
August.....	13	0	0
September.....	15	4	0
October.....	9	1	0
November.....	19	7	0
December.....	18	10	1
Totals.....	350	118	27

\*Twenty-one days only. Instrument found broken on 16th and replaced on 26th.



The following is a summary of the most extreme spreads per month for 29½ 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.

Month	Date	Temperature No. 1	Temperature No. 6	Extreme spread
1926				
July.....	3rd	40	53	13
August.....	10th	29	43	14
September.....	13th	23	38	15
October.....	30th	18	32	14
	31st	18	32	14
November.....	23rd	-22	-4	18
December.....	8th	-3	18	21
	18th	-1	20	21
1927				
January.....	10th	-4	19	23
February.....	17th	-52	-27	25
March.....	4th	-5	17	22
	19th	-12	10	22
April.....	5th	0	19	19
	9th	-2	17	19
May.....	22nd	24	38	14
June.....	6th	35	45	10
	16th	31	41	10
July.....	28th	35	46	11
August.....	25th	35	50	15
September.....	10th	31	44	13
October.....	10th	17	29	12
	11th	-31	-14	17
November.....	24th	-6	11	17
	26th	-11	13	24
December.....				
1928				
January.....	25th	-18	4	22
February.....	29th	-3	20	23
March.....	14th	-14	8	22
	6th	2	18	16
April.....	14th	22	37	15
May.....	27th	45	57	12
*July.....	10th	29	42	13
	11th	35	48	13
August.....	22nd	18	32	14
	29th	31	45	14
September.....	30th	29	43	14
	27th	12	30	18
October.....	1st	11	26	15
November.....	7th	10	26	16
	8th	7	23	16
December.....	26th	-8	15	23

\*Twenty-one days only. One instrument found broken on 18th.

TABLE COMPARING MONTHLY MEANS OF MINIMUM TEMPERATURES REGISTERED BY FULLY EXPOSED SELF-REGISTERING THERMOMETERS PLACED AT EQUAL SUCCESSIVE RISES ON A GRADUAL 214-ROD SLOPE WITH A TOTAL ASCENT OF 134 FEET. RECORDS JANUARY TO MID-JULY, 1928, BEAVERLODGE, ALTA.

Month	No. 1 (slough)	No. 2		No. 3		† No. 4	
	Tem- perature	Tem- perature	Degrees above (+) or below (-) No. 1	Tem- perature	Degrees above (+) or below (-) No. 2	Tem- perature	Degrees above (+) or below (-) No. 3
January.....	°	°	°	°	°	°	°
February.....	-1.32	3.23	4.55	5.13	1.90	7.00	1.87
March.....	0.66	6.21	5.55	8.97	2.87	11.72	2.75
April.....	7.71	11.71	4.00	12.77	1.06	14.29	1.52
May.....	15.33	17.63	2.30	20.70	3.07	18.77	-1.93
June.....	30.94	33.61	2.67	35.23	1.62	34.61	-0.62
*July.....	40.10	42.10	2.00	42.63	0.53	42.27	-0.36
	39.07	42.00	2.93	43.00	1.00	43.27	0.27
Average.....	18.93	22.36	3.43	24.06	1.72	24.56	0.50

\*Fifteen days only; one instrument broken on 16th.

†Erratic instrument.

Month	No. 5		Half of spread between Nos. 3 and 5 above (+) or below (-)	No. 6		Official minimum (caged) same level as No. 5		Total spread between highest and lowest ther- mometers Nos. 1 and 6
	Tem- perature	Degrees above (+) or below (-) No. 4		Tem- perature	Degrees above (+) or below (-) No. 5	Tem- perature	Degrees above (+) or below (-) No. 5	
January.....	°	°	°	°	°	°	°	°
February.....	8.61	1.61	1.74	9.65	1.04	10.90	2.29	10.97
March.....	12.38	0.66	1.71	13.72	1.34	14.76	2.38	13.06
April.....	15.68	1.39	1.46	17.03	1.35	17.74	2.06	9.32
May.....	19.80	1.03	-0.45	20.57	0.77	21.37	1.57	5.24
June.....	36.03	1.42	0.40	37.29	1.26	39.32	3.29	6.35
*July.....	44.50	2.23	0.94	46.77	2.27	45.80	1.30	6.67
	45.00	1.73	1.00	46.53	1.53	48.48	3.48	7.46
Average.....	26.00	1.44	0.97	27.37	1.37	28.34	2.34	8.44

TABLE COMPARING EXTREME TEMPERATURES IN EACH MONTH RECORDED BY FULLY EXPOSED SELF-REGISTERING THERMOMETERS PLACED AT EQUAL SUCCESSIVE RISES ON A GRADUAL 214-ROD SLOPE WITH A TOTAL ASCENT OF 134 FEET. RECORDS JANUARY TO MID-JULY, 1928, BEAVERLODGE, ALTA.

Month	No. 1 (slough)	No. 2		No. 3		No. 4		No. 5	
	Tem- perature	Tem- perature	Degrees above (+) or below (-) No. 1	Tem- perature	Degrees above (+) or below (-) No. 2	Tem- perature	Degrees above (+) or below (-) No. 3	Tem- perature	Degrees above (+) or below (-) No. 4
January.....	°	°	°	°	°	°	°	°	°
February.....	-56	-52	4	-47	5	-43	-1	-44	4
March.....	-37	-32	5	-27	5	-20	7	-20	0
April.....	-29	-21	8	-19	2	-18	1	-13	5
May.....	-17	-10	7	-7	3	-5	2	-2	3
June.....	13	17	4	18	1	18	0	20	2
*July.....	21	22	1	24	2	27	3	28	1
	28	30	2	33	3	35	2	37	2
Average...	-11	-6.57	4.43	-3.57	3	-1.57	2	0.86	2.43

\*Fifteen days only in July. One instrument broken on 16th.

TABLE COMPARING EXTREME TEMPERATURES IN EACH MONTH RECORDED BY FULLY EXPOSED SELF-REGISTERING THERMOMETERS PLACED AT EQUAL SUCCESSIVE RISES ON A GRADUAL 214-ROD SLOPE WITH A TOTAL ASCENT OF 134 FEET. RECORDS JANUARY TO MID-JULY, 1928, BEAVERLODGE, ALTA.—*Concluded*

Month	Half of spread between Nos. 3 and 5 above (+) or below (-)	No. 6		Official minimum (caged) same level as No. 5		Total spread between highest and lowest thermometers Nos. 1 and 6
		Temperature	Degrees (above+) or below (-) No. 5	Temperature	Degrees above (+) or below (-) No. 5	
January.....	1.5	-43	1	-41	3	13
February.....	3.5	-21	-1	-15	5	16
March.....	3	-13	0	-11	2	16
April.....	2.5	-2	0	-2	0	15
May.....	1	21	1	23	3	8
June.....	2	30	2	30	2	9
*July.....	2	38	1	40	3	10
Average.....	2.21	1.43	0.57	3.43	2.57	12.43

\*Fifteen days only in July. One instrument broken on 16th.

TABLE COMPARING MONTHLY MEANS OF MINIMUM TEMPERATURES RECORDED BY FULLY EXPOSED SELF-REGISTERING THERMOMETERS PLACED AT EQUAL SUCCESSIVE RISES ON A GRADUAL 214-ROD SLOPE WITH A TOTAL ASCENT OF 134 FEET. RECORDS AUGUST TO DECEMBER, 1928, BEAVERLODGE, ALTA.

Month	No. 1 (slough)	No. 3		No. 6		Total spread between highest and lowest thermometers No. 1 and No. 6
	Temperature	Temperature	Degrees above (+) or below (-) No. 1	Temperature	Degrees above (+) or below (-) No. 3	
August.....	34.65	39.29	4.64	42.29	3.00	7.64
September.....	26.31	32.17	5.86	35.59	3.42	9.28
October.....	19.26	23.39	4.13	26.00	2.61	6.74
November.....	8.23	.....	.....	19.75	.....	11.52
December.....	0.47	.....	.....	11.43	.....	10.96
Average.....	17.78	.....	.....	27.01	.....	9.23

TABLE COMPARING EXTREME TEMPERATURES IN EACH MONTH RECORDED BY FULLY EXPOSED SELF-REGISTERING THERMOMETERS PLACED AT EQUAL SUCCESSIVE RISES ON A GRADUAL 214-ROD SLOPE WITH A TOTAL ASCENT OF 134 FEET. RECORDS AUGUST TO DECEMBER, 1928, BEAVERLODGE, ALTA.

Month	No. 1 (slough)	No. 3		No. 6		Total spread between highest and lowest thermometers (No. 1 and No. 6)
	Temperature	Temperature	Degrees above (+) or below (-) No. 1	Temperature	Degrees above (+) or below (-) No. 3	
August.....	18	25	7	31	6	13
September.....	6	16	10	21	5	15
October.....	-4	2	6	5	3	9
November.....	-12	.....	.....	-2	.....	10
December.....	-44	.....	.....	-28	.....	16
Average.....	-7.2	.....	.....	5.4	.....	12.6

## SOIL TEMPERATURES

Each year it becomes more apparent that there are several factors which tend to modify the soil temperatures as gauged by the Friez soil and water thermograph with bulb three inches beneath the surface of summer-fallowed ground. The physical condition of the soil, including its geological nature, water content, and structural composition, is most important during the growing season but in the late fall and during the winter months, when the roots of perennials and winter annuals are in a dormant state, the soil temperatures are modified very greatly by the snow cover.

An analysis of the data for November and December of 1927 and the current year shows the trend during periods when meteorological conditions varied widely. During this period in 1927 the air temperatures were very low but the snow cover was quite adequate. November had a fall of 14.5 inches, and 20 inches more fell in December. Nearly all this remained and proved very effective in preventing the undue lowering of soil temperatures. In the fall of 1928 three inches of snow fell on December 1. Most of this disappeared and no more fell until December 28.

Without the protective influence of the snow cover the soil temperatures in 1927 would have been considerably lower than they were. As a result of the cover the mean soil temperatures for November and December, 1927, were 23.22 and 21.08 degrees respectively, as compared with 25.87 and 23.30 degrees for the corresponding period in 1928 while the mean air temperature was 7.68 degrees and minus 0.88 of a degree for November and December, 1927, and 31.52 and 21.61 degrees respectively in 1928. The snow cover in 1927 proved effective in maintaining a soil temperature very much higher than that of the atmosphere. Conversely, in 1928 owing to lack of cover there was close agreement between the air and soil temperatures.

The records for the four summer months have shown a fairly regular tendency to increase since the instrument was installed in 1922, the mean having risen from 51.94 degrees in 1922 to 55.09 in 1928. The most likely cause of such an increase would be a reduction in the depth of soil cover over the bulb. Care has been taken, however, to see that this was uniform and that the instrument was carefully adjusted but as several observers have had care of it there is a possibility of very slight alterations passing unrecognized. It may be that a gradual change is taking place in the physical condition of the soil through oxidation of the humus content. Again it may be that windbreaks some distance to the west may have had an influence. Or possibly the difference of 3.15 degrees is significant of nothing more than variations in weather conditions from year to year. But the trend seems at least worthy of remark.

SUMMARY OF AIR AND SOIL TEMPERATURES FOR NOVEMBER AND DECEMBER, 1927 and 1928, BEAVER LODGE

	Soil temperatures			Air temperatures			Number of days below 32 degrees Fah.	Number of days below 0 degrees Fah.	Snowfall in.
	Average monthly minimum	Average monthly maximum	Average monthly mean	Average monthly minimum	Average monthly maximum	Average monthly mean			
November, 1927.....	22.48	23.95	23.22	-0.47	14.9	7.68	30	18	14.5
December, 1927.....	20.35	21.81	21.08	-8.61	6.84	-0.88	31	21	20.0
November, 1928.....	25.00	26.73	25.87	21.57	41.47	31.52	28	0	1.0
December, 1928.....	22.10	24.50	23.30	13.19	30.03	21.61	29	6	14.0

## SOIL THERMOGRAPH DATA. BEAVERLODGE, 1928

Showing number of days in each month of 1928 that the soil temperature, as registered by a Friez thermograph with bulb three inches beneath the ground surface of summer-fallowed ground, rose at any time above the respective degrees specified.

Month	Days above 32 degrees Fah.	Days above 40 degrees Fah.	Days above 45 degrees Fah.	Days above 50 degrees Fah.	Days above 55 degrees Fah.	Days above 60 degrees Fah.	Days above 65 degrees Fah.	Days above 70 degrees Fah.	Days above 75 degrees Fah.
January.....	0	0	0	0	0	0	0	0	0
February.....	0	0	0	0	0	0	0	0	0
March.....	8	1	0	0	0	0	0	0	0
April.....	11	7	4	0	0	0	0	0	0
*May.....	22	22	20	15	10	7	3	0	0
†June.....	25	25	25	25	21	9	3	1	0
‡July.....	31	31	31	31	30	30	23	14	1
August.....	27	27	27	27	25	21	6	0	0
September.....	30	30	29	20	10	4	1	0	0
October.....	24	7	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.....	178	150	137	118	96	71	36	15	1

\*Clock stopped for 9 days, 2nd-10th.

†Clock stopped for 5 days, 20th-24th.

‡Clock stopped for 4 days, 15th-18th.

## THE FURROW METHOD OF SOWING WINTER WHEAT

It has become the practice in certain parts of Southern Alberta and adjoining sections of the United States to sow winter wheat with an attachment that places the grain five inches deep and leaves it covered with about two inches of soil. This insures that the seed is placed in moist soil and, later, when rains or wind reduce the ridges somewhat the crowns and roots of the plants are left protected from frost and ice. The stubble and depressions are supposed to increase and hold the snow covering above the drills and so lessen the risk of the



Silt washed from fallow land and held by stubble.

plants alternately freezing and thawing and, consequently, winter-killing. It is commonly understood that winter grain beneath an ice sheet often winter-kills but under conditions prevailing at this Station it remains to be proven whether the bands of ice occasionally forming in the drill furrows will endanger the crop. More evidence is needed concerning this important point.

In a quintuplicate test of this method Turkey Red winter wheat was sown on September 8, 1927. The plots were three rows wide, the centre one being the test row. Germination was uniform but weak owing to the late seeding. Winter conditions were favourable and thus, in part, defeated the object of the experiment. The deep furrows yielded 1,967 pounds per acre as compared with 1,723 pounds from the shallow furrows. In four out of the five sets of plots the advantage was in favour of the deep furrows. The increased yield obtained this year from the deep furrows would compensate for the extra equipment and work involved but as the results are based upon one year's work under extreme conditions too much emphasis should not be placed on them.

## CEREALS

### SCOPE OF WORK AND TECHNIQUE

Cereal work was continued along much the same lines as in 1927 although amplified at some points to permit more thorough comparisons.

Three years careful analysis having indicated that the rod-row system of testing, lending itself as it does, to extensive replication, gave for the most part more consistent comparisons of varieties and methods than were obtained from a smaller number of drilled plots, and having further indicated that the hand-sown, hand-harvested and hand-threshed rod-row plots gave yields averaging not more than two or three per cent in excess of those from plots seeded with a grain drill, harvested with a binder and threshed with an indoor separator, it was decided to adopt the rod-row as the standard method of cereal testing at Beaverlodge.

The principal objection that has been found to the plan was that where narrow plots were grown without intervening paths the lodging of one kind was liable to bear down its neighbour. To help overcome this the rod-row plots were widened to seven drills instead of five as in 1927 or three as originally adopted in 1924. Of the seven drills, two on each side are regarded as flank or buffer rows and are rejected at harvest, the yield being taken only of the middle three. The drills are seven inches apart.

The rod-row plots are sown  $18\frac{1}{2}$  feet long with a carefully gauged quantity of seed per row, separately calculated for each variety. A taut wire marks each end of a range, and, after seeding is completed, the wires are each set in one foot and left until harvest. This shortens each plot to a rod, so that the area harvested is one rod long by three drills—making 21 inches—wide. The plot weight in grams figures out easily to a per-acre yield in pounds.

All the rod-row tests were in octuplicate. That is to say, there were eight plots representing each variety, strain or condition under test. In all, some four acres were thus seeded, there being two thousand rod-row plots of spring grain alone.

Eight small plots spread over a considerable acreage of undulating ground will not all ripen at the same time. To harvest each when at its best would introduce an advantage impossible to obtain in field practice, hence it was decided to garner all the eight plots on the day when on the average they were judged most fit. An onrush of harvest caused some unavoidable delay, with consequent shattering, but the principle adopted seems sound nevertheless.

The danger of natural crossing when many varieties are grown in close formation has been recognized for years at Beaverlodge. Accordingly, a plan has been adopted whereby all varieties under test are grown in a tier of increase plots well to the windward of grain which might be likely to cross with them. This half-mile tier or range of increase plots runs north and south and in it the arrangement is usually as follows: (1) An early variety of wheat, (2) an early oat, (3) an early barley, (4) a mid-season-to-late wheat, (5) a mid-season-to-late oat, (6) a mid-season-to-late barley. Thus between any two varieties of wheat, of oats or of barley likely to blossom together so that crossing would be probable, are five buffer plots, and only a straight north or south wind would be likely to carry pollen from one variety to another with which it would be liable to hybridize. These increase plots do not figure in yield computations, hence may be rogued relentlessly. They thus produce pretty pure stocks for the next season's test plots, which latter are not rogued at all except perhaps to pluck some conspicuous impurity.

This year the size of the increase plots was doubled, making them practically a rod square. The seed of 177 varieties, strains, selections and seed stocks of various sources was thus multiplied. These include the following introductions:

O. A. C. 144, oats from Guelph, reputed to have stiff straw.

White Cross oats from Ottawa. An early variety from Wisconsin.

Star oats from Ottawa. A recent introduction from Sweden.

Banner x Alaska (21-10005); Victory x Alaska (21-10008). These are crosses made in 1921 at Ottawa and are to be grown with a view to selecting likely-looking material. Should contain many homozygous forms.

Reward 42 x Huron 3 (Ottawa 25-1495). In the F3 generation. To be treated as the oat crosses.

Marquis Sask. 70, from Saskatoon.

Several spring wheats from Russia, viz., *Lutescens* 062, *Albidum* 0721, *Albidum* 0604, *Mildurum* 0274, *Mildurum* 0321, *Caesium* 0111, *Melanopus* 069, *Hordeiforme* 010, *Hordeiforme* 0189.

A thickness-of-seeding test with spring grains is being conducted with drilled plots.

Dates of planting were compared in the case of both spring and winter grain.

A stage-of-harvest test was undertaken with Reward wheat.

A uniform rust nursery was seeded and a spore trap was exposed in co-operation with the Division of Botany and the Rust Research Laboratory at Winnipeg. Not a spore of rust was caught at Beaverlodge in 1928.

A few co-operative tests with cereals were supervised in conjunction with the Cereal Division.

Some forty-odd samples of wheat grown in field crops were collected in the autumn and sent to Winnipeg to be graded by Mr. Jas. D. Fraser, Chief Grain Inspector, and afterwards forwarded to Ottawa for milling and baking test in the laboratory of the Cereal Division.

A few minor tests were made and incidental data obtained.

#### SEASON, SEEDING, SOIL AND PREPARATION

For all except the rate-of-seeding experiment, the preparation was summer-fallow after cereal plots which had yielded heavily in 1926. In its natural condition this land was of average quality. It had a heavy application of manure in 1922-23 and a lighter coat in 1927-28. Prior to seeding it was lightly spring-toothed and harrowed. This produced seed-bed conditions favourable for prompt germination. May was exceptionally warm and as there were a few showers early growth was rapid. Midsummer weather was hot and dry, ripen-

ing crops rather hastily and impairing both yield and sample of some of the precocious sorts. Thus it came about that a moderately late season was followed by one of the earliest harvests on record. Yields were barely average, while the grade was marred by uneven size of berry. High winds just before harvest caused considerable shattering. Over-ripeness caused further loss. Some of the barleys lost so heavily that yields were not taken.

Rod-row seeding of the variety test commenced on May 1 and was completed on the fourteenth. The first drilled plots of peas and wheat were seeded April 30, the oats and barley May 3. The Reward and Garnet plots were harvested August 18.

#### FUNGOUS DISEASES NOT TROUBLESOME

There was no rust whatever. Ergot, so prevalent in 1927, was this year little in evidence. Most of the smuts were apparently controlled by the copper-carbonate treatment to which all the staple cereals were subjected. A little smut showed in a few susceptible barleys, notably the Eureka, and traces were found elsewhere.

A trace of loose smut occurred in two multiplying blocks of Reward wheat but not in the test plots nor in a block sown exclusively with a stock of old seed. Following back, it was found that the two infected blocks had been sown with seed through which had been mixed the crop from a plot sown in the previous season with a stock obtained from another Station. Inquiry elicited that a trace of smut (not then identified as loose smut though now thought to be such) had been found in that plot in 1927, while other plots of Reward sown with home-grown seed were free from it.

Loose smut is an early-appearing, early-shattering form which spreads by blossom infection and is not amenable to treatment by any chemical since the spores are inside the kernel. Temperature treatment applied through the medium of hot water is the only known means of control and this must be applied with great accuracy and care followed by close attention to the drying of the swollen grain. It is significant and is a matter for gratification that of all the Reward distributed from Beaverlodge in 1928 not one head of loose smut was reported by any grower, whereas material percentages were found in all crops grown from seed obtained from certain other sources, having very probably been introduced to their stocks by blossom infection from some adjacent field or plot. Loose smut does not affect the milling quality of wheat but only the yield.

#### COMPARISON OF YIELDS OF ROD-ROWS AND DRILLED PLOTS

As a means of judging to what, if any, extent the rod-row system of variety testing might tend to exaggerate yields, calculations have been made each season for several years past to compare the performance of those varieties which were being tested in both the rod-rows and the drilled plots. Until 1928 the difference was almost negligible.

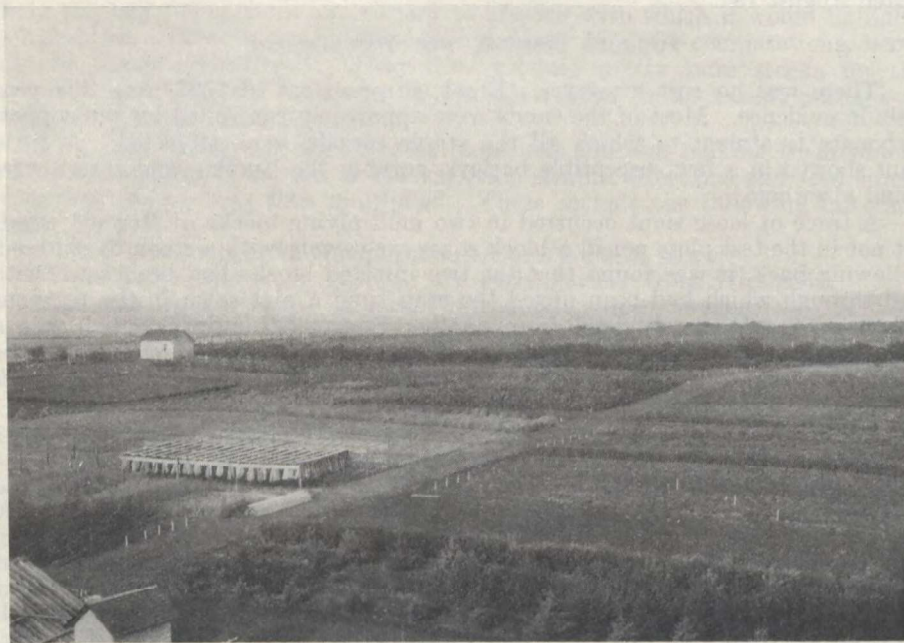
This year for some reason or reasons the disparity is 23.57 per cent. To be sure, the drilled plots were unduplicated, while the rod-rows were in octuplicate. This, however, should not account for much of a spread in the net average. Allowance may be made for the fact that the drilled plots had perhaps scarcely so good a soil as the rod-rows, the drilled plots of flax and buckwheat in particular being on a trampled area adjacent to a driveway. It may be noticed that the contrast is greatest of all in the case of these two crops. The low yield of the drilled plot of Victory oats is harder to reconcile, as is the indifferent showing of Reward wheat in the drilled plots.

Shattering reduced the yields of some plots although whether the drilled plots more than the rod-rows it is not easy to decide.



The rod-row crops were sacked, stored and threshed practically without waste. The drilled-plot stooks were exposed to ordinary losses and some little extra attention this year from crows. Even so, the waste anticipated was rather less than usual, apart from the factor of shattering.

The rod-row plots averaged about four days earlier in maturing. This is quite understandable since the trampling of them in the course of seeding packs the ground and decidedly hastens emergence.



Rack supporting sacked crops of cereals from the rod-row plots. About a thousand plots represented.

RESULTS OF COMPARISON OF YIELDS OF ROD-ROWS AND DRILLED PLOTS, 1928

Variety	Days to mature		Yield of grain per acre	
	Rod-row plots (octuplicate)	Drilled plots (not replicated)	Rod-row plots (octuplicate)	Drilled plots (not replicated)
			lb.	lb.
Marquis wheat.....	107.4	113.0	2,771	2,481
Reward wheat.....	99.1	101.0	2,237	1,848
Banner oats.....	97.5	102.0	4,031	3,537
Victory oats.....	100.8	103.0	3,512	2,270
Eureka barley.....	92.3	102.0	1,979	1,980
Hannchen barley.....	94.0	105.0	3,382	2,851
Chancellor peas.....	111.3	107.0	2,548	2,164
Arthur peas.....	114.1	111.0	2,690	2,323
Premost flax.....	107.0	116.0	1,004	528
Common buckwheat.....			1,320	633
Averages.....	102.6	106.7	2,547.4	2,061.5

## SOME LONG-TERM-AVERAGE YIELDS

Although the rod-row system has been adopted for variety testing, and tables of comparative yields must henceforth be based upon their turnout, it has been thought well to sow each year an ordinary drilled plot of one or two varieties each of several kinds of grain in order to be able to record long-term-average yields of wheat, of oats, of barley, etc., grown under conditions of seeding and harvesting similar to those practised in commercial work. Commencing with 1922 the border drills have been systematically excluded from these plots at harvest so that they approach field conditions quite closely save only that the plots are hand-weeded when necessary.

Considering then, these long-distance records of drilled plots, it is interesting to note that the fourteen-year average for Marquis wheat has been 37 bushels 3 pounds per acre, the current season's yield of 41 bushels 21 pounds having raised it slightly.

The thirteen-year average of Victory oats has been 87 bushels 27 pounds. The ten-year average, by the way, is 86 bushels 1 pound against 91 bushels 9 pounds of Banner. Periods of maturity recorded during a nine-year span show the Banner 2·3 days earlier.

During thirteen years the O.A.C. No. 21 barley has averaged 40 bushels 28 pounds in spite of a low yield of 30 bushels 31 pounds recovered in 1928 after a violent wind during which the plot stood two or three days over-ripe. As the disaster was due to delay in harvesting, efforts were made (with only partial success) to glean the heads broken off. In a nine-year average O.A.C. 21 has produced 43 bushels 39 pounds of grain, Eureka (hulless) 43 bushels 31 pounds and Hannchen 50 bushels 37 pounds. In that time O.A.C. No. 21 ripened a day and a half earlier than Eureka and nearly a week ahead of Hannchen.

The fourteen-year record for Arthur peas is 25 bushels 18 pounds. Chancellor, grown for eight years only, is but half a bushel behind Arthur in yield, and, being almost a week earlier, it is a much safer sort to grow.

The eleven-year average for flax is 12 bushels 37 pounds, this covering one year of failure from late spring frosts.

The four-year average for buckwheat is 26 bushels 21 pounds.

## VARIETY TESTS

Forty-seven varieties and strains or stocks of spring wheat, forty-three oats, fifty-nine barleys, seven peas, three kinds of flax and three spring ryes were tested, but no good purpose would be served by detailed discussion. A few comments may be offered on the performance of the leading sorts.

**WHEAT.**—While the nature of the midsummer weather was harder than usual on early-ripening sorts, causing Garnet and Reward to fall below Marquis by a much wider margin than usual, it is surprising to find Ruby holding its customary ratio to Marquis and crowding close on the heels of its early rivals, which usually outyield it considerably. Reward especially seemed to be adversely affected by the hot, dry July weather both as to yield and sample. Early Triumph for once fell a little below Marquis, though still leading it substantially in the seven-year average yield.

**OATS.**—Banner maintained its slight edge on Victory in the matter of yield, the ten-year average standing, in the table, at 92 bushels 25 pounds against 89 bushels 24 pounds for Victory, 81 bushels 16 pounds for Abundance and 56 bushels 13 pounds for Liberty. Crediting Liberty with the thirty per cent or so of hull carried by ordinary oats its yield would be brought up to 80 bushels.



## BARLEY—VARIETY TEST. (ROD-ROWS, 1928, DRILLED PLOTS PREVIOUSLY)

Variety	Days to mature				Yield of grain per acre			
	1928	Average 3 years 1926-28	Average 7 years 1922-28	Average 9 years 1920-28	1928	Average 3 years 1926-28	Average 7 years 1922-28	Average 9 years 1920-28
					bush. lb.	bush. lb.	bush. lb.	bush. lb.
Bearer Ott. 475.....	94.8	110.8	113.6	.....	55 45	73 40	51 45	.....
Charlottetown No. 80.....	94.6	109.0	111.6	.....	57 33	71 36	.....	.....
Eureka (hulless).....	92.3	105.2	107.9	108.3	41 11	58 37	41 37	43 30
Gold.....	96.4	110.5	.....	.....	69 38	78 20	.....	.....
Hannchen.....	94.0	109.2	112.7	.....	70 22	73 34	50 12	52 ..
O. A. C. No. 21.....	(Shattered in 1928, yields not taken.)				.....	.....	.....	.....
Average 5 varieties.....	.....	.....	.....	.....	59 1	.....	.....	.....
Average 4 varieties, excluding hulless.....	.....	.....	.....	.....	63 23	.....	.....	.....

## PEAS—VARIETY TEST. (ROD-ROWS, 1928, DRILLED PLOTS PREVIOUSLY.)

Variety	Days to mature			Yield grain per acre			
	1928	Average 5 years 1923-28 excluding 1924	Average 7 years 1921-28 excluding 1924	1928	Average 6 years 1923-28	Average 7 years 1922-28	Average 8 years 1921-28
				bush. lb.	bush. lb.	bush. lb.	bush. lb.
Arthur Ott. 18.....	114.1	124.2	124.8	44 50	36 16	33 0	33 25
Chancellor 0.26.....	111.3	117.1	118.4	42 28	34 25	31 34	32 55
Mackay Ott. 25.....	115.8	126.0	.....	41 22	38 0	.....	.....
Average, 3 varieties.....	.....	.....	.....	42 53	.....	.....	.....

## FLAX AND BUCKWHEAT. (ROD-ROWS, 1928, DRILLED PLOTS PREVIOUSLY)

Variety	Days to mature				Yield of grain per acre		
	1928	Average 4 years 1925-28	Average 5 years 1924-28	Average 6 years 1923-28	1928	Average 4 years 1925-1928	Average 11 years 1918-28
					bush. lb.	bush. lb.	bush. lb.
Flax—Premost.....	107	112.8	116	119	17 52	16 19	13 25
Buckwheat—Common.....	95	104	.....	.....	27 24	30 0	.....

## WINTER GRAIN—VARIETY TEST. (ROD-ROWS, 1928, DRILLED PLOTS PREVIOUSLY)

Variety	Days to mature		Yield of grain per acre	
	1928	Average 11 years 1918-28	1928	Average 11 years 1918-28
			bush. lb.	bush. lb.
Winter wheat—Turkey Red.....	356	372.0	41 52	27 34
Winter rye—2nd date.....	363	370.5	45 45	40 52

## RATES OF SEEDING

Throughout the four years during which it has been running on its present plan, the experiment on rates of seeding has given consistently inconsistent results, these seeming to vary more according to accidental factors than according to the quantity of seed applied. Even those few tendencies that have promised to stand out with some degree of certainty have sooner or later met with reversals. For instance, during the first two years Banner oats decreased progressively in yield from the thinnest to the thickest seedings, the spread in the first year being 9 bushels, 11 pounds per acre and the next year (on a much heavier crop) 18 bushels, 30 pounds. Strangely enough, in 1927 the heaviest yields of Banner were from the extreme rates, the 16-peck seeding, for example, giving five bushels more than the 14-peck, and six bushels more than the 12-peck. This year a fresh surprise was furnished when the 12-peck seeding produced the largest yield, followed by the 14-, 16- and 10-peck seedings in order named. The 12-peck had the shortest straw. All the rates of seeding of oats ripened pretty well together though the 16-peck was judged half a day earlier than the others.

Even making due allowance for the factor of experimental error, these results are difficult to reconcile. The one broad, outstanding inference suggested is that rates of seeding are not, as a rule, extremely important in affecting crop yields. Within the limits of this test there has seemed to be a tendency for heavy seeding to hasten maturity, each additional half-bushel of oats having in some seasons advanced it about a day. With wheat and barley the effect in this regard has not been very noticeable, though more evident this time than usual.

Thickening the seeding has usually shortened the straw by one or more inches, has made it finer and has shortened the heads. Its effect on lodging has been slight, if indeed there has been any at all. The varieties employed have been Garnet and Marquis wheat; Banner and Ligowo oats; Eureka and Bearer barley.

The rates of seeding compared have been five, six, seven and eight pecks of wheat per acre; ten, twelve, fourteen and sixteen of oats; four, six, eight and ten of barley. Of each condition there have been duplicate plots.

Rates of seeding have been roughly regulated by the index on the seeder and the aim has been to sow according to weight. The method is admittedly inaccurate at the best, and occasional slips have occurred as well. In sowing the thickest seeding of Bearer barley in 1928, one half of one plot was put on about twenty per cent more heavily than was intended.

## DATES OF PLANTING SPRING GRAINS

The dates-of-seeding project was conducted as in 1927 except that the plots were widened to seven drills. All were in octuplicate.

Commencing April 30, six successive weekly sowings were made of Marquis and Garnet wheat; O.A.C. No. 3, Banner and Liberty oats; Eureka barley; Mackay and Chancellor peas. Commencing on May 14, three weekly sowings were made of Premost flax and Common buckwheat. The land was summer-fallow in a good state of tith.

Germination was prompt and the early growth satisfactory. There was no real interference with development until midsummer drouth affected the plots. This must have influenced not only yields but also such matters as periods of maturity.

Experiments of this character vary markedly in their outcome from year to year and great circumspection must be exercised in drawing deductions. Considering briefly the 1928 tables, we note that with wheat, oats, barley and peas the highest yields were in most cases produced not by the first but by the second or third sowing; in one case (Chancellor peas) by the fourth and in another case (Garnet wheat) by the fifth. Possibly the July drouth hit the early sowings at the critical filling stage, pulling down yields as it did of precocious kinds in the variety test. Favourable autumn weather permitted later kinds to ripen on the Station area practically without frost injury. With all crops, however, except buckwheat the lowest yield was produced by the final seeding. The first sowing of buckwheat was caught by a spring frost.

Some fairly good crops were obtained, several of the wheat plots running around forty bushels per acre, while the third sowing of Marquis turned off fifty. On lower ground this crop would have been badly frosted. The third sowing of Banner oats threshed out nearly a hundred.

#### DATES OF PLANTING WINTER GRAIN

Six dates of planting of Turkey Red winter wheat and Ottawa winter rye were sown in a sextuplicate rod-row test commencing August 4, 1927. The Turkey Red plots ripened within three days of each other while the winter rye plots were all judged ripe on August 8. The later plantings of winter wheat made very little growth in 1927 and showed thinner and weaker stands in the spring of 1928.

#### STAGE-OF-HARVESTING TEST WITH WHEAT

Two weeks before harvest several blocks of Reward wheat were canvassed to find the most suitable portion on which to conduct a stage-of-harvesting test. Two adjacent drill widths comprising 28 drills six inches apart and approximately 10 rods long sown May 2 on summer-fallow, were chosen for the test. Cutting commenced August 2, when the grain was slightly past the early dough stage, and continued until August 24, samples being taken each alternate day, following the same drills. The heads from each row plus about a foot of straw were clipped, placed under cover, and hand-threshed two months later.

Although the stand seemed quite uniform for machine-drilled grain an examination of the stubble and yields obtained from each row shows a distinct lack of uniformity. It was necessary, therefore, to combine the grain from each date for sampling purposes, so that the data as presented are taken from plots 11.6 by 14 feet.

The crop would ordinarily have been harvested between the seventh and eighth dates of this test. The lower yields from the first dates are no doubt due to improper filling. As no shattering was observed it is possible that the lower yields of the eleventh and twelfth dates were due to thinness of stand.

Samples of the respective crops were officially graded by the Government grader at Calgary, all those taken from the sixth date onward being rated No. 1 Northern.

Further samples representing the same lots were forwarded to the Division of Chemistry, Central Experimental Farm, Ottawa, for analytical study.

## RESULTS FROM STAGE-OF-HARVESTING TEST WITH REWARD WHEAT, 1928

Date	Yield per acre	Weight per measured bushel	Weight per 1,000 kernels	Commercial grade
	lb.	lb.	grms.	
1st date..... Aug. 2.....	1,779.8	65.0	26.4	3 Northern line sample
2nd " " " 4.....	1,604.7	65.8	26.4	3 Northern
3rd " " " 6.....	1,919.9	66.6	27.6	3 " "
4th " " " 8.....	1,719.9	67.0	29.2	2 " "
5th " " " 10.....	1,723.8	67.5	29.2	2 " "
6th " " " 12.....	2,016.5	66.9	30.0	1 " "
7th " " " 14.....	2,164.3	67.5	29.6	1 " "
8th " " " 16.....	2,158.0	67.5	29.6	1 " "
9th " " " 18.....	1,942.1	66.8	29.6	1 " "
10th " " " 20.....	1,788.4	66.5	29.0	1 " "
11th " " " 22.....	1,333.4	67.0	28.8	1 " "
12th " " " 24.....	1,471.5	65.8	28.8	1 " "

## THE CHEMIST'S FINDINGS

Since preparation of the foregoing table, a report has been received from Dr. Frank T. Shutt, Dominion Chemist, which is herewith appended. It will be observed that the weight per thousand kernels as taken at Ottawa runs substantially higher than the corresponding determinations made at Beaverlodge, particularly throughout the earlier and medium-early "takes". The Beaverlodge figures are the average of three independent scorings. Dr. Shutt's comment follows:—

"A preliminary study of these data permits the following comments:—

"*Weight of Kernel*.—There appears to be a more or less regular increase in weight of kernel from the date of first cutting (August 2) to that of the sixth cutting (August 12). These cuttings include three samples (1st to 3rd) in Grade No. 3, Northern, two samples (4th and 5th) in Grade No. 2 and one sample (the 6th) in No. 1.

"No regular trend in respect to this datum can be observed in the figures for the remainder of the series, but certainly there is no increase in the weight of kernel after the date of the sixth cutting.

"*Protein*.—The protein content (dry matter basis) more or less regularly increases from the first to the sixth cutting, and in this follows weight of kernel.

"From the sixth to the twelfth cutting the results are irregular and the reason for or cause of this irregularity is not apparent.

"Presumably, the only definite conclusion that we can reach from this work is that there was no appreciable improvement in the grain after the date of the sixth cutting which apparently is very close to the stage of ripeness at which you considered the crop would ordinarily be harvested.

"While admitting that your general plan of conducting this work is probably the only one that would yield data of practical value to the farmer—and I think this it has done, since your judgment as to the best time for harvesting is confirmed by our data—it may be pointed out that in this plan *all* the kernels at any one date of cutting are not necessarily at the same stage, physiologically. This irregularity in maturing was observed in our experimental work planned to trace the development of the wheat kernel. This unevenness in development may account for the lack of regularity in trend in the data which has been observed in this series".

## REWARD WHEAT: EXPERIMENTAL STATION, BEAVERLODGE, ALTA.

CROP OF 1928.—DATE OF CUTTING EXPERIMENT

(Determinations by Division of Chemistry, C.E.F., Ottawa)

Sown on summer-fallow, May 2.

Laboratory No.	Number of cutting	Date of cutting	Grade	Weight of 1,000 kernels	Moisture	Protein (N. x 5.7)		Ash	
						13.5% moisture	Dry matter basis	13.5% moisture	Dry matter basis
						p.c.	p.c.	p.c.	p.c.
				gm.	p.c.	p.c.	p.c.	p.c.	p.c.
96994.....	1st	2-8-28	No. 3 Northern	28.57	9.68	15.03	17.38	1.45	1.67
95.....	2nd	4-8-28	No. 3 "	28.43	7.98	15.02	17.36	1.34	1.55
96.....	3rd	6-8-28	No. 3 "	30.29	9.63	16.28	18.81	1.30	1.51
97.....	4th	8-8-28	No. 2 "	30.96	8.67	16.43	18.99	1.17	1.35
98.....	5th	10-8-28	No. 2 "	30.78	8.78	15.94	18.43	1.21	1.40
99.....	6th	12-8-28	No. 1 "	31.60	8.56	16.97	19.63	1.36	1.58
96700.....	7th	14-8-28	No. 1 "	28.91	8.66	15.35	17.74	1.24	1.43
01.....	8th	16-8-28	No. 1 "	30.22	9.12	15.53	17.96	1.22	1.41
02.....	9th	18-8-28	No. 1 "	29.68	8.34	16.97	19.63	1.33	1.54
03.....	10th	20-8-28	No. 1 "	28.47	7.98	16.73	19.34	1.38	1.60
04.....	11th	22-8-28	No. 1 "	28.76	7.76	16.77	19.38	1.75	2.03
05.....	12th	24-8-28	No. 1 "	29.34	9.24	16.13	18.64	1.24	1.43

## FORAGE CROPS

The production of forage plants in a semi-arid climate is fraught with difficulties. Both the perennial meadow crops and the succulent annuals, such as field roots, demand abundance of moisture. The perennials call for plenteous draughts early in the season. The slow-sprouting root crops require enough showers to ensure germination and reasonable early growth, and make heavier demands later on. Only in a very occasional season does the Peace River summer suit either. At Beaverlodge, the summer of 1928 rather favoured the latter in that it provided enough light early-summer rains to ensure a good germination and produce a promising braird. There was scarcely enough autumn moisture, however, to support a heavy tonnage of roots and certainly not enough early moisture to give decent crops of hay save under exceptional conditions.

From an experimental standpoint the most encouraging feature is the relatively good showing of legumes. Alfalfa seed was again a paying crop.

All perennials had wintered well, having been thickly mantled with snow while the weather was cold.

## PASTURING TEST IN SEEDING DOWN

Four annual seedings have been made in an experiment laid down in 1925 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.

It is thought inadvisable to publish the results as yet although they are not without promise.

The crop of 1926 was fairly free of weeds. That of 1927 was pretty clean in some cases but certain stands were interspersed with considerable weed growth. A rough estimate of the impurities in the worst-polluted plots was made but it was only approximate, hence no accurate allowances from the 1927 yields could be made.

It was feared there might be further pollution in 1928. Fortunately this was not extensive, and, except for some volunteer winter rye and a certain amount of stubble trash, the 1928 hay was reasonably clean from at least three of the several preparations.



It may be expected that the outcome of the pasturing system will depend somewhat upon the nature and prevalence of the weeds to be contended with. Thus far, however, the plan of seeding without nurse crop but pasturing during the season of seeding has resulted in a limited amount of grazing in the initial season, followed by creditable crops of fairly clean hay in the second year. The total tonnage of feed produced in the long run has not equalled that produced by seeding with a nurse crop of oats harvested for green feed, but the meadow seeding itself is surer and the production of grass and legume hay very much larger than by the other practice. Judgment is still reserved.

An incidental point brought out by the 1928 harvest of the 1926 seeding is that while plots consisting of grass only gave low yields, chiefly averaging from three-quarters of a ton up to a ton per acre, plots which carried a substantial percentage of alfalfa averaged around a ton and a half.

Considering two-year-aggregate yields the advantage of a legume admixture seems rather clearly indicated.

PASTURING TEST IN SEEDING DOWN, 1926 SEEDING

Presenting 1927 and 1928 results in pounds of hay per acre from the average of duplicate plots under each treatment.

Designation	Year	Seeded with winter rye to be pastured	Seeded with a sprinkling of rape to be pastured	Seeded without nurse crop	Seeded with oats to be pastured	Seeded with oats to cut	Average 4 preparations (except winter rye)
		lb.	lb.	lb.	lb.	lb.	
Alfalfa.....	1927	1,665.0	2,641.0	3,098.0	2,153.0	978.0	2,217.5
	1928	3,162.0	4,123.0	3,107.5	3,032.0	2,492.0	3,188.6
Total 2 years.....		4,827.0	6,764.0	6,205.5	5,185.0	3,470.0	5,406.1
Alfalfa and western rye.....	1927	2,280.0	3,524.0	3,865.0	2,096.0	1,263.0	2,687.0
	1928	3,417.0	2,871.5	3,325.0	3,621.0	3,078.0	3,223.9
Total 2 years.....		5,697.0	6,395.5	7,190.0	5,717.0	4,341.0	5,910.9
*Western rye grass.....	1927	2,071.0	3,587.0	4,583.0	1,710.0	1,106.0	2,746.5
	1928	3,723.0	2,803.0	3,242.5	2,592.0	2,181.5	2,704.8
Total 2 years.....		5,794.0	6,390.0	7,825.5	4,302.0	3,287.5	5,451.3
Alfalfa and Brome.....	1927	1,363.0	2,866.0	3,254.0	1,785.0	1,400.0	2,326.3
	1928	2,715.5	2,711.0	3,511.0	4,061.0	1,993.0	3,069.0
Total 2 years.....		4,078.5	5,577.0	6,765.0	5,846.0	3,393.0	5,395.3
Western rye and brome.....	1927	1,195.0	2,391.0	4,626.0	1,258.0	1,011.0	2,321.5
	1928	1,804.0	2,167.5	2,153.0	1,924.0	1,402.0	1,911.6
Total 2 years.....		2,999.0	4,558.5	6,779.0	3,182.0	2,413.0	4,233.1
Brome.....	1927	1,105.0	2,334.0	4,584.0	1,066.0	999.0	2,245.8
	1928	1,413.0	1,554.5	1,824.0	1,332.5	1,532.5	1,560.9
Total 2 years.....		2,518.0	3,888.5	6,408.0	2,398.5	2,531.5	3,806.7
Sweet clover and brome.....	1927	1,455.0	3,539.0	4,207.0	1,078.0	889.0	2,428.3
	1928	1,390.5	1,795.0	1,795.0	1,460.0	1,579.5	1,657.4
Total 2 years.....		2,845.5	5,334.0	6,002.0	2,538.0	2,468.5	4,085.7
Sweet clover and western rye.....	1927	1,614.0	4,420.0	4,649.0	1,233.0	1,264.0	2,891.5
	1928	2,369.0	3,385.5	3,010.0	2,026.0	2,297.0	2,679.6
Total 2 years.....		3,983.0	7,805.5	7,659.0	3,259.0	3,561.0	5,571.1
Sweet clover.....	1927	1,921.0	4,109.0	4,540.0	1,729.0	989.0	2,841.8
	1928						
Averaging 8 kinds of crop (excluding sweet clover).....		4,092.8	5,839.1	6,854.3	4,053.4	3,183.2	4,982.5
Average 9 kinds of crop.....		3,851.5	5,646.9	6,597.1	3,795.2	2,939.4	4,744.7

\*The 1928 crop showed 10 to 50 per cent alfalfa as a result of a mischance in seeding. (See footnote). From the same cause a little alfalfa showed in certain other plots intended to be seeded with grass seed only.

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 shooting. 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 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.

8. 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.

9. 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.

10. 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.

#### 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 recommended by the Station for commercial use, the yield results have been surprisingly good, and, furthermore, an exceptionally nice growth of corn was obtained in 1928 on the area where the 1925 seeding was ploughed up in 1927.

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.

DATE-OF-PLANTING TEST WITH MEADOW CROP; CONJOINED WITH PASTURING TEST, 1926 SEEDING  
OF THE 4-4-4 MIXTURE

Average of duplicate plots under each treatment, 1927 and 1928 crop in pounds per acre.

Designation	Seeded without nurse crop	Seeded with winter rye to be pastured*	Seeded with rape to be pastured	Seeded with oats to be pastured	Seeded with oats to cut
	lb.	lb.	lb.	lb.	lb.
First date, 1927.....	4,483.0	1,379.0	3,709.0	1,612.0	1,037.0
1928.....	2,850.5	1,924.5	3,700.0	3,081.0	1,794.5
Total 2 years.....	7,333.5	3,303.5	7,409.0	4,693.0	2,831.5
Second date, 1927.....	5,010.0	4,365.0	4,110.0	2,322.0	1,652.0
1928.....	3,959.5	2,152.0	3,006.5	2,791.0	1,854.0
Total 2 years.....	8,969.5	6,517.0	7,116.5	5,113.0	3,506.0
Third date, 1927.....	3,887.0	1,712.0	3,160.0	1,975.0	1,076.0
1928.....	4,377.5	2,434.5	3,105.5	2,501.0	1,969.0
Total 2 years.....	8,264.5	4,146.5	6,265.5	4,476.0	3,045.0
Fourth date, 1927.....	3,792.0	2,681.0	1,808.0	1,686.0	1,420.0
1928.....	3,627.5	2,697.5	2,948.5	2,782.5	2,718.5
Total 2 years.....	7,419.5	5,378.5	4,756.5	4,468.5	4,138.5

\* 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 oats 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.

#### ALFALFA VARIETY TESTS

Variety tests of alfalfa are in progress with seedings made in four different seasons, viz., 1923, 1926, 1927 and 1928. For the most part these seedings happen to represent the driest and poorest soil on the Station area. Their vigorous persistence and comparatively creditable yields under such adverse conditions are encouraging.

The 1923 seeding is on a particularly dry, clay knoll-head yet the two strains of Grimm gave over a ton and a half of hay per acre from their five-year-old stands, although cut on June 27, when slightly past fifty per cent in bloom. Only one cutting per season is taken in this test. The Yellow-flowered Siberian and the Cossack fell off considerably in 1928 and both now stand below Grimm in four-year-aggregate yields, while their stands are certainly no more successful in holding the land.

The 1926 seeding comprised eight strains and varieties. Here again the Yellow-flowered Siberian makes an indifferent showing, with less than a ton and a half of hay in 1928 against nearly two tons for the three strains of Grimm.

The Siberian variety did relatively better in the 1927 seeding but still it may be said that to date the test has demonstrated no variety superior to Grimm.

#### ALFALFA FOR SEED PRODUCTION

Again there was an excellent set of alfalfa seed and a very nice sample was threshed. The season was not quite long enough for all the seed to ripen, although a certain proportion became rather over-mature and shattered. Side by side were six rows, two of them flanked by trees on the east, which two rows had been drilled in 1923 with seed raised on the Station in 1922. The other four were sown in 1926.

The two rows have borne a nice crop of seed every year commencing with 1924, save only in 1926, when it was scarcely worth harvesting. In 1927 the threshing outturn was so large that its accuracy was mistrusted and not permanently recorded, the yield of the new- and old-seeded rows being averaged as two bushels per acre. According to that year's records, the old seeding far out-yielded the new. In 1928 there was again such a disproportion in the two yields as to arouse suspicion, but this time the new seeding appeared to have produced much the heavier crop and on being cleaned its seed was found to be larger in size. A partial explanation might lie in the fact that when the new seeding was being bound a canvas was carried to catch seed that might otherwise spill on to new seedings of grass plots adjacent. Two sacks of pods were collected in this way, containing, doubtless, some of the ripest and best seed. The precaution was not adopted in harvesting any of the other seed areas and there may consequently have been more loss than was apprehended at the time.

The two old rows, estimated as drawing from an area of 0.28 acre threshed 6 pounds of the larger run of seed, and 18½ pounds of the smaller run, both lots grading No. 1 at the Dominion Seed Laboratory, Calgary. The total amounts to 86.6 pounds per acre or 1 bushel and 26¾ pounds. This is much less than was promised by the appearance of the standing crop.

The four rows of 1926 seeding, estimated as drawing from an area 0.61 of an acre, cleaned up 128½ pounds of the larger run, and 32 pounds of the smaller run, both lots grading No. 1. The total yield would thus be 160½ pounds, or 263 pounds per acre, equivalent to 4 bushels 23 pounds.

On soil closely resembling that on which the drills grew, is a half-acre seeded broadcast in 1923 with the same stock of seed used for the rows. It has usually thrown a lighter crop of seed than the rows, and the sample has seldom been quite so good. In 1928 there were 31½ pounds of the larger run, officially grading No. 1, and 33 pounds of the other grading No. 2 because of having a few seeds of sweet clover, timothy and rye grass. The total of 64½ pounds amounts to 128½ pounds per acre.

About a bushel per acre was threshed also from a hog pasture seeded in 1924 and not very closely eaten off in 1928. Containing a little sweet clover and lamb's quarter, this did not grade quite so high, the first separation being No. 2 and the second lot No. 3. The hog pasture was not handweeded and the crop contained a little sweet clover and grass seed.

#### VARIETY TESTS WITH ALSIKE, WHITE AND RED CLOVER

On an area where the previous season's seeding had killed out absolutely, a variety test of clovers was platted and sown June 9. Good catches were obtained, and, thanks to prompt and ample blanketing with snow, most of the stands wintered with no thinning whatever.

The plots were cut July 21 when crimson top knots were turning brown. In fact the white clovers and alsike were partly ripe.

The red clovers yielded well, even the common red giving more than a ton and a half of cured hay per acre, the Early Swedish nearly two tons and the later clovers upwards of two and a half.

Alsike, as usual, headed short, yielding abundance of bee pasture but only a ton of cattle fodder.

The White clovers gave inconsequential yields and evinced varying degrees of thinning of their stands. The commercial White Dutch, the Mammoth and the two Danish strains pretty fully occupied the ground but English Wild Clover and Ladino were patchy, one plot being estimated as low as thirty per cent of a full stand. Killing-out occurred chiefly on a dry knoll which transversed the area.

## VARIETY TEST OF TIMOTHY

Three varieties of timothy were seeded June 15, 1926, in duplicate plots on summer-fallow preparation. The stands obtained were somewhat irregular and the first year's cropping results inconclusive. The one plot of Boon yielded in 1927 not much more than half as much as its fellow. By 1918 it had evened up but the showing of the variety is depressed by the inferior 1927 performance of the one plot. The Ohio strain leads the field but in view of the indecisive nature of the test it is hoped the Forage Plants Division at Ottawa may not be debarred from further breeding of its Boon.

## KINDS AND VARIETIES OF GRASSES

In 1927 a strain test of timothy was combined with a comparison of six other grasses. The land was oat stubble after a date-of-planting test in 1926, the arrangement of the 1927 test being such as to equalize substantially the conditions for the grass plots, which were in duplicate. On May 23-25 the land was double-disked to sprout shattered grain, then shallowly ploughed and harrowed immediately before seeding on June 15. The grass seed was sown by hand and covered with the single-disk drill. All the seed was from Ottawa except the western rye, which was of local propagation. The plots were ten rods long by seven feet wide, lined on eight-foot centers.

Considerable oat growth volunteered and was not removed. The few weeds that came were hand-pulled. The volunteer oats were cut with a binder in September. The growth of the grasses was not particularly strong. It seldom is at Beaverlodge when seeding is done on grain stubble.

The varieties and kinds of seeds were,—Timothy: Commercial, Huron, and Boon; western rye grass; brome, meadow fescue, Kentucky blue, orchard and red top.

The grasses were all mown on July 20, by which date some of the earlier kinds had become somewhat over-ripe. Western rye and brome were by far the best, the former giving over two tons per acre, and the latter a little less than two tons. Two strains of timothy each cut a ton and a quarter. Meadow fescue contented itself with 2,315 pounds. Kentucky blue and red top were very petite. Orchard grass had a 65 per cent stand, leaving plenty of room for trees.

## INTERCULTIVATED CROPS

All the intercultivated crops in 1928 were compared by what might be called a modification of the rod-row plan of testing. The rows were somewhat more than a rod long, yet shorter than they have usually been made. Every plot carried a flanking drill of its own variety on either side, the two flanks of each plot being excluded from the calculations. The rapes and sunflowers were tested in quadruplicate; the corn and field roots in octuplicate.

## SUNFLOWERS

Diminishing favour of the sunflower crop seemed to warrant a contraction of its test to four varieties. Besides, seed of no others was available.

Two of the four sets were on summer-fallow, one on oat stubble and one lapped the two preparations. While stands were good throughout, the crop was shortened by dry weather. The oat stubble yielded only about 64 per cent as much green crop and 67 per cent as much absolute dry matter as did the fallow ground. Following is the tabulated comparison:—

The following table gives the pounds absolute dry matter per acre from sunflowers grown respectively on summer-fallow and oat stubble.

Variety	Summer-fallow, average, two sets	Oat stubble one set only
	lb.	lb.
Mennonite.....	2,022.5	1,444
Early Ottawa 76.....	3,064.5	1,879
Manchurian.....	2,862.5	2,230
Mammoth Russian.....	4,014.0	2,483
Average.....	2,990.9	2,009.0

The sunflowers were planted May 11, emerged ten days later and were harvested September 19, before any frost injury had occurred.

Once more it developed that although the Mammoth Russians were much the least mature of all the varieties, being only one per cent in bloom as against 96 per cent for the Manchurians and 100 per cent for the other two kinds, in percentage of dry matter they were second only to the Mennonites and in yield of dry matter per acre were 27 per cent ahead of their nearest competitor. Since this best yield, however, amounted to scarcely seven and a half tons of green weight and barely a ton and three-quarters of absolute dry matter per acre, it is apparent that either the moisture or the dry matter of sunflowers would require to be of super-excellent quality to justify much attention to the crop. Such marked superiority has not been evident from feeding trials, and seeing that ground devoted to the raising of sunflowers is left powdery, prone to drift and in poor condition for an ensuing crop, it would seem that the remains of the sunflower fad might be gently laid to rest by Peace River farmers with the inscription "Requiescat in Pace".

Sunflowers may still find a very limited use for soiling purposes and even to mix with the top layers of oats to promote settling in a silo. They may be grown to provide shade and seed for poultry and may serve a good purpose as a snow catch, but as a staple reliance for winter forage, adieu!

#### VARIETY TEST OF SUNFLOWERS, 1928

Average of quadruplicate plots

Variety	Date of emergence	Per cent stand	Height at harvest	Per cent in bloom	Yield per acre		Per cent dry matter
					Green weight	Absolute dry matter	
		%	in.	%	lb.	lb.	%
Mennonite (Rosthern).....	May 21	91	41	100	8,387.3	2,036.5	24.28
Early Ottawa 76.....	" 21	95	46	100	12,132.0	2,745.0	22.63
Manchurian (McKenzie).....	" 21	94	50	96	12,158.8	2,775.0	22.82
Mammoth Russian.....	" 21	95	57	1	14,980.5	3,531.3	23.57
Average.....					11,914.7	2,772.0	23.27

#### CORN

Seven field corns were drilled in octuplicate on May 11, appeared above ground on the twenty-second and twenty-third, and were harvested September 7 and 8, nicely in advance of injurious frost.

Half the plots were on summer-fallow, and one-quarter of them on oat stubble, while two sets were partly on each.

There was a little wireworm injury in one part of the patch and yields exhibited quite a sharp fluctuation from range to range, so that octuplication does not in this instance ensure very reliable data.

Comparing the summer-fallow with the oat-stubble sets we find the following quantitative averages:—

	Green weight	Absolute dry matter
	lb.	lb.
Summer-fallow.....	11,752	1,865
Oat stubble.....	5,380	1,004

Again the corns seemed to vary in percentage of dry matter rather directly according to their relative degrees of maturity. Thus Howes Alberta Flint, with many ears at the roasting stage, was found to contain 20.76 per cent of dry matter, while Longfellow counted his substance only to the extent of 14.74 per cent.

Since the production of absolute dry matter per acre ranged from 1,247 to 1,850 pounds, averaging 1,521, it would not take many cattle to consume all the corn that could be grown on a quarter section. As a summer-fallow substitute in the Peace River country corn may be a conditional success. As a crop substitute its performance is not stellar.

#### RAPE AND KALE

Giant rape had to fight a one-to-five encounter with the kales but worsted them all and emerged at the head of the list in yield, with more than twenty tons of green weight and nearly five tons absolute dry matter per acre. This was mostly on land adjoining that where the corn achieved 1,865 pounds and the sunflowers barely a ton and a half of dry matter. Three of the kales produced better than four tons dry matter per acre and even the fine-growing Sheep kale made 7,330 pounds. The preparation was summer-fallow. The plots were seeded May 14 and emerged May 22, producing complete stands. Yields were taken October 29.

Such proportion of these fleshy-stemmed annuals as could be fed before the weather turned too frosty were well appreciated by the cattle and to some extent by the swine, but most of the flank rows were left until spring to wave "the sere and yellow leaf."

#### VARIETY TEST WITH RAPE AND KALE, 1928

Average of quadruplicate plots

Variety	Per cent stand	Yield per acre		Per cent dry matter
		Green weight	Dry matter	
		lb.	lb.	
Giant rape.....	100	41,416.7	9,812.3	23.69
Sheep kale.....	100	32,371.8	7,330.0	22.64
Thousand-headed kale.....	100	35,245.0	8,262.8	23.44
Green Marrow-stemmed kale.....	100	39,814.8	8,156.0	20.48
Purple Marrow-stemmed kale.....	100	38,420.0	7,884.0	20.52
Improved 1000-Headed kale.....	100	35,257.0	8,154.3	23.13
Average.....		37,087.6	8,266.6	22.29

## FIELD ROOTS

Eighteen varieties of field roots were chosen and seeded May 10 on summer-fallowed land and made a prompt get-away, all but the carrots having emerged by May 22, and they only two days later. Each plot consisted of five rows, three of which were taken for test.

Thinning was done by a young Aberdonian of little faith who had no hope of the specimens attaining large size and accordingly sought to augment the yield by leaving plenty of plants to the yard. They were far too thick, the Swedes averaging only six to eight inches apart. This seemed to restrict the development of a crop which otherwise promised unusually well. There appears always to be something at Beaverlodge to take the joy out of the root crop.

Dry weather during the maturing stage and at harvest doubtless accounts largely for the percentages of dry matter running higher than usual.

For all the roots the preparation was unmanured summer-fallow.

**MANGELS.**—All the six mangels distinguished themselves by producing over two tons of solids per acre and two of them achieved the total of almost two tons and a half. Royal Giant Sugar Beet had 14 tons 408 pounds of fresh-pulled roots per acre.

The mangel harvest commenced October 4 and concluded on the eighth.

**SUGAR BEETS.**—As the result of an opportune reminder, twelve specimens of each variety of sugar beets were duly forwarded to the Dominion Chemist, Central Experimental Farm, Ottawa, who found them "Small to medium in size, uniform as to type with no forking. As received, they were slightly wilted, which would have the effect of raising somewhat their sugar content. The data show a high percentage of sugar with a fair purity. The results from this Station in the past have not as a rule been those of beets suitable for factory purposes."

The beets averaged about a pound in weight and the juice contained a sugar content ranging from 21.35 per cent for Dippe to 22.97 per cent for Home-grown.

Following is Dr. Frank T. Shutt's table of the analytic data:—

Variety	Sugar in juice	Co- efficient of purity	Average weight of one root
	per cent	per cent	lb. oz.
Dippe.....	21.35	81.19	1 2
Frederickson.....	22.52	83.70	1 -
Schreiber.....	22.11	84.72	- 15
Home Grown.....	22.97	87.34	- 14

No sugar beet factory has yet been established at Beaverlodge.

**CARROTS.**—The carrot competition was a duel, in course of which the Danish Champion was defeated by Improved Intermediate White rolling up the impressive score of almost ten tons per acre. It is doubtful at present writing whether the horses will have completed this dessert by spring.

Drawing took place October 12 and 13, the toes of quite a few specimens being thoughtfully left to fertilize the subsoil.

**SWEDES.**—Sweden need not yet be jealous of Beaverlodge's record in rutabagas, even if one sort did achieve the staggering production of nearly fifteen tons while another did still better in respect to nutrients, synthesizing 4,650 pounds of dry matter per acre. This is more than half as much as might have been expected from a crop of oats on like ground.



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 1928 the comparison was fairer than usual. Wherever possible, summer-fallow yields have been selected for the tabulation. In computing the dry-matter yields of the O.P.V. and cereals for hay, both of which this year were weighed in a field-cured condition, it was assumed that they would contain 88 per cent of dry matter. Perhaps 86 per cent would have been nearer the mark but the error will not be very great.

The feature of the 1928 percentage column is the meteoric ascendancy of the fleshy-stemmed group of plants, rape and kale, as compared with its performance in previous years. In 1927, to be sure, it was badly handicapped by defective stands while in the current season stands were complete and growth excellent. At that, its production of dry matter is remarkable. Sunflowers and corn grown on an adjoining area were down near the foot of the list. The root crops stand higher than in the two previous years.

Excepting only for the rape and kale, Banner oats take top place once more, having a substantial lead over the oats-legume mixtures.

While pounds of dry matter per acre are by no means the sole factor in determining the feed value of a crop, the comparison is interesting and of not a little significance. Succulence undoubtedly adds to the quality of a ration but is like the proverbial boy's whistle—all right if one does not pay (or sacrifice) too much for it.

DRY MATTER PRODUCTIONS OF VARIOUS CROPS

—	Preparation for 1928 crop	Number of plots involved	Yield dry matter 1928 lb.	Per cent compared with oats as 100		
				1928 per cent	1927 per cent	1926 per cent
Rape and kale.....	Summer-fallow.....	24	8,266	143.3	51.0	58.9
Banner oats.....	Sunflower and rape, ground.....	6	5,768	100.0	100.0	100.0
Oats and legumes.....	" "	12	5,047	87.5	81.0	84.2
Ruby wheat.....	" "	2	4,633	80.3	84.0	80.5
Mangels.....	Summer-fallow.....	48	4,528	78.5	25.0	21.1
Swedes.....	" "	32	4,257	73.8	60.0	43.0
Bald barley.....	Sunflower and rape.....	8	3,956	68.6	72.0	80.5
Turnips.....	Summer-fallow.....	16	3,690	64.0	60.0	43.0
Sugar beets.....	" "	32	3,290	57.0	16.0	25.7
Sunflowers.....	" "	8	2,991	51.9	63.0	76.3
Millet.....	Sunflower and rape.....	20	2,655	46.0	38.0	56.3
Carrots.....	Summer-fallow.....	16	2,209	38.3	21.0	7.3
Corn.....	" "	28	1,865	32.3	11.0	21.9

SOIL FERTILITY

THE NITRATE TEST WITH RAPE

As in 1927, nitrate of soda at 160 pounds per acre was applied to both rows and broadcast stands of rape on spring-ploughing after two grain crops and on summer-fallow. The test was in quadruplicate. The third-crop ground was ploughed June 11 and harrowed soon after. The soil was loose at seeding time but there was sufficient moisture for germination.

The rows of rape were sown with a garden drill. The broadcast stands were seeded at 4 pounds per acre. The whole test was seeded in quadruplicate on June 13 and harvested September 26. The nitrate of soda was applied on July 7. The soil was moist enough to dissolve the fertilizer almost immediately.

Separate comparisons are made, one on the basis of green weights and one on the basis of absolute dry matter as determined by the usual procedure. In this case it is probable that the green-weight data are the more trustworthy, especially when considering the yields from broadcast stands. The rape was cut with hoes, and in spite of care to avoid picking up dirt with the crop a certain amount of earth was unavoidably included. Whereas this would add slightly to the weight of green crop it would gravely affect the percentage of dry matter and also the per-acre production of dry matter calculated thereby. Such experimental error is liable to vary considerably in degree and to affect especially the results from short crops such as the stands from broadcast rape would be, more particularly on spring ploughing.

Even taking the dry-matter comparisons we see that nitrate fertilizing produced substantial increases in the broadcast stands, but only slight increases in the rows, where intertillage probably promoted nitrification.

Taking the green-weight comparison, we find that nitrate fertilizing produced a gain of nearly two tons per acre, or 25.53 per cent, on the broadcast rape after spring ploughing, and an identical increase in weight (though a smaller percentage, viz., 17.61) on the broadcast crop after summer-fallow. On the intercultivated rows the nitrate produced increases of only 7.36 per cent and 10.46 per cent, respectively.

These results accord substantially with the tenor of previous trials, seeming to indicate rather definitely that in a climate such as that of Peace River, on land which has grown a crop in the preceding season, soluble nitrogen may be, second to moisture, a limiting factor in crop production, particularly where nitrification is not stimulated by intertillage during the growing season.

Nitrate deficiency may also at times reduce the production on summer-fallow, though not usually to the same extent as on second or third-crop land.

NITRATE TEST WITH RAPE, BEAVERLODGE, 1928  
Averages of quadruplicate plots

Designation	Yield in pounds per acre				Per cent increase from nitrate fertilizer	
	Green weight		Absolute dry matter		Green weight	Dry matter
	Nitrate	Non-nitrate	Nitrate	Non-nitrate		
<i>Spring Ploughing—</i>						
Broadcast.....	18,880	15,040	5,056.0	4,343.3	25.53	16.41
Rows.....	19,250	17,930	3,987.8	3,900.8	7.36	2.23
<i>Summer-fallow—</i>						
Broadcast.....	25,640	21,800	6,600.0	5,721.0	17.61	15.36
Rows.....	29,040	26,290	5,369.0	5,129.3	10.46	4.67

## HORTICULTURE

Seeding in the hotbed began on April 28 and outdoor seeding commenced with the first date-of-planting of vegetables on April 30. There was a fair amount of moisture. Aside from a shower in August, the whole latter part of the season was dry, making this possibly the driest fall experienced in twelve years. Upon many vegetables and flowers the effect was less serious than

might have been expected. Of the former, possibly onions and cabbage in the variety test were most affected. The blooming of many of the annual flowers was slow but, on the whole, gratifying.

The frosts of August provided a sharp contrast in weather to several preceding years. Tender vines were scorched considerably on the lower slopes of the area but none of the staple vegetables were materially injured.

The main vegetable garden was in a new location, on soil innocent of manure and thus not too well adapted to gardening.

## VEGETABLES

### VARIETY TESTS

**ARTICHOKE.**—The Common Jerusalem made the usual vigorous growth. Burbank's hybrids, Giant Crimson and Burbank's Perpetual, were sown on May 22, and produced fine healthy plants, one of which had a number of very large buds.

**ASPARAGUS.**—The old row of 1916 continues to furnish a good supply for the table early in the year. Of three varieties of two-year-old plants transplanted in the fall of 1927, one, the Giant Washington, proved a complete failure, while the other two, Palmetto and Argenteuil, had about sixty per cent stands. The gaps in these were filled in the spring. It is proposed to transplant these varieties in the spring of 1929 to compare with autumn transplanting.

**BEANS.**—Twelve varieties were planted. Drouth militated against an abundant yield. Frost on August 16, which touched beans in other experiments, did little damage in the variety tests. The first picking of green beans was on July 26, the most generous supply being from Masterpiece (James). The last picking was at the end of August. In yield Red Valentine compares better than usual. The new variety, Sutton Princess, also compares well.

VARIETY TEST OF BEANS, 1928

Variety	Source	Green beans per acre	
		tons	lb.
Red Valentine.....	McD.....	3	135
Princess.....	Sutton.....	2	1,828
Masterpiece.....	O-Gen-Run.....	2	677
Bountiful.....	O-9363.....	2	635
Round Pod Kidney Wax.....	McD.....	2	594
Masterpiece.....	James.....	2	302
Plentiful French.....	Sutton.....	1	1,844
Princess of Artois.....	O-925.....	1	1,781
Ex. Ey. Red Valentine.....	S-B.....	1	1,406
Stringless Green Pod.....	O-11402.....	1	1,335
Wardwell Kidney Wax.....	Graham.....	1	354
Henderson Bountiful.....	D. and F.....	1	229

**POLE BEANS.**—On May 22 four short rows of Garden King (Webb) Scarlet Runners (Sutton) and of Kentucky Wonder were planted. The two rows of the last were used to test the advantage of removing the terminal bud. In one row it was removed on July 8. In the other it was left on. These two rows were each a comparative failure but the row with terminal bud removed had three times the yield of the other. Garden King (Webb) was prolific, and the Scarlet Runners best of all.

BEETS.—Fifteen varieties were sown on May 11, and taken up on September 21. They were in triplicate sets of 14.52 feet each, rows 3 feet apart. On account of prolonged drouth the yield was not much more than half that of former years.

VARIETY TEST OF BEETS, 1928

Variety	Source	Yield per acre	Results of cooking test, average rating of two households	
			Texture	Flavor
		tons lb.		
Eclipse.....	McDonald.....	11 1,500	98	98
Cardinal Globe.....	Rennie.....	11 917	95	96
Detroit Dark Red.....	McDonald.....	10 833	97	97
Early Wonder.....	Ewing.....	10 583	98	98
Early Model.....	Bruce.....	9 1,750	95	95
Early Flat Egyptian.....	Moore.....	9 1,167	98	85
Detroit Dark Red.....	Graham.....	9 917	96	96
Crosby Egyptian.....	Steele-Briggs.....	9 917	98	98
Extra Early.....	McKenzie.....	9 583	94	95
Early Model.....	Graham.....	9 250	90	90
Detroit Dark Red.....	Moore.....	8 1,750	98	97
Egyptian.....	James.....	7 750	98	97
Detroit Dark Red.....	O-10467-8.....	7 500	96	96
Improved Dark Red.....	Webb.....	3 750	95	83
Black Red Ball.....	O-8894.....	3 0	97	93

The Black Red Ball, at the bottom of the list, had not a good stand, the germination being poor. The Improved Dark Red, a long thin beet, is no improvement on last year. The greater number of these varieties are good clean samples, the globular type prevailing. The Egyptian varieties are of a flatter type.

BORECOLE OR KALE.—The two varieties, Scotch Curled and Dwarf Curled, appeared to be little affected by the dry season. They were large graceful plants with deep green foliage but there is no local demand for this vegetable.

BRUSSELS SPROUTS.—Some seed was sown on May 1 in the hotbed and set out early. The variety test was sown May 8. The latter when taken up proved equally as mature as the early-sown. It is difficult to get well matured sprouts in this region. In order of merit the Dalkeith variety as usual takes the lead, giving 90 per cent mature heads, followed by Improved Dwarf with 65 per cent, Paris Market 35 per cent and Amager Market 10 per cent.

CABBAGE.—On May 8 twenty-one varieties were sown in the hotbed, thinned out to the cold frame June 6 and set in the open June 27. The variety test of cabbage proved somewhat of a disappointment, the yield being not half that of previous years. Three or four reasons may be assigned. The soil was not so rich; the weather was unfavourable; the young plants in the hotbed were affected by a sort of brown fungus in the soil. As a result most of the heads proved small and many failed to become solid. The early varieties were better matured and larger than the winter varieties. Few of the Danish Ballhead hardened, moisture being lacking to develop late cabbage. In striking contrast to these there were about two hundred plants set in old cabbage ground rich with manuring of previous years. Most of these were transplanted from the thinnings of the date-of-planting test, which was sown in the open. The rest were from the hotbed. In this lot none failed to become solid and all developed to fine large heads, mainly attributable to the soil, the location of which ensured a little extra moisture as well as plant food.

The two strains of Copenhagen Market rendered the greatest yields. They had good, round, robust heads. Golden Acre also gives a good account of itself. Most of the Enkhuizen Glory, were solid, though not so large as usual.

VARIETY TEST OF CABBAGE, 1928

Variety	Source	Yield per acre	
		tons	lbs.
Copenhagen Market.....	Graham.....	15	322
Copenhagen Market.....	Strandholm.....	14	1,098
Golden Acre.....	Harris.....	14	652
Enkhuizen Glory.....	Rennie.....	12	1,125
Early Summer.....	Rennie.....	11	1,930
Dala.....	McDonald.....	11	1,203
Jersey Wakefield.....	Steele-Briggs.....	11	418
Babyhead.....	Graham.....	8	781
Succession.....	Ewing.....	7	1,938
Early Paris Market.....	Frith.....	7	906
Winnigstadt.....	Madsen.....	6	1,313
Flat Swedish.....	Dupuy and Ferguson.....	6	938
Danish Roundhead.....	Strandholm.....	5	1,813
Winnigstadt.....	Steele-Briggs.....	5	1,250
Brunswick Short Stem.....	Madsen.....	5	875
Best of all Savoy.....	Sutton.....	5	875
Danish Hollander.....	Strandholm.....	5	875
Brandon Market.....	McKenzie.....	4	1,563
Danish Ballhead.....	Strandholm.....	4	1,000
Kinver Globe Savoy.....	Webb.....	3	1,500
Extra Amager Ballhead.....	O-862.....	1	1,844

CARROTS.—The seed of eight varieties, after being soaked for a day, was sown on May 9, in triplicate rows making 43.56 feet in length, three feet apart. There was steady, healthy growth and though the yield is not heavy the roots were a fine table sample. A study in texture and flavour was conducted by three homes, resulting in no great discrepancy in estimation but giving all the varieties a nearly uniform rating. Oxheart, Favorite and Champion were scored a shade lower than the rest.

VARIETY TEST OF CARROTS, 1928

Variety	Source	Yield per acre	Cooking test	
			Texture	Flavor
		tons lb.		
Chantenay.....	McDonald.....	8 1,667	98	96
Oxheart.....	Steele-Briggs.....	7 1,333	95	95
Improved Danvers.....	D. & F.....	7 833	98	96
Nantes.....	McDonald.....	6 1,667	98	98
Early Scarlet Horn.....	D. & F.....	6 1,000	97	96
Favorite.....	Patmore.....	6 667	98	93
Chantenay.....	O-8932.....	6 0	98	97
Champion.....	Sutton.....	4 1,500	97	96

CAULIFLOWER.—On May 8 four varieties were sown in the hotbed and transplanted to the open on June 27. For some reason 1928 proved better for cauliflowers than several of the preceding years, both in the date-of-planting and in the variety test. They did not head up prematurely as in 1926 and 1927. The following represents the yield calculated from 10 plants for each variety.

## VARIETY TEST OF CAULIFLOWER, 1928

Variety	Source	Yield per acre	
		tons	lb.
Early Dwarf Erfurt.....	McDonald.....	9	797
Earliest.....	Madsen.....	6	1,688
Danish Perfection.....	Madsen.....	6	727
Snowball.....	Graham.....	6	117

**CELERY.**—Eight varieties were sown in the hotbed April 28. At one end of the hotbed the young plants were overheated and destroyed. Those at the other end did not appear to have suffered injury. These were pricked into a cold frame and set out on July 24 in a trench 10 inches deep, 14 inches wide, in which rotten manure was mixed with soil at the bottom. Over this was placed a few inches of earth. Plants were spaced 6 inches apart, and the whole well watered. Only one watering was given afterwards. Though they were kept cultivated moisture was insufficient and about the poorest crop of celery ever experienced was the result. Taking the varieties with all their handicaps the Golden Self-Blanching (McDonald) produced the choicest plants. Sandford Superb, a new variety at Beaverlodge, had plants about as large but much greener.

In the trench-vs-level-vs-boards blanching test, those in the trench were better plants and better blanched than those on the level or those in the boards.

An attempt was made at a harvesting experiment to determine the advantage of harvesting and storing at different times, first, before any frost, secondly, after the first frosts and finally after considerable frost. The first part of the experiment was nullified by an early frost stealing on us before any were taken in. The second lot were stored after considerable frost, and the third after a fairly hard freeze. These were to be examined at Christmas time.

The results of the experiment cannot be very conclusive as the plants were poor.

**CELERIAC.**—This vegetable seems like a cross between celery and turnip. It was sown with the celery, the seed and young plants closely resembling it. When the plants were set out they appeared healthy but they did not develop sufficiently to give results.

**CITRON.**—Two varieties were sown in the open on May 25, in rows 12 feet long. The plants though growing finely were hard-hit by frost August 16, and succeeding frosts ended all growth. The Red-seeded produced 12 specimens, the largest of which was 4 inches in diameter. The Green-seeded had 4 of 2-inch diameter.

**CORN.**—On May 15, in quadruplicate rows of 14.52 feet each, and 3 feet apart, the eighteen varieties of corn were planted and though growth was slow and August frosts touched the plants to some degree, the results are fair. Banting and Pickaninny again establish their record for earliness with 56 usable ears to the credit of each. They have been looked to as the earliest of all, but a new variety of flint corn sent by W. Truckenmiller of Blackfalds, Alta., called by him Early Alberta, proved still more precocious, having 72 usable ears to their 56. Burleigh Co. Mixture and Alpha show possibilities, with good-sized ears. From all sources over 800 ears of corn were used in 1928.

## VARIETY TEST OF GARDEN CORN, 1928

Variety	Source	Average height	High-est	In tassel	In silk	Number of usable ears	Usable ears per acre	Weight usable ears		Weight per acre
		in.	in.	%	%			lb.	oz.	
Early Alberta.....	Truckenmiller.....	29	34	100	100	72	18,000	17	10	2 406
Banting.....	O-Gen-run.....	34	42	100	100	56	14,000	13	3½	1 1,305
Pickaninny.....	O-Gen-run.....	32	38	100	100	56	14,000	11	3	1 797
Burleigh Co. Mixture.....	Will.....	40	48	100	95	20	5,000	7	14½	0 1,977
Alpha.....	Ferry.....	36	45	100	100	16	4,000	4	15	0 1,234
Sixty Day Make Good.....	Child.....	42	50	100	95	8	2,000	3	12½	0 945
Sunshine.....	Will.....	44	54	95	90	7	1,750	2	11½	0 680
Malakoff.....	Vaughan.....	41	44	100	80	5	1,250	1	11	0 422
Golden Bantam.....	Moore.....	48	57	100	95	4	1,000	1	2½	0 289
Improved Ey Dakota.....	Will.....	37	45	100	92	3	750	0	13½	0 211
Early Malcolm.....	O-Gen-run.....	37	43	100	50	3	750	0	10	0 156
Assimboine.....	Will.....	45	51	100	100	2	500	0	9	0 141
Peep-o-Day.....	Schill.....	40	48	100	40	1	250	0	6½	0 102
Whipple Yellow.....	Harris.....	55	71	100	60	1	250	0	5	0 78
Pocahontas.....	Harris.....	42	51	95	35					
Whipple Early.....	Harris.....	46	53	100	10					
Golden Bantam.....	Graham.....	44	51	100	20					
Golden Bantam.....	McDonald.....	48	55	95	50					

A suckering test with corn was conducted, the Banting and Pickaninny varieties being used. Though the test was as nearly fair as could be provided, there was little to choose between pruned and unpruned rows. In each the suckered had an advantage of about 2 per cent in number of usable ears, and in relative weight as well. There was not enough advantage to awaken enthusiasm in suckering.

## CORN—SUCKERED VS. NOT SUCKERED, 1928

Variety	Suckered, number of ears	Weight		Not suckered, number of ears	Weight	
		lb.	oz.		lb.	oz.
Banting.....	95	26	5	93	25	5
Pickaninny.....	102	27	11½	100	25	13
Total for the two varieties.....	197	54	0½	193	51	2

**CUCUMBER.**—Seven varieties were allotted rows of 10 feet each. There was good growth in a good stand, but the August frosts proved disastrous. The first picked was from Giant Pera and Early Russian on August 13. Early Russian usually outdistances all others in number of fruits, but in this season Snow Pickling leads it by 17 per cent in number and 81 per cent in weight. The other varieties are comparatively low.

**EGG PLANT.**—Good healthy plants of Black Beauty, N. Y. Purple and Extra Early Dwarf were transplanted to the open on June 12. By the frost of August 16 Black Beauty and N. Y. Purple were considerably injured while Extra Early Dwarf suffered little. However, succeeding frosts precluded all hope of blossom and fruit.

**HERBS.**—Sage, Thyme and Summer Savory made the usual sturdy growth, while Hyssop was the most vigorous.

**KOHL RABI.**—The White and the Purple Vienna were again sown with the usual success, but there is little home demand for the product.

**MELONS.**—The following varieties of muskmelon were sown May 26, in rows 10 feet long: Extra Early Hackensack (Ewing), Montreal Market (Ewing),

Hearts of Gold (Morell), Golden Champion (Walpeth), Honey Ball (Schell), and Oka (D. & F.). As with the other tender vines, frosts prevented the maturing of fruit, but Hackensack, Hearts of Gold, Golden Champion and Honey Ball had small fruit from 2½ to 4 inches in diameter. Montreal Market usually the leading variety, produced nothing this year.

LETTUCE.—Twelve varieties were sown on May 10. Poor soil and drouth militated against a good crop of lettuce in this test. The Cos varieties were poor, as was also the Early Paris Market, which soon goes to seed. On account of the unfavourable season several were tough and bitter. This was noticeable in New York or Wonderful. Grand Rapids and Denver Market were good eating. An Improved strain of Hanson from James was as good as any.

MINT.—Thriving and spreading. Many persons got roots for a start in their own gardens.

ONIONS.—The twelve varieties sown on May 4, grew very slowly, being on unsuitable soil and lacking the moisture to ensure vigour. These plots, together with the onion sets, showed the effects of adverse conditions more than any other vegetables. Large Red Wethersfield, at the bottom of the list, has been at the top in better conditions. Seed onions in another test were fine.

VARIETY TEST OF ONIONS, 1928

Variety	Source	Yield per acre	
		tons	lb.
Australian Brown.....	McDonald.....	1	1,938
Yellow Globe Danvers.....	Steele-Briggs.....	1	1,281
Large Yellow Prizetaker.....	Graham.....	1	1,250
Yellow Globe Danvers.....	Graham.....	1	1,188
White Barletta.....	Graham.....	1	906
Southport Yellow Globe.....	McKenzie.....	1	844
Ailsa Craig.....	Graham.....	1	781
Yellow Globe Danvers.....	O-3692.....	1	750
Ebenezer.....	Schell.....	1	594
Giant Prizetaker.....	Steele-Briggs.....	1	500
Southport White Globe.....	Steele-Briggs.....	1	250
Large Red Wethersfield.....	O-11477-8.....	0	1,906

PARSNIP.—The usual three varieties were sown in triplicate rows 29·04 feet long by 3 feet wide. Steady growth was maintained and fair results secured. As between the varieties there is no wide spread in the yields.

VARIETY TEST OF PARSNIPS, 1928

Variety	Source	Yield per acre	
		tons	lb.
Guernsey XXX.....	Rennie.....	3	1,333
Hollow Crown.....	McKenzie.....	3	1,333
Hollow Crown.....	O-289A.....	3	750

PEANUTS.—The germination of the two varieties sown was poor, yet some healthy plants developed; but neither blossom nor fruit was produced. Frost cut short their existence.



PEAS.—Seventeen varieties of peas were planted May 3. All germinated well except those from the Gregory seed, the Gregory Surprise and Early Morn especially. This was manifest in each row of the triplicate. It was noticeable also in Pioneer. Otherwise in all the varieties the stand was good and growth vigorous. Gradus x English Wonder and Manifold have an abundance of small pods. All the late varieties have the largest pods, as Lincoln, Daisy, Stratagem and McLean Advancer, so that if they get a chance, as they did in 1928, their bulk brings up their record. In the table it may be noted that the late varieties are at the top and all the early are at the foot. The first picking of green peas was from Gregory Surprise, Thos. Laxton and Gradus x English Wonder on July 11.

VARIETY TEST GARDEN PEAS, 1928, PICKED GREEN

Variety	Source	Yield per acre	
		tons	lbs.
McLean Advancer.....	Harris.....	4	316
McLean Advancer.....	Ferry.....	4	83
Little Marvel.....	Rennie.....	3	1,531
Lincoln.....	Sharpe.....	3	1,341
Manifold.....	McKenzie.....	3	1,104
American Wonder.....	Graham.....	3	1,104
Stratagem.....	Graham.....	3	844
Laxtonian.....	Graham.....	3	813
Pioneer.....	Gregory.....	3	719
Gradus x English Wonder.....	O-2330.....	3	417
Gradus x American Wonder.....	O-8624.....	3	229
Daisy.....	Patmore.....	3	21
Gregory Surprise x English Wonder.....	O-8623.....	2	1,917
Thos. Laxton.....	McDonald.....	2	1,396
Gradus or Prosperity.....	Rennie.....	2	625
Early Morn.....	Gregory.....	1	1,500
Gregory Surprise.....	Gregory.....	1	583

POTATOES.—Tuber-unit propagation was continued and the vines of these as well as those of the main crop were inspected by J. W. Marritt.

Blocks of certified Gold Coin and Irish Cobbler seed obtained from Herman Trelle were grown, as were smaller areas of Mitchell Excelsior and Bliss Triumph, both propagated from seed stock supplied in 1926-7 through the good offices of H. S. McLeod. The Bliss Triumph were from a shipment Mr. McLeod had received from George W. Points, of Redstone, Montana, and were what is known as the Sharples strain of that variety and said to be highly resistant to mosaic, a disease that is very common in Bliss Triumph. Mitchell's Excelsior was thought to be identical with Gold Nugget.

The Cobblers were from a stock originally obtained by Mr. Trelle from the Beaverlodge Station, which was supplied with certified Maritime-Province tubers in 1923 by the Division of Botany, Central Experimental Farm.

All the crop grown from certified stock passed a favourable field inspection, except that quite a few plants of Bliss Triumph were found to be afflicted with Witch's Broom.

In the commercial crop the Early Rose B. L. 7 had quite a number of plants showing mottling but only a very few definitely suspicious of mosaic and leaf roll. In another strain of the Early Rose were quite a few plants with well marked symptoms of mosaic and with some rhizoctonia.

Among the non-certified stock of Irish Cobbler there were quite a number of plants with Witch's Broom and some other plants with a harsh appearance, which may represent an incipient stage of the disease.

PUMPKIN.—On May 25 four varieties were planted, three hills for each, one with no manure, one with fresh manure, the other with well-rotted manure. Holes were dug to put the manure beneath the surface. Germination was good. A spring frost in June touched a few of the tender plants. Then in August the vines were greatly injured though not absolutely destroyed. The pumpkins had to be harvested just when they were beginning to ripen nicely. The relative merit of neither the several varieties nor the different methods of planting is conclusively indicated. Results are given as obtained.

VARIETY TEST OF PUMPKINS, 1928

Variety	Source	No manure	Fresh	Old
		lb.	lb.	lb.
Small Sugar.....	O-8290.....	13	12½	12
Sugar.....	Graham.....	22½	29½	24
Sugar.....	McDonald.....	22½	21½	27½
Pie Pumpkin.....	Brand.....	10	5½	6½

Some Connecticut Field pumpkins in another test attained good size and were partially ripe when taken under cover, where ripening was completed.

RADISH.—Only two varieties were sown, the Saxa, from Rice, and the French Breakfast, from Graham, but these germinated promptly and furnished an abundant supply of choice eating. The Saxa is a fine, round radish while the French Breakfast is long and oval, equally good. By August 6, however, both had gone badly to seed.

RHUBARB.—The old plot of rhubarb, part of which was set out in 1916, is still going strong and furnishes a good supply of large, juicy stalks. Another plot, mostly Ruby O-45 divided in the autumn of 1917, is doing well but it still goes to seed. More Ruby O-45 was seeded, together with the Royal Albert, a new variety. All the young plants of these are thriving.

SPINACH AND SWISS CHARD.—Four varieties of the first and two of the second, seeded May 22, grew satisfactorily. New Zealand spinach was used late in the fall and appreciated. It retains its freshness long after the common spinach has gone to seed.

SQUASH.—The eight varieties were planted similarly to the pumpkins—three hills each with no manure, with fresh and with old. The whole plantation had its vicissitudes, mainly from frosts. Some germinating plants were touched in June. Then the August frost scorched the growing vines severely. New Acorn (Buckbee) was late and gave no appreciable results. Giant Crookneck (McD) had a few splendid specimens. Most of the Golden Hubbards together with the Blue Hubbard were thrown out of the competition, though furnishing some good fruit. Vegetable Marrow and Summer Asparagus gave some positive results:—

	No manure	Fresh	Old
	lb.	lb.	lb.
Vegetable marrow.....	18½	19½	11
Summer asparagus.....	10½	18	20

The vegetable marrows have given a good report of themselves for years. The summer asparagus fruit resembles the marrows, being somewhat smaller but more prolific.

The transplanting of a squash plant sown on sod vs. one sown in loose soil of the hotbed was not a success. No true comparison could be made.

TOBACCO.—The plants held out against the frost almost through August but finally succumbed.

TOMATO.—The thirty-five varieties of tomatoes were sown originally in the hotbed on April 28. Some were pricked out to the cold frame June 5, and all were transplanted to the open on June 23, arranged in four sets with four plants of each variety in each set. The growth was good and the yield of green tomatoes, while not heavy, was fair for a northern latitude. Viking and Fargo, at the head of the list, were sent from the North Dakota Agricultural College for trial. At once the Viking comes to first place while the Fargo is beaten by only one of our standbys, an Earliana. The Earlianas, the Alacritys, Avon Early and Alacrity x Hipper are, as usual, among the best. The position of the Pinks Nos. 1 and 2, and of L. G. x B. B. at the foot of the list is a surprise, for these have been among the first. A few, such as Earliest Market, Red Rock and Canadian (Rice) had each one plant of one set die, which, of course is their misfortune. August night temperatures checked the tomato plants repeatedly but they survived until September 7, when they were harvested. On the vines of Viking, Penn. State Earliana, Pink No. 1 O-9731, Pink No. 2 O-9730 Alacrity x Earlibel, some of the fruit had begun to ripen. Others were ripened inside.

RESULTS OF TOMATO VARIETY TEST, 1928

Variety	Source	Yield per acre	
		tons	lb.
1. Viking	N. Dakota Agric. College	7	1,102
2. Select Earliana	Moore	6	1,272
3. Fargo	N. Dakota Agric. College	6	648
1. Alacrity	O-11381	6	591
5. Alacrity	1-3, 1-3 1-7, 1	6	378
6. Avon Early	Ferry	5	905
7. Alacrity x Hipper	O-6568	5	677
8. Early Atlantic	McKenzie	5	125
9. Earliana Gr. 2	Langdon	5	26
10. Herald	O-9725	4	1,825
11. Penn. State Earliana	Stokes	4	1,615
12. Alacrity x Earlibel	O-9723	4	1,075
13. Princess Mary	McKenzie	4	1,018
14. Earliest Market	Buckbee	1	607
15. Canadian	Rice	4	481
16. Canadian	McKenzie	4	196
17. Alacrity x Earlibel	O-6572	4	25
18. A. B. B.	O-11390	3	1,884
19. Bonny Best	Keith	3	1,330
20. Bonny Best	Stokes	3	1,500
21. Sparks Earliana	Burpee	3	1,488
22. Bonny Best	Moore	3	1,359
23. Avon Early	Dreer	3	1,119
24. Burbank	Bruce	3	1,062
25. Pink No. 1	O-9731	3	1,047
26. Chalks Early Jewel	Steele-Briggs	3	921
27. Jewel	Langdon	3	678
28. John Baer	Moore	2	1,970
29. Bloomdale	Langdon	2	1,898
30. Pink No. 2	O-6569	2	98
31. Red Rock	Langdon	1	1,813
32. L. G. x B. B.	O-11392	1	1,546
33. Pink No. 2	O-9730	1	1,192
34. Pink No. 1	O-6573	1	1,120
35. Greater Baltimore	Ferry	1	865

**TOMATO—TEST OF STAKING VS. NOT STAKING.**—The Earliana Gr. 2, and Alacrity x Hipper were used for this test. Twenty-four plants of each variety, twelve of them staked and twelve not staked, were all trimmed to one stem. It will be seen by the table below that the staked in both varieties have a good advantage in point of yield, 16·4 per cent in the Earliana Gr. 2, and 32·3 per cent in Alacrity x Hipper. The fruit was rapidly ripening in both when severe frost came. The ripening was more noticeable in this than in the other tomato tests. The unstaked had the advantage in point of earliness though there was not much to choose between them.

TOMATOES—STAKED VS. NOT STAKED, 1928

Variety	Yield per acre	
	Staked	Not staked
Earliana Gr. 2.....	tons lb. 4 1,510	tons lb. 4 168
Alacrity x Hipper.....	5 1,779	4 905

**TOMATO PRUNING.**—For this test Alacrity and Bonny Best were used. One hundred and forty-four plants from seed sown in the hotbed on April 30 were set out on June 21. Three objects were in view: (1) to compare the relative advantages of training the plants to one, two or three stems; (2) to ascertain the advantage, or otherwise, of limiting the number of trusses of fruit to one, to two or to three per stem as compared with leaving all the clusters that might form; (3) to decide whether, in limiting the trusses, it were better to cut the foliage back to the last truss of fruit left or merely to pinch off the superfluous trusses of fruit but to leave the foliage all on.

Unfortunately, two weights are missing from the one-stem series of yield. Their omission mars the table to some extent, but yields are for the most part averaged among the number of plots represented in each case, hence the statistical error is probably not very great. The results, however, are not consistent enough to be very conclusive. As practically none of the fruit ripened, the effect of the respective treatments in promoting maturity was not indicated.

1. Training to two stems gave the greatest yield, 22·8 per cent better than training to one stem and 21·8 per cent better than training to three stems.

2. What is best from the standpoint of earliness and yield: to prune all the trusses or clusters of fruit back to one, to two, or to three per stem, or to leave them all on? As explained above, there are no available data regarding the first point nor is there a record of the relative size or sample of fruit resulting from the several systems, but in regard to total weight of fruit produced the odds seem to favour the plan of leaving three trusses per stem, with the unlimited and the two-truss plants nearly tied for second place and the single-truss plants a poor fourth. In fact the three-truss system surpassed the single truss by 66·8 per cent.

3. Half the plants in each series had their foliage cut back to the last truss of fruit allowed, while the remaining half had all the foliage left unpruned. Although in the two-stem series there seemed to be a small advantage in favour of foliage pruning, when the three series are considered together the net loss from pruning the foliage amounts to 11·8 per cent.

#### FALL VS. SPRING SOWING

Is there any advantage in sowing seed of vegetables in the fall rather than in the spring? To answer this the seed of seven kinds of vegetables was sown

on October 25, 1927, and alongside of these, seed of the same kinds was sown on May 1, 1928. The comparative stands of each of the seven most common vegetables are here presented side by side:—

THE STANDS FROM FALL AND SPRING SOWING, 1928

	Fall	Spring
	%	%
Carrot.....	80	100
Beet.....	50	100
Onion.....	20	100
Radish.....	5	95
Cabbage.....	0	25
Lettuce.....	100	90
Turnip.....	0	0

Here it is seen that only one of the seven, viz., lettuce, has a full stand from fall sowing. No information from this trial can be gathered *re* garden turnip, but in respect to all the other crops the spring sowing is superior. Sometimes a fall sowing of onions is good, but taking in everything autumn seeding cannot be advocated.

## DATE OF PLANTING VEGETABLES

Again the result of the date-of-planting test of vegetables is presented. When is the best time in the spring to sow the various seeds? In this table 100 denotes the highest yield, indicating the best results for 1928, the other yields being rated in proportion:

DATE OF PLANTING OF VEGETABLES, 1928

Variety	First date April 30	Second date May 7	Third date May 14	Fourth date May 21	Fifth date May 25	Sixth date June 4
Corn.....	100	89	96	46	20	4
Pea.....	93	100	77	76	95	81
Beet.....	100	97	89	94	64	60
Carrot.....	43	46	100	68	65	49
Parsnip.....	100	98	94	65	66	46
Cabbage.....	71	86	100	80	50	24
Cauliflower.....	23	12	47	100	10	11
Pumpkin.....	68	0	0	47	100	13
Squash.....	19	21	21	21	100	21
Pea.....	13	48	28	100	92	49
Onion.....	80	100	40	67	90	27
Parsley.....	100	98	98	98	77	79

## SEED-SOAKING EXPERIMENT

Project No. 654 was suggested by the Beaverlodge Station in order to determine the advantage or disadvantage of soaking seed of vegetables and to compare soaking for differing periods, from the standpoint of germination.

For each vegetable four rows 12 feet long and running side by side were allotted:—

- No. 1, seed non-soaked.
- No. 2, seed soaked one day.
- No. 3, seed soaked two days.
- No. 4, seed soaked three days.

When the seed had been soaked one day rows 1 and 2 were sown on May 7. That is, the dry and the one-day soaks were sown then. On the following day row 3 was sown with the seed soaked two days. Then on May 9 row 4 was sown with the seed that had been soaked three days. The following table shows the estimated result in emergence:

Kind of vegetable	Not soaked	Soaked 1 day	Soaked 2 days	Soaked 3 days
	per cent	per cent	per cent	per cent
Radish.....	80	50	20	20
Pea.....	5	50	45	20
Onion.....	5	40	20	25
Carrot.....	10	50	15	5
Corn.....	35	50	50	20
Beet.....	20	50	50	25
Bean.....	30	60	50	50
Pumpkin.....	20	40	20	15
Squash.....	20	40	60	60
Parsnip.....	50	45	30	20
Salsify.....	25	30	20	10

In estimating emergence this plan was followed: Say for radish, the rows sown with non-soaked and with seed soaked one day were judged on May 17, row 3 (soaked two days) on May 18, and row 4 (soaked three days) on May 19, and so in each case the first and second rows were estimated one day, the third row the following day and fourth row the day after that, to correspond with the sequence of sowing, thus giving each an equal number of days for germination. In radish and parsnip emergence was promptest in the non-soaked row. In six kinds, viz., peas, onion, carrot, bean, pumpkin and salsify, soaking one day gave the quickest germination. Squash alone seemed best when soaked two days, while corn and beet are equally divided between twenty-four-hour and forty-eight-hour immersion. On the whole, the experiment this year strongly favours soaking for one day. It shows at least that soaking for three days is undesirable and two days is questionable.

#### PROJECT 637—FROST PROTECTION

To determine the advantage of protection from spring frosts of tender vegetables, beans, corn, beets, cabbage, cauliflower, tomatoes, pumpkin and squash were sown on May 17 in rows 12 feet long, half of each row to be protected if necessary. There was a frost on June 6 which affected a few plants in other places but no effect was observed in this test. That was not the fault or the merit of the experiment as nothing had been done to protect any.

#### PROJECT 651—FROST PROTECTION LATE SUMMER AND AUTUMN

To determine the advantage of protection for the tender vegetables against fall frosts, beans, cucumbers, cantaloupes, tomatoes, pumpkins and squash were sown in two sets of rows 12 feet long, except the pumpkins and squash, which were given eight feet by six. The latter two were injured by the scuffler. Frost caught us unprepared. Most of the vegetables were touched by the early-August frost. Some protection was later given, but the only definite information that can be gleaned is concerning the cantaloupes.

The non-protected were frozen without fruit while the protected had a number of specimens from 3 to 3½ inches in diameter.

#### HOT-KAPS FOR FORCING VEGETABLES

Much is being made in some quarters of the use of paper caps placed over plants. A tentative experiment was attempted when on June 28 paper caps

were placed on potatoes, corn, onion and radish. In most cases it was soon seen that the plants under the caps were twice as large as those not capped. Some onions, however, seemed to be more tender.

Tar-paper strips were placed between rows. Beyond the fact that they kept down weeds no definite information was obtained.

## FRUIT

### CURRANTS

Again the Station is indebted to Morden for a gratifying addition to its currant plantation. From that source have been set out three fine varieties of black currants, viz., Black Victoria, Merveille de la Gironde and Buddenborg, also eight varieties of red, equally fine, viz., Cherry, Diploma, Holland, Ruby Red, London Market, Raby Castle, Red Grape and Versailles. All these are healthy bushes. A wild creeping currant obtained from C. G. Jones, of Carbon River, B.C., is still creeping, bearing bloom but no fruit. A wild black currant bore fruit much too acrid for use.

The aphid is still troublesome in the old currant plantations. To combat it three sprayings of Black Leaf 40 were given.

All varieties seemed to have wintered well except the Wilder red, the centre branches of which were badly killed.

#### RED CURRANTS

Twelve years' crops. Average per bush each variety

Year	New Red Dutch	Cumberland Red O-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
Average of 12 years.....	7.51	5.78	6.56	1.93	2.31

#### WHITE AND BLACK CURRANTS

Twelve years' crop. Average per bush each variety.

Year	Large White O-551	White Cherry O-556	Collins Prolific O-565	Topsy O-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
Average 11 years.....	3.51	4.64	.....	.....
Average 12 years.....	.....	.....	2.03	2.44

## GOOSEBERRIES

Five of the eleven Oregon Champion bushes were transplanted to a new location. All were severely winter-injured. Those transplanted bore no fruit and those left gave a much smaller yield than in 1927. Four Houghtons make a hopeful addition to the gooseberry row.

## RASPBERRIES

All varieties of raspberries came through the winter well and are making fine growth. The Herbert is still the most prominent and promising variety. The test row, 234 feet long, though sampled considerably, produced 138 pounds, 12 ounces, or 3,171 pounds per acre.

In the Brighton and Sunbeam varieties the canes are not so strong nor the fruit so large as in the Herbert.



A Herbert raspberry row, in September, 1928.

Of the 12 bushes of Adams 87 received in 1927 from J. P. Bridgman, Winona, Ont., 11 are living. These were cut back as directed to six inches in the spring, but now present a very robust appearance. Some fruit of fine quality was gathered. It seemed later and sweeter than Herbert.

We are indebted to the Horticultural Experimental Station, Vineland, Ont., for 24 Newmans and 25 Vikings. Nearly every one is living and thrifty.

Some bushes of Native blackberries and Hilborn blackcaps were received from Morden. A few survived the transplanting.



## STRAWBERRIES

On June 20, fruit was forming on the Early Dakota, and there seemed prospect for a fair crop. The first ripe was picked on June 28. The season at Beaverlodge did not prove satisfactory for this fruit and yields were exceedingly small. Three 126-foot rows of Early Dakota planted in 1927 produced only 8 pounds, 5½ ounces, but four other rows of the same length did much better, giving 75 pounds, 2 ounces, or at the rate of 1,623 pounds per acre.

An attempt was made to weed out the non-productive or diseased plants, but many must still remain. A root affection seems to prevail to some extent, identified as a *Fusarium* fungus.

Senator Dunlap, such a reliable variety in some localities, has produced at the Station a few fine plants with but little fruit.

Choice varieties received from Morden last year, such as Minnehaha, Kellogg Marvel, Glen Mary, Easy Picker, Dr. Burrill and Portia, have very much depleted stands.

A couple of hundred plants of Early Dakota or a very similar sort received in the spring from Brainard are all thriving, as are also five rows of home-raised Early Dakota set out about the same time.

Another lot of 50 Mastodons were received from the Assiniboine Gardens, Winnipeg. All died except five, which are good, healthy plants. They are full of bloom in the latter part of September. This bloom was removed, except for a few blossoms, which developed into fine, large fruit, the last nearly ripe ones being picked on October 2.



Manitoba wild plum tree, *prunus nigra*, bearing several dozen blushed-yellow plums.

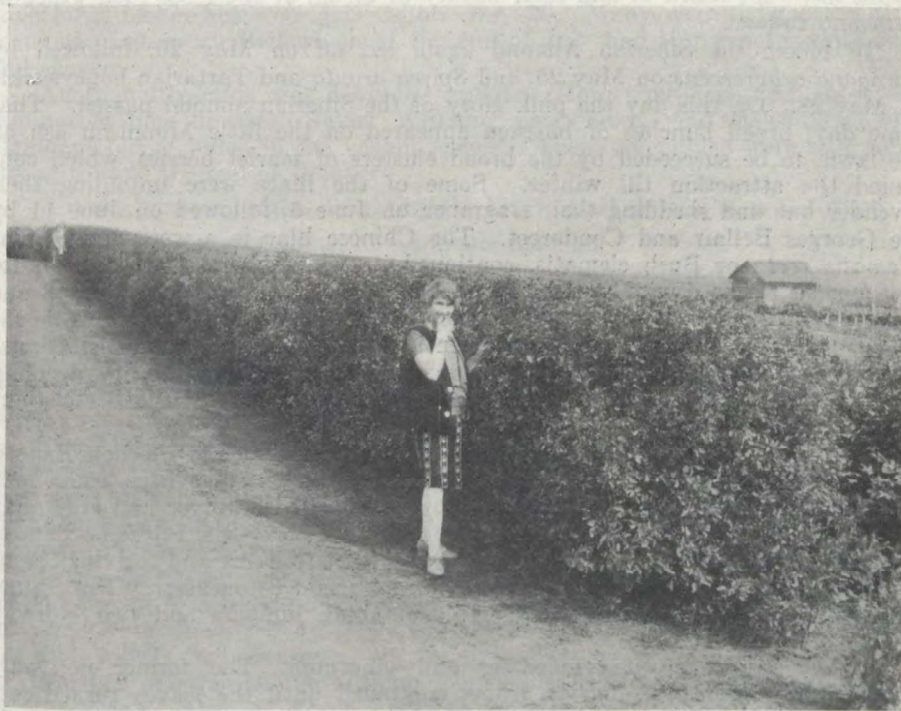
## PLUMS

Again most of the plum trees were dead at the top through winter-killing, though it was less severe than in 1927. Three native trees received locally did not suffer in this way at all. The Dominion Horticulturist thinks these are likely the native wild pincherry, *Prunus pennsylvanica*. On May 20 a greater number of plum trees were in bloom than ever before. Fruit formed on several. One, particularly, which bore some fruit in 1927, had about a quart of yellowish-red plums which ripened in early September, and were edible if not very delicious. Lesser quantities were borne on one or two other trees, and still another bore a very large, late plum, which failed to ripen. Among the wild plums formerly assumed to be *Nigras* are two species, those with the acutely serrated leaves as *Prunus americana*, and those with leaves more bluntly serrated as *Prunus nigra*.

A fine addition to the stock of plums was received from Morden, comprising five each of Cree, Opata and Waneta, six Oka, and three each of Kaga and Assiniboine.

## SANDCHERRIES

The procumbent Hudson Bay variety began blooming on May 21, and on May 28 was in fine bloom. Some bushes seem to be much earlier than others. A good quantity of fruit was gathered for the making of pies, preserves and jelly. The bushes of the more upright Select suffered again by winter-killing, as did also the Champa. The fruits of the latter are like small plums, but have never quite ripened. Their load is enormous.



A Saskatoon hedge, still fruiting in September, 1928.

## APPLES

Excepting a Blushed Calville which had some bloom, neither blossom nor fruit was noticed on the apple trees. There was little winter-killing except on the Anoka, whose tips suffered.

## SASKATOONS

The two hedges of Saskatoons, the one pruned, the other not, were well out in bloom on May 24. The pruned one was then a magnificent sight. On July 16-23, its fruit was ripening fast, but as usual the ripening was protracted, and edible berries continued to be produced until early September. The test row produced, besides the sampling by visitors and birds as well as considerable waste, 158½ quarts of fruit from a row 290 feet long, and estimated as drawing from an area at least half a rod wide, or, say, amounting to nine square rods. The harvested yield would thus figure out to 2,818 quarts per acre.

In July selection was made of the trees bearing the choicest fruit and in October sections of roots were taken for propagation.

## ORNAMENTAL TREES, SHRUBS AND VINES

The woody ornamentals become increasingly interesting year by year, whether we consider the development of the older planting, the progress of the fine addition of 1927 or the greatly expanded arboretum of 1928. Eighty-five species have been planted and all but a very few are thriving.

Gratifying growth is everywhere observable in the older planting. The shrubs have not failed to add their beauty of bloom or the trees their grace of form and foliage.

In bloom the Siberian Almond again led off on May 20, followed by *Caragana arborescens* on May 25, and *Spiraea arguta* and Tartarian honeysuckle on May 28. On this day the pink glory of the Siberian almond passed. That same day, broad bunches of blossom appeared on the little Mountain ash on the lawn, to be succeeded by the broad clusters of scarlet berries, which continued the attraction till winter. Some of the lilacs were unfolding their lavender hue and shedding their fragrance on June 6, followed on June 11 by the Georges Bellair and Condorcet. The Chinese lilac is a week later. The *Clematis recta* or Bush clematis, continued its white bloom from June 6 for two months. The diminutive *Caragana pygmaea* was flowering on June 8 and full on 11. *Lonicera tatarica* was a mass of pink colour on June 11, while the golden petals of the Caragana were silently falling. Elms, basswoods, Ginnalian maples, May Day tree, Buffalo berry, and pavia are making fine development. While all the older evergreens are vigorous, several of the Scotch pine and White spruce are approaching the towering stage.

The progress of the fine addition of 1927 supplied by the Morden Experimental Station affords pleasure and satisfaction. There has been some loss, mainly in Mountain pine and Norway spruce but all the Silver and Ginnalian maples, the Spindle trees and cotoneaster, or quince berry, the *Pyrus baccata* or flowering crab, the Viburnum and the *Cornus alba*, are living and thriving. Some gnawing of mice was observed on *Pyrus baccata* and cotoneaster. The former also had its tips winter-killed. Three flourishing junipers and two Norway spruce adorn the lawn.

Bloom appeared on cotoneaster and viburnum. The former not only bloomed but formed its berries, which continued until the leaves turned red. The white bloom of the viburnum or Highbush cranberry continued from June 12 to July 8.

Two valuable contributions to the arboretum were supplied in the spring of 1928, one by the Morden Experimental Station, the other by the Central Experimental Farm.

## FLOWERS

### PERENNIAL BORDERS

The horseshoe border laid out in 1926 east of the Superintendent's residence has become a centre of attraction. Here was continuous and everchanging bloom from the latter part of May, far into October. White sweet rocket, and yellow Iceland poppy were first to head this procession of colour, the former on May 18, and the latter May 21. It may be noted here that these two were in the pattern to the closing days of October. The tulips follow. Chrysolora and Moonlight with their differing shades of yellow appear on May 28. Next Murillo and Gretchen greet us on June 6. Now follow the finest and richest of all tulips, the Darwins: Isis, Bartigon, and William Pitt, in varying shades of brilliant red, on June 8. Dom Pedro, a coffee brown, with Franz Hals, Clara Butt and Aphrodite complete this part of the show. As some were still blooming on June 25, the tulips displayed their colour for almost a month.

The deep-green foliage of the peony and the bright green blades of the iris have already been making a fine background for the earlier flowers. They bloom close behind the tulips and run concurrently. On June 11 the yellow and purple irises began to show colour and kept it up for a month. The peonies, strongly budded on June 25, were beautifully unfolded on Dominion Day. Here is a pink with light centres, there one with outer petals white, tinged slightly with pink and inner petals a cream yellow. Then more great pinks. All varieties gave large bloom but were gone before July 20. Many were delighted with a plant of Canterbury Bell which at the end of July had thirty pure white cups and saucers.

Another attraction was *Myosotis alpestris* (forget-me-not) with its sweet, diminutive blue flowers. Sweet William, nasturtium, and calendula, with abundant bloom, filled in the vacant spaces. These calendulas were still going strong toward the end of October.

But the crowning sight, delighting the heart of all classes, were the roses.

"Annuals may come, and annuals may go,  
Shrubs are shrubs; but the rose is the ultimate beauty of the  
garden."

A Hugh Dickson, a Souvenir de Claudius Pernet, and a General McArthur were the sole survivors from 1927, but amply repaid all the care bestowed on them. The little bush of Souvenir de Claudius Pernet displayed four great creamy roses one after the other.

The Hugh Dickson, better developed, presented ten fine red roses while General McArthur had at least thirty to his credit. Three red roses on General McArthur were in full bloom on July 16. This was followed by continual and abundant bloom until October. On October 1 two were full with ten buds yet to open. Colour showed until almost the middle of the month.

In the spring this border was enriched from Ottawa by one Agnes Rose (a cross between *Rosa rugosa* and the Persian Yellow), by five each of *Rosa rubrifolia* and *Rosa spinosissima* and by two Harrison roses. None of these bloomed but their foliage was an asset.

Further planting in the autumn included a cabbage rose and a Grootendorst. Peonies, also, of eleven different varieties were added, including such choice ones as *Festiva maxima*, Felix Crousse, Couronne d'Or, and Duchesse de Nemours. The addition comprised lilies too, the first of the Liliaceae on the

Station. They included *L. tigrinum*, *L. regale* and *L. canadense*. In autumn the roses were mounded with earth and covered with boards in the form of an inverted "V", earth and rotted manure being later super-imposed.

In the border established in 1927 in lee of a caragana hedge, twenty out of twenty-five varieties of iris bloomed. Foxglove, pentstemon and mysotis failed to winter. Only one plant of geum was left, but achillea, hollyhock and iris proved their vigour.

Plants of achillea developed well and maintained their snowy whiteness throughout the season against the hedge background. The hollyhocks from seed sown in spring of 1927 and transplanted to this border in the fall were not mulched but came through well and had wonderful growth, the tallest being eight feet high. These stalks were clothed to the tip with white, pink and cream flowers, the joy of all beholders.

In this border, of the iris, the beautiful Mithras had yellow standards and purple falls with yellow streaks. Mrs. Neubrouner was yellow in both standards and falls. In Maid Marion standards were blue-purple and falls white tinged with pink. On June 27 appeared Juniata with light purple standards and falls of darker purple. Ossian had a yellow standard and falls of yellow tinged with purple. On July 3 Mme. Chereau was blooming, and by July 16 the iris display was over.

#### HERBACEOUS PERENNIALS

Here are presented the massy white of Sweet rocket, the fragile cups on fragile stems of Iceland poppy, the gorgeous dark-red bloom of the Oriental poppy, the vari-coloured spurs of the columbine, the great blue spikes, some of them twenty-eight inches long, of the delphinium, the white net-veil-like flowers of gypsophila (baby's breath) so suitable to set off bouquets, and the modest wee flowers of forget-me-not. To know the colours of the wall-flowers we shall have to wait until 1929. These had a struggle for existence, mainly with the red turnip beetle. A final dusting with arsenate of lead freed the plants and they sprang into vigorous growth.

**HOLLYHOCK.**—These were an out-standing feature in the flower display of 1928. The roots in one bed had been taken up in the fall and stored in the root cellar. When set out in the spring they had already grown 6 to 8 inches. Rapid growth followed and while the out-door-wintered hollyhocks by the caragana hedge grew taller, the cellar-wintered were first to bloom on July 1. From that time until October there was a succession of attractive bloom. A double yellow particularly called forth expressions of admiration.

**GLADIOLUS.**—Twenty varieties of gladioli were planted in semi-circular rows on May 14, and on May 31 a bed of small bulbs and bulblets was planted for propagation purposes. By June 11 the green sword blades of the main bed were six inches high. On August 10 the earliest variety, Maiden Blush, had unfolded five blooms and when Argo appeared on the twentieth, Maiden Blush had many more. Scarlano, whose name suggests its colour, revealed a scarlet glory on August 27. At this date L'Unique also appeared. On the first of September Prince of Wales and Halley were rivals for favour. The former, a rich salmon and of large size, has been the favourite of the past, but the Halley, deeper salmon and slightly larger, is the more handsome. Others to show their colours were Alice Tiplady, Franz Hals, Anny and Brilliant. Many varieties such as War, Peace, Baron Hulot, Evelyn Kirtland, Dr. Van Fleet and others have never bloomed at Beaverlodge, being a little too late. On October 1 all were badly frozen. When the frost caught Golden Measure it was strongly budded but failed to bloom.

SIBERIAN PERENNIAL LAVATERA.—On May Day there was no sign of this interesting plant, but it stretched up till seven feet high and bloomed from July 16 till September.

DAHLIAS.—Frost caught the dahlias before their colours were unfolded.

#### ANNUALS

SWEET PEAS.—These were sown on May 3 in two long rows of 10 rods each, again flanking the main flower garden. Collections of varieties were used from Burpee, of Philadelphia, Robert Sydenham, of Birmingham, England, from the Central Experimental Farm, Ottawa, and from James, of British Columbia.

The seed was soaked but the water must have been too hot as not much over half germinated. They were resown and in the end the rows were full and climbed to the top of the wire support. First bloom was observed July 14. This increased and continued through August and September to October. How many feasted their eyes on the varied colours? How many bouquets gladdened hearts and homes in the Peace River district? What can take the place of sweet peas?

BEDS.—On May 27 the poppy bed was sown with three varieties. Eschscholtzia in white, pink, and yellow, Shirley with its fragile cups of brilliant colours and French Ranunculus of many glorious hues. These were sown in squares with salpiglossis for a centre and tagetes and candytuft for borders, the whole making a fine display.

Another bed of varied flowers was in diamond shape with sunflowers, African marigold and cosmea for centre and linaria with its tiny brilliant blossoms bordering the four sides of the diamond. Off the corners are lines of schizanthus together with zinnia, tagetes and calendula, touched here and there with amaranthus or cockscomb.

Other beds, a circular one of phlox, another of stocks, phlox and petunia, another of snapdragon, one of linaria flanked with ageratum and Mrs. Sinkin's pinks, and another of dimorphotheca and African marigold, all grew slowly but were charming in the end.

Still another bed in a large square was composed of helianthus, salpiglossis, cosmos, French and African marigolds, asters and calendula flanked by tall sunflowers and taller hemp.

A bed at the house had a varied mass of foliage and bloom from geranium, stocks, pinks, nemesia, pansies, linum and leptosiphon.

ANNUALS OF SPECIAL MENTION.—The mimosa or sensitive plant was of unfailing interest to young and old. It was curious to see the leaves close up and the leaf stalk bend down. The *Celosia plumosa* had handsome foliage and still more handsome plumes but easily succumbs to frost. The phacelia, a 1928 introduction to the Station, was a great attraction. The leaves were a light green shaded with brown veining and borders. It bloomed promptly and continued blooming with a pretty little blue bell-shaped flower.

The everlastings are worthy of mention. *Helichrysum* put out its varicoloured blossoms not long before frost, and furnished a few winter bouquets, while *acroclinium* bloomed early and continued through the whole season. The flowers are pink-and-white shaded, with yellow centre, sweet and chaste, making a very attractive winter bouquet.

#### BEEES

On September 30, 1927, four colonies of bees were loosely packed with straw in a couple of quadruple outdoor wintering cases, planer shavings being later substituted in part and a thick shavings quilt placed over the hives. Ere the

shavings could be obtained and dried the weather had turned very cold and it seemed inadvisable to disturb the packing unduly. Thus the bees had to endure the extreme temperatures of November and December of that year with inadequate insulation, though snow was systematically banked around the cases. Two hives were cellar-wintered.

Examination on March 20 of the outdoor bees revealed the two colonies in one case dead. They were also found to have been rather light on stores. The other two outdoor colonies had been flying freely for some days and had their case well pigmented with excreta. In both these colonies bees were found at the tops of the shallow honey supers. The shavings in this packing case were damp, presumably as a result of snow getting beneath the case cover.

Second examination a month later discovered one of the two colonies reduced to a last guard of two or three bees. There were plenty of stores in the super above but mice had stuffed with cut straw the space beneath the hive body. Apparently the bees seen at the earlier examination had been a remnant forced to the top of the super.

The remaining colony, consisting of bees with very brunette complexions, was in strong condition, with workers well distributed through both storeys and a few eggs in one comb of the super.

On April 25 the outdoor colony was observed bringing in considerable pollen and the two cellared colonies were accordingly moved out. They had wintered fairly well in spite of some little disturbance by mice, which marauders, however, had been in this instance successfully excluded from the hive bodies by means of queen excluders above and wired entrances beneath.

Since 1922 there has been only one colony lost in the cellar. That casualty was attributed to dampness and mice. Results of outdoor wintering, on the other hand, have varied extremely.

On May 10 one of the cellar-wintered colonies had seven frames of eggs and brood, a good percentage of it capped. The other had five frames of eggs and brood while the outdoor wintered colony had some brood or eggs in five frames.

The three colonies built up nicely for a time but two of them were interrupted by the volunteer efforts of a neighbouring beekeeper permitted to requeen the black colony.

#### QUEEN BREEDING

Early attempts to requeen the black colony directly failed for some reason but in the latter part of July it accepted one of the queens which had been reared in the mating box, and which was introduced by the push-in method. By this time the best honey flow was over and the colony had been gravely handicapped in what might otherwise have proven, for it, a fair season's work.

The two cellar-wintered colonies did well until late July, making no large daily records but maintaining a fairly steady production, and building up rapidly in bee strength. No. 201 had been depleted, however, to create nuclei for the queen-breeding experiments and 205 exhibited a swarming impulse toward mid-July in spite of the fact that Her Majesty still seemed to be energetically at work. However, swarming cells and a few supersedures being found on July 14, regicide was committed and infanticide as well, all the queen cells being destroyed except three used to make nuclei in a second mating box.

Detained by other duties and restrained by unsuitable weather, the beekeeper, who also functions as superintendent, was unable to go through the colony to destroy ripe queen cells until July 27. By this time the virgins had begun to emerge, one being found and destroyed.

Dull weather suppressed the ardour of their Royal Highnesses until August 1, when promptly at 2 p.m. the exact moment when the Dominion Apiarist was scheduled to begin a demonstration in handling bees, a large swarm issued from the hive and presently settled in two bunches on the leg of the canopy where the demonstration was to have been staged. The larger of the two clusters settled loyally beside a small Union Jack decorating one corner of the canopy. With a broad smile the Dominion Apiarist walked the clusters into two hives, afterwards despatching all but one virgin, uniting the bees into one swarm and moving them later to the old stand, the parent colony being shifted two or three feet and given a new number. The virgin was afterwards mated successfully and both colonies proceeded happily to work.



A loyal swarm of bees.



On August 1 the second triple mating box (numbered 206) was found to have one live virgin and two vacant thrones. Two spare virgins were introduced from the opportune swarm. Eight days later only one queen was found. Her nucleus was later combined for wintering with the nucleus left in the first mating box, a hive with a division board and two entrances being employed.

#### FEEDING AND WINTERING

Feeding commenced October 12, 1928, and finished October 29, two colonies having by that time had seven saccharine banquets each. Tartaric acid was used in making the syrup in order to prevent granulation.

Counting as a unit two nuclei combined in the one hive, there were six hives prepared for winter quarters, two outdoors in a quadruple case packed with shavings, and four in the cellar of the Superintendent's house.

The record of feeding, honey taken and cellaring weights is as follows:—

COLONY PERFORMANCE, 1928

Number of colony	Syrup fed	Honey taken (estimated)	Weight at cellaring in 1928
	lb.	lb.	lb.
201. Overwintered (cellar).....	32	60	65
202. Artificial swarm.....	30	54	65
203. Overwintered (outdoors).....	5.25	50	outdoors (not weighed)
*204. Mating box.....	13	-	combined with 206 43
205. Swarm from overwintered (cellar).....	23	104	outdoors (not weighed)
*206. Mating box.....	14	-	combined with 204 43
207, 205 swarm hived on new stand and renumbered.....	17	-	48
Totals.....	134.25	268	
Average per colony, excluding mating boxes.....		67	
Average per colony overwintered, excluding mating boxes.....		89.3	

Total quantity of sugar fed, probably 100 pounds.

Total quantity of old honey used, unknown.

Total honey crop for season, 268 pounds.

Increase in colony strength over spring count, probably about 100 per cent.

\*These two nuclei combined in one hive.

#### PUTTING AWAY FOR WINTER 1928-29

On November 6, after a particularly favourable opportunity for autumn flight, four colonies were weighed and carried to the house cellar. Above and beneath each of the three colonies was a queen excluder to exclude mice from the combs and brood chamber.

No stores supers were given to any colonies, the two empty supers mentioned being merely for the purpose of facilitating ventilation.

On November 9 the two outside colonies which had previously been brought together in one quadruple wintering case and fed to the saturation point were groomed for the winter. There were already queen excluders above and beneath them. Over each hive a cotton quilt and several pads of folded newspapers were now placed, with a big sheet of brown wrapping paper as well over the colony in the northeast corner. A large shavings quilt was then tucked in over both cases.

## SUMMARY

Summarizing, it may be said that under the trying conditions of 1927-28, cellar wintering proved much more successful than outdoor wintering, though the latter had not quite a fair chance owing to lack of an early supply of dry shavings for packing.

The forepart of the season of 1928 was very favourable for building up, but results were marred considerably by experimental manipulations. The latter part of the season was unfavourable owing to dry weather restricting the nectar secretion of sweet clover and other plants, while wind greatly interfered with gathering on some days when there might have been nectar.

In spite of handicaps the apiary yielded a hundred per cent increase in colony count and 268 pounds of honey, which amounted to 89.3 pounds per colony overwintered. This does not allow for some hundred pounds of sugar fed nor for some held-over honey used for spring stimulation and queen breeding.

The quality of the honey was not so good as usual and the season was not a favourable one for producing comb honey.

## EXTENSION AND PUBLICITY

Among upwards of two thousand visitors entertained in 1928 were two lords, two knights, a general, three bank presidents, a railway president, two ministers of the Crown, two or more deputy ministers, a dozen railway directors, two Boards of Trade en masse, an Archbishop and a dean of agriculture, besides journalists, professors, administrators, doctors, business men, a synod and, best of all, farmers. The latter came daily as individuals, in groups and in neighbourhood picnic parties of several dozen each. Notable among the distinguished outside visitors were Their Excellencies, Viscount and Lady Wil-



A neighbourhood picnic day at the Experimental Station, Valhalla and Teepee Creek.

lingdon, Lord Lovat, Under Secretary for the Dominions in the Imperial Government, and President E. W. Beatty and his party of C. P. R. directors. Of all these it may truly be said that they came, they saw (the country) and were conquered.

Letters to the number of 2,202 were received directly by the Station and 2,717 despatched, as well as 365 circulars. In addition, 246 letters were answered for Mr. Herman Trelle.

Some three hundred packages of nursery stock and seventy-five packets of ornamental seeds were distributed.

Twelve co-operative tests with cereals and forage crops were supervised. Reward wheat distribution in the Peace River country was handled on behalf of the Cereal Division, and in the autumn 48 samples of wheat for grading and subsequent milling test were personally collected from widely scattered growers and despatched, care being taken where possible to obtain samples of two or more varieties from immediately adjacent areas.

The Illustration Station at Fort St. John was visited in company with Dr. G. P. McRostie, who narrowly escaped being marooned at Taylor's Flats, with the Edmonton Board of Trade. Dr. J. H. Grisdale, Deputy Minister of Agriculture for the Dominion, was shown as much of the country as was possible in three days without an aeroplane.

Over a hundred photographs were taken and several dozen new lantern slides made. Eight lantern slide addresses were delivered to an aggregate audience of 530. Exhibits were made at seven fairs.

Two articles were written for Seasonable Hints and several press articles for general distribution, besides the usual run of specially requested articles for various media.

An inky grist of memoranda for distribution pours steadily from the mimeograph, and the local newspapers carry a weekly budget of practical items styled "Timely Hints from the Beaverlodge Station." Editorial and other comment would indicate that these have been appreciated.

As a result of heavy migration into the district the Station's mailing list is being almost doubled.