DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION

LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT

W. H. FAIRFIELD, M.S.

FOR THE YEAR 1923

Printed by Authority of the Hon. W. R. Motherwell, Minister of Agriculture, Ottawa, 1924

TABLE OF CONTENTS

DOMINION EXPERIMENTAL STATION, LETHBRIDGE, ALBERTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

THE SEASON

The season of 1923 opened in favourable time. Work on the land commenced the second week in April. Spring moisture, though not abundant was sufficient for good germination, and grain crops had a favourable start. A pleasing feature of the 1923 seeding was the care taken by farmers generally to secure a good seed bed. Spring ploughing for grain following grain was the common practice; only in odd instances was "stubbling" in the seed resorted to. This improvement in work is due to two causes:—first—recent dry years have given crop returns only in proportion to the good treatment given the soil. Second—scarcity of money made it essential that every bushel of seed should count in crop produced.

Summer rains came early in May and extended into August. The total rainfall for the three months, May, June and July amounted to 10.48 inches. The average rainfall for this three month period over the past 22 years has been 7.22 inches or 3.26 inches less. The years in which the three month total of 1923 was exceeded were 1902, 1906, 1908, 1915 and 1916.

It should be pointed out that the timeliness of the rains during the season of 1923 was as important a factor in the production of the good crop as was the quantity of moisture received.

The foregoing statement will not apply fully to a somewhat limited area in the southeast and along the eastern edge of southern Alberta, in which portions of the province the rains were not general until the last days of May and crops had suffered too long from drought to recover completely.

Throughout the Lethbridge and Coaldale districts some difficulty was met with in making alfalfa hay, owing to frequent rains at cutting time.

Conditions in the main for dry land grain crops were favourable throughout the season, with the result that threshing revealed good yields of high grade wheat. The western half of southern Alberta may be regarded as having obtained a wonderful crop in 1923, and most of the remaining area a good crop, with the exception of a small area in the southeast.

The precipitation at Lethbridge for the crop year, August 1922 to August 1923, was 16.28 inches which is 1.60 above the average of the past 21 years.

In a few localities during July and early August damage occurred from hail storms. The one considerable storm of this nature was experienced in the evening of July 1, and extended from Aldersyde south to the border. The city of Lethbridge was in the storm path and the west side, or the dry land portion of the Experimental Station, suffered a 25 per cent loss. Although the hail was not heavy on the east side of the Station some appreciable damage was done. The estimated 25 per cent loss on the dry land portion of the Station was sufficient to materially affect the results from an experimental standpoint as different fields and plots sustained different degrees of injury due to their being in varying stages of development.

METEOROLOGICAL DATA FOR CALENDAR YEAR, 1923

Month	Temperature F.			Precipitation	Bright sunshine	Wind			
	Highest	Lowest	Mean			Hourly mean	Greatest mileage in 1 hour		
	°	°	°	inches	hours	miles	miles	dir.	date
January	51·0	−24·0	21·54	0·48	69·6	14·00	48	W.	7
February	58·0	−37·0	17·13	0·42	112·0	17·50	56	W.	28
March	69·0	−13·0	30·15	0·75	164·3	15·20	57	S.W.	19
April	81·5	0·0	40·75	1·09	235·6	11·10	42	S.W.	18
May	80·0	25·0	50·58	3·48	270·6	11·80	50	S.W.	1
June	85·8	39·0	58·78	4·45	235·9	9·60	32	W.	13
July	88·5	41·5	65·24	2·55	287·6	5·00	27	S.W.	11
August	87·5	37·0	61·32	1·01	274·8	4·50	27	W.	23
September	86·0	25·0	54·34	0·18	212·8	6·70	31	N.W.	9
October	75·5	40·0	43·83	0·55	184·4	10·10	44	W.	16
November	68·0	2·0	40·47	0·53	120·7	15·90	52	W.	24
December	59·0	−34·0	26·26	0·91	110·6	17·64	52	W.	1
Total for year	.....	.....	.....	16·40	2278·9	.....			

Latest spring frost occurred on May 29, 1923	29. 5°
First fall frost occurred on September 11, 1923	29. 0°
First killing frost occurred on September 22, 1923	25. 0°
Total precipitation for the 4 growing months of April, May, June and July, 1923	11.57″
Twenty-two years average for the 4 growing months of April, May, June and July, 1923	8.14″
Twenty-two years average annual precipitation	15.30″

A limited number of farmers in the district, as well as Illustration Station Operators over the Province, are supplied with rain gauges and they have been good enough to report their observations of precipitation monthly to this office. The table that follows gives the locations and the names of the observers who have sent in complete reports for the twelve calendar months of 1923.

Observers' Precipitation Records, 1923

Station and Observer	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total, 1923
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Alsask—Andrew Anderson	0·40	0·45	0·80	0·50	1·08	7·46	3·00	2·47	Nil	0·22	0·10	0·02	16·50
Acadia Valley—E. C. Hallman	0·10	0·30	0·15	0·20	0·89	5·87	3·16	1·83	Nil	Nil	0·15	0·10	12·75
Barons—S. R. Hunt	0·40	0·60	0·30	0·72	4·72	5·02	2·72	0·52	0·14	0·17	0·28	1·00	16·59
Bow Island—M. Mortensen	0·30	0·50	0·50	0·36	1·03	4·67	3·20	0·59	Nil	0·77	0·40	0·40	12·72
Cardston—J. F. Parrish	0·43	1·20	1·15	1·03	2·35	4·86	2·11	1·11	0·56	1·80	1·20	0·55	18·35
Carmangay—W. R. Henderson	0·35	0·45	0·80	1·34	2·66	5·27	2·28	0·98	0·06	0·10	0·50	1·10	15·89
Claresholm—School of Agriculture	0·25	0·56	0·75	1·05	3·89	8·64	2·69	0·83	0·23	0·05	0·85	1·05	20·84
Coaldale—Rev. F. N. Priestly	0·49	0·39	0·68	1·33	3·35	3·87	2·20	1·56	0·17	0·55	0·43	0·73	15·75
Delacour—A. H. Fennessey	0·20	0·30	1·08	1·00	4·80	9·17	2·77	1·50	Nil	0·05	0·20	0·80	21·87
Foremost—T. H. Frankish	1·10	Nil	0·50	0·60	2·15	3·28	5·27	0·35	0·22	0·65	Nil	Nil	14·12
Grassy Lake—James Palmer	0·80	0·70	0·60	1·38	2·24	4·41	3·83	1·07	0·16	0·69	0·45	0·40	16·73
Grassy Lake—J. E. James	0·32	1·10	0·70	0·99	1·14	3·63	3·93	0·58	Nil	0·60	0·50	0·50	13·99
High River—B.F. Kiser	1·00	1·00	1·30	0·38	5·33	5·83	3·76	0·60	Nil	Nil	0·60	1·20	21·00
Kippenville—D. Kippen	0·35	0·90	0·40	0·80	2·92	3·89	2·08	0·80	0·69	Nil	Nil	0·80	13·63
Lethbridge—Experimental Farm	0·48	0·42	0·75	1·09	3·48	4·45	2·55	1·01	0·18	0·55	0·53	0·91	16·40
Macleod—Norman Grier	0·88	0·60	1·10	1·88	3·42	5·38	2·49	0·65	0·24	0·25	0·70	1·00	18·59
Milk River—P. W. Stimson	1·47	1·10	0·03	1·15	2·35	4·30	2·90	2·26	0·73	1·57	0·40	0·30	18·56
Munson—R. R. Fraser	0·73	1·40	0·48	0·20	2·59	2·91	1·78	2·30	0·03	Nil	Nil	0·20	12·62
New Dayton—R. W. Risinger	0·65	1·25	0·60	1·03	3·34	2·63	3·14	0·32	0·36	0·86	0·20	1·50	15·88
Nobleford—E. L. Woodbury	0·20	1·10	0·50	1·43	4·14	3·07	2·44	0·77	0·12	0·32	0·70	1·20	15·99
Orion—S. Eggleston	0·80	0·75	0·80	0·50	1·00	3·89	2·17	1·51	0·11	0·63	0·08	0·45	12·69
Pincher Creek—Andrew Christie	1·06	0·88	2·10	2·55	5·97	6·88	2·30	2·80	0·65	0·56	1·66	1·20	28·61
Raymond—School of Agriculture	1·13	0·60	0·65	0·80	2·34	7·10	2·35	0·83	0·39	0·22	1·45	1·10	18·96
Skiff—R. M. Arthur	1·20	0·25	0·40	1·10	2·95	3·59	3·03	1·27	0·57	0·64	0·05	0·80	15·85
Vulcan—J. H. Cook	0·41	1·03	1·13	1·50	3·52	7·18	2·64	0·14	0·30	Nil	0·20	1·10	19·15
Wainwright—G. C. Boyd	0·20	0·85	0·90	0·40	1·49	3·56	1·98	2·25	0·43	Nil	Nil	0·05	12·11
Whitla—R. H. Babe	0·70	0·80	1·50	1·01	1·95	6·04	3·63	0·82	Nil	0·65	Nil	0·10	17·20
Youngstown—G. S. Coad	0·15	0·50	0·25	0·48	1·16	8·25	2·71	1·69	0·15	0·06	0·10	0·10	15·60

ANIMAL HUSBANDRY

The experimental work in animal husbandry is under the supervision of Mr. V. Matthews, Assistant to Superintendent, and he has compiled the data given under this heading.

CATTLE

STEER FEEDING EXPERIMENT

Object of experiment.—To obtain further information as to the value of alfalfa hay in the fattening of steers.

Plan of experiment.—Two cars of steers were purchased in the early fall and were divided into 4 groups. The amount of grain fed to each group was the same, consisting chiefly of a mixture of equal parts ground oats and barley. The roughages supplied varied and were as follows:—

Group I—Alfalfa.
Group II—Alfalfa and corn silage.
Group III—Alfalfa and sunflower silage.
Group IV—Alfalfa and corn fodder.

The steers were fed in the open, the only protection given being a straw shelter at one end of each corral.

STEER FEEDING EXPERIMENT

—		Group 1 — Straight alfalfa, grain	Group 2 — Corn silage, alfalfa, grain	Group 3 — Sunflower silage, alfalfa, grain	Group 4 — Corn fodder alfalfa, grain
Number of days in experiment		167	167	167	167
Number of steers in experiment		11	11	11	11
Total initial weight (Nov. 22, 1922)	lb.	12,480	12,507	12,502	12,510
Average initial weight	"	1,134·54	1,137	1,136·54	1,137·27
Final total weight (May 8, 1923)	"	15,440	16,910	15,610	16,105
Final average weight	"	1,403·63	1,537·27	1,419·09	1,464·09
Total gain for period	"	2,960	4,403	3,108	3,595
Average gain per head for period	"	269·09	400·27	282·54	326·81
Average gain per head per day	"	1·611	2·396	1·691	1·956
Quantity of silage fed for period	"	.....	55,957	55,957	.....
Quantity of corn fodder fed for period	"	.....	.....	.....	24,405
Quantity of alfalfa hay fed for period	"	41,645	18,340	15,150	19,595
Quantity of grain (equal parts ground barley and oats) fed for period	"	13,222	13,222	13,222	13,222
Quantity of barley chop fed for period	"	3,564	3,564	3,564	3,564
Quantity of corn meal fed for period	"	396	396	396	396
Quantity of oil cake fed for period	"	176	176	176	176
Quantity of salt fed for period	"	120	120	120	120
Cost of Feed and Returns					
Silage at $4.00 per ton	$	.....	111·91	111·91	.....
Corn fodder at $6.00 per ton	$	.....	.....	.....	73·21
Alfalfa hay at $10.00 per ton	$	208·22	91·70	75·75	97·97
Grain at $29.50 per ton (oats at 1½c. per lb., barley at 1½c. per lb., and crushing at $2.00 per ton)	$	195·02	195·02	195·02	195·02
Barley chop at $27.00 per ton	$	48·11	48·11	48·11	48·11
Corn meal at $42.00 per ton	$	8·31	8·31	8·31	8·31
Oil cake at $55.60 per ton	$	4·89	4·89	4·89	4·89
Salt at $32.50 per ton	$	1·95	1·95	1·95	1·95
Total cost of feed	$	466·50	461·89	445·94	429·46
Cost of feed per head	$	42·41	41·99	40·54	39·04
Cost of feed per head per day	$	0·253	0·251	0·242	0·233
Cost to produce one pound of gain	$	0·157	0·104	0·143	0·119
Initial cost of steers including commission, insurance, freight	$	519·17	520·29	520·08	520·42
Initial cost of steers per pound	$	0·0416	0·0416	0·0416	0·0416
Total cost plus cost of feed	$	985·67	982·18	966·02	949·88
Selling price to break even	$	0·06383	0·05808	0·06188	0·05898
Selling price at $6.50 per cwt	$	1,003·60	1,099·15	1,014·65	1,046·82
Net profit per group	$	17·93	116·97	48·63	96·94
Net profit per head	$	1·63	10·63	4·42	8·81

Deductions.—In order to arrive at a financial statement the steers in the experimental feeding tests were appraised by Mr. W. Shaw, Manager of P. Burns & Co., Lethbridge. This was deemed advisable on account of two car loads being included in the shipment of live cattle and chilled beef consigned to England in May, 1923. The reader who desires a detail report in pamphlet form of the experiment on the shipping of live cattle and chilled beef to England may obtain the same from this Station or by writing to the Publication Branch, Department of Agriculture, Ottawa for pamphlet No. 39, N.S.

The local feeder would no doubt be interested to know that it cost $18.10 per head to take steers to Montreal, this includes freight and other rail charges to Montreal as well as attendant charges of 50 cents per head. Or, in other words, it cost $1.40 per hundred pound live weight to take cattle to Montreal. The shrinkage in rail shipping from Lethbridge to Winnipeg was 116 pounds per steer or 8 per cent, and from Winnipeg to Montreal, 65 pounds per steer or 4 per cent; a total shrinkage from Lethbridge to Montreal of 181 pounds per steer or 12 per cent.

It cost $50.79 per head to land cattle from Lethbridge in England. This amount was made up of charges to Montreal as already stated plus reloading to wharf, tags and tagging, marking, ropes and pails, wharfage, marine insurance, ocean feed, ocean freight of $22.50 per head and the charges at port of debarkation which includes lairage, dues, droving and veterinary inspection fees.

In the 50 fat steer lot killed and shipped as chilled beef from Montreal to the Smithfield market, London, there were 18 Lethbridge steers. The 50 steers realized a gross price of $3.93 per cwt. on live weight at Montreal. This would make a net price at Lethbridge of $2.53 per cwt. live weight after taking into account the expenses of shipping from Lethbridge to Montreal.

In the 25 fat lot shipped alive, killed immediately on arriving in England and sold on the Smithfield market as fresh beef, there were 3 Lethbridge steers. These 25 steers realized a gross price of $7.53 per cwt. on live weight at Montreal. This would make a net price at Lethbridge of $6.13 per cwt. live weight after taking into account the expenses of shipping from Lethbridge to Montreal.

In the 25 fat lot shipped alive and sold as short keep stores on the Birkenhead and Norwich markets, England there were 15 Lethbridge steers. These 25 steers realized a gross price of $9.33 per cwt. on live weight at Montreal. This would make a net price at Lethbridge of $7.93 per cwt. live weight after taking into account the expenses of shipping from Lethbridge to Montreal.

All the Lethbridge steers were classified at Montreal as fat cattle, consequently there were none from this station included in the lighter and thinner lot of 75 grass fed stores. This lot, however, realized a gross price of $8.03 per cwt. on live weight at Montreal and thus by allowing the cost of $1.40 per cwt. of taking steers of this class to Montreal from Lethbridge it would have meant a net price at Lethbridge at $6.63 per cwt.

The lots of live cattle realized considerably higher returns than did the chilled beef shipment. The intending shipper of cattle to the Old Country must remember that the overseas market requires good breedy steers, weighing from 1,000 to 1,250 pounds live weight. The lighter steers are more suitable for grass feeding and the heavier steers for stall feeding. This point and other matters relating to the English beef trade are taken up in pamphlet No. 39, N.S.

The table following gives the average daily ration for the entire period; daily gains, feed for one hundred pound gain and the feed cost of one hundred pound gain.

STEER FEEDING

Average ration	Daily gains	Feed for 100 lb. gain				Feed cost of 100 lb. gain
		Grain	Hay	Silage	Corn fodder	
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$
Group 1, no silage—						
Alfalfa hay, 22·67 lbs.						
Chop, 9·45 lbs.....	1·611	587	1,407	.....	.....	15 76
Group 2, fed corn silage—						
Corn silage, 30·46 lbs.						
Alfalfa hay, 9·98 lbs.						
Chop, 9·45 lbs.....	2·396	394	417	1,271	.....	10 49
Group 3 fed sunflower silage—						
Sunflower silage, 30·46 lbs.						
Alfalfa hay, 8·25 lbs.						
Chop, 9·45 lbs.....	1·691	558	487	1,800	.....	14 35
Group 4 fed corn fodder—						
Corn fodder, 13·29 lbs.						
Alfalfa hay, 10·67 lbs.						
Chop, 9·45 lbs.....	1·956	483	545	.....	679	11 95

The weight of silage fed per day was determined by the group eating the least amount. When the increased gains from the roughage supplement are taken into consideration, 1.28 pounds of corn silage replaced 1 pound of alfalfa hay and by valuing the alfalfa hay at $10 per ton the corn silage was worth $7.81 per ton. In like manner 1.96 pounds of sunflower silage replaced 1 pound of alfalfa hay and had a value of $5.12 per ton. Similarly 0.79 pound of corn fodder replaced 1 pound of alfalfa hay and had a replacement value of $12.66 per ton.

From one year's results with corn fodder it would be unwise to draw conclusions, although the deduction that corn may be stooked and fed economically as corn fodder in place of being ensiled looks very possible.

The two-year results of feeding corn and sunflower silage as a supplement with alfalfa resulted in 1.50 pounds of corn silage replacing 1 pound of alfalfa hay. Thus due to the increased gains, the corn silage was 53.33 per cwt. more efficient than sunflower silage in the fattening of steers where combined with alfalfa hay. With the alfalfa hay valued at $10 per ton the corn silage had an average value for 2 years of $6.84 per ton and the sunflower silage an average value of $4.46 per ton. It is safe to conclude that corn silage of the quality used in these tests the corn being practically in the glazed stage when cut is worth 50 per cent more than sunflower silage as a supplement with alfalfa.

The group of steers getting corn silage attained a much higher finish than any of the other groups, the difference being quite marked. The group getting corn fodder was a close second. In point of finish there was not a great difference between the group getting no ensilage and the group getting sunflower ensilage.

In order to get more information as to the value of ensilage vs. no ensilage; corn silage vs. corn fodder; sunflower silage vs. corn silage an experiment along similar lines was started in November, 1923.

SHEEP

LAMB FEEDING EXPERIMENT

Object of experiment.—As in previous years, an experimental feeding test with lambs was undertaken, the object in view being to compare alfalfa with alfalfa and silage, and alfalfa and oat sheaves.

Plan of experiment.—The test was carried out with four groups of fifty lambs each. The amount of grain fed to each group was the same and consisted of a mixture of equal parts whole oats and barley.

Group 1—Alfalfa hay.
Group 2—Alfalfa hay and corn silage.
Group 3—Alfalfa hay and sunflower silage.
Group 4—Alfalfa hay and oat sheaves.

The feeding was carried on in open corrals, the only shelter provided being a shed open to the east. The method of feeding was somewhat similar to that followed in previous years. The lambs received hay in combination racks at 7.30 a.m. and 3.30 p.m. each day, and the grain was fed on silage in the same trough. They were started on one-half pound of grain, and at the close of the feeding period were getting one and a half pounds per head per day. The amount of grain fed was the same for all groups. The weight of silage fed per day was the same for groups 1 and 2, but was determined by the group eating the least amount. The lambs were started on one-half pound of silage, and at the close of period were getting two pounds per head per day.

The lambs had access to water at all times, and in extremely cold weather, tank heaters were used to keep ice from forming.

LAMB FEEDING EXPERIMENT—TABLE I

—		Group 1 — Alfalfa, grain	Group 2 — Corn silage, alfalfa, grain	Group 3 — Sunflower silage, alfalfa, grain	Group 4 — Oat sheaves alfalfa, grain
Feeding experiment commenced Dec. 14, 1922, and ended March 21, 1923.					
Number of days in experiment		97	97	97	97
Number of lambs in group at beginning of period		50	50	50	50
Number of lambs in group at end of period		50	50	50	50
Total initial weight	lb.	3,755	3,745	3,735	3,730
Average initial weight	"	75·1	74·9	74·7	74·6
Total weight at beginning of experiment after deducting weight of loss	"	3,755	3,745	3,735	3,580
Final total weight	"	5,240	5,500	5,280	5,100
Final average weight	"	104·8	110·0	105·6	106·25
Total gain for period	"	1,485	1,755	1,545	1,520
Average gain per head for period	"	29·7	35·1	30·9	31·67
Average gain per head per day	"	0·31	0·36	0·32	0·33
Quantity of silage fed for period	"	.....	8,350	8,350	.....
Quantity of oat sheaves fed for period	"	.....	.....	.....	4,447
Quantity of alfalfa fed for period	"	10,735	8,715	8,570	7,380
Quantity of grain (whole oats and whole barley) fed for period	"	5,711	5,711	5,711	5,653
Quantity of salt fed for period	"	120	120	120	119
Cost of Feed and Returns					
Silage at $4.00 per ton	$	.....	16·70	16·70	.....
Oat sheaves at $10.00 per ton	$	.....	.....	.....	22·24
Alfalfa hay at $10.00 per ton	$	53·68	43·58	42·85	36·90
Grain at $27.50 per ton	$	78·53	78·53	78·53	77·73
Salt at $32.50 per ton	$	1·95	1·95	1·95	1·95
Total cost of feed	$	134·16	140·76	140·03	138·80
Cost of feed eaten by the 50, 50, 50, and 48 respectively	$	134·16	140·76	140·03	134·50
Cost of feed per head	$	2·68	2·82	2·80	2·80
Cost of feed per head per day	$	0·028	0·029	0·029	0·029
Cost to produce one pound of gain	$	0·09	0·08	0·09	0·09
Initial cost of lambs	$	262·85	262·15	262·45	262·10
Initial cost of lambs per pound	$	0·07	0·07	0·07	0·07
Total cost plus cost of feed	$	397·01	402·91	402·48	400·90
Selling price at $11.25 per cwt. less 5 p.c. shrink	$	560·02	587·81	564·30	545·06
Net profit on group	$	163·01	184·90	161·82	144·16
Net profit per head	$	3·26	3·70	3·24	3·00

The results of the two-year feeding tests are somewhat contradictory and to assist the reader to analyze the experiment the following tables are given:—

LAMB FEEDING EXPERIMENT—TABLE II

Average ration	Daily gains	Feed for 100-pound gain				Feed cost of 100 pound gain
		Grain	Hay	Silage	Oat sheaves	
1921–22	lbs.	lbs.	lbs.	lbs.	lbs.	$ cts.
Group 1, no silage— Alfalfa hay, 2·23 lbs. Whole oats, 0·73 lbs.	0·1966	384	1,123	.....	.....	9 42
Group 2, corn silage— Corn silage, 0·79 lbs. Alfalfa hay, 2·04 lbs. Whole oats, 0·76 lbs.	0·2166	361	943	363	.....	8 83
Group 3, sunflower silage— Sunflower silage, 0·79 lbs. Alfalfa hay, 2·03 lbs. Whole oats, 0·76 lbs.	0·23	328	882	341	.....	8 28
1922–23						"
Group 1, no silage— Alfalfa hay, 2·21 lbs. Whole oats and barley, 1·18 lbs.	0·31	385	702	.....	.....	9 03
Group 2, corn silage— Corn silage, 1·72 lbs. Alfalfa hay, 1·80 lbs. Whole oats and barley, 1·18 lbs.	0·36	325	497	476	.....	8 02
Group 3, sunflower silage— Sunflower silage, 1·72 lbs. Alfalfa hay, 1·77 lbs. Whole oats and barley, 1·18 lbs.	0·32	370	555	540	.....	9 06
Group 4, oat sheaves— Oat sheaves, 0·92 lbs. Alfalfa hay, 1·53 lbs. Whole oats and barley, 1·18 lbs.	0·33	372	486	.....	290	8 85

Deductions.—It will be observed that better gains were made during the winter 1922-23 on alfalfa without silage than during the winter 1921-22. This is accounted for by the fact that more grain was fed and what was still of greater importance a more balanced grain ration. When barley was included in the grain ration it was found that the lambs attained a much better finish than when the grain ration consisted solely of oats.

In both winters the group getting corn silage attained a good finish, while the group getting sunflower silage appeared to grow rather than fatten. From the year's work, oat sheaves appear to be an excellent feed to combine with alfalfa, as the lambs in that group reached the highest degree of finish. These results are in line with the results of a feeding test with lambs conducted at this Station during the winter of 1914-15. Great care needs to be exercised in feeding oat sheaves with a full grain ration, otherwise the lambs will easily be stalled and death may result from excessive feeding of concentrates. When the increased gains from the group getting oat sheaves as a supplement are taken into account it was found that 1.35 pounds of oat sheaves replaced 1 pound of alfalfa hay and by valuing the alfalfa hay at $10 per ton, the oat

sheaves were worth only $8.93 per ton to feed. Since the irrigation farmer can grow a ton of alfalfa more cheaply than a ton of oat sheaves, the latter is not likely to be employed to any great extent in the fattening of range lambs.

Each autumn a vast amount of feed goes to waste on the stubble fields, and as scavengers for gleaning stubble fields, cleaning up around straw piles and converting screenings and refuse grains into cash, lambs are in a class by themselves. Therefore, one of the objects in view in the winter feeding tests carried on with lambs has been to ascertain the possibilities of using the stubble fields and the roughages available on the irrigated land, in the finishing of lambs during the fall and winter months. To accomplish this object lambs have been run on stubble fields after the grain has been harvested and then finished later by feeding in corrals.

The results indicate, (1)—that it is profitable to stubble graze and fatten range lambs in the fall and winter months. On October 18, 1922, the average weight of the lambs when put on stubble pasture was 73.23 pounds. On December 5, the average weight of the lambs when taken off the pasture was 80.46 pounds. In 48 days on pasture they gained 7.23 pounds or 0.15 pounds per head per day. With pasture at one-half cent per head per day, the cost of producing mutton on stubble fields in the fall was 3.32 cents per pound.

On October 17, 1923, the average weight of the lambs when put on stubble pasture was 79.25 pounds. On December 10 the average weight of lambs when taken off pasture was 82.8 pounds. In 44 days on pasture they gained 3.55 pounds or 0.08 pounds per head per day. The pasture at $4.00 per thousand per day makes the cost of producing mutton on stubble fields in the fall 4.95 cents per pound.

(2) The only protection necessary to fatten range lambs is shelter from winds and a dry place to bed.

The average profit for the 9 years was $1.98 per head. The average price charged for alfalfa hay for the same years was $12.30 and grain $25.64 per ton.

The average cost of growing alfalfa hay for the years 1911 to 1923 inclusive was $4.43 per ton. The grain fed to the lambs was not ground, thus a price of one and one-quarter cents per pound would be a very fair price for farmers to realize for grain by selling it off the farm during these same years that feeding operations were carried on.

Without showing any profit per head the average farmer would be well contented to receive $12 for the alfalfa hay and $25 per ton for the grain during the past 13 years. By showing a profit per head is further evidence that alfalfa and grain can be marketed on the hoof by feeding it to range lambs rather than baling and shipping it off the farm. Then again the fertility of the land can be maintained. Alfalfa fields that have been top dressed with manure during the fall and winter months at the rate of 12 tons of manure to the acre have resulted in an increase of half a ton of hay to the acre over no manure. Besides, there is the further advantage that all good irrigation farmers realize and that is, fertile soils require less water to produce maximum yields than similar types of soils less fertile.

PASTURING SHEEP IN FOREST RESERVE

Objects of experiment.—To determine the feasibility of alfalfa growers on the irrigated land utilizing the nearby forest reserve in the Rocky Mountains for summer pasture for sheep.

Plan of experiment.—In the fall of 1919, 900 grade Merino ewes were provided for the foundation stock and since that time the experiment has been continued.

During the fall and winter months the band is either run on stubble fields or fed at the Station, the amount of feeding required depending upon the

severity of the weather. During the summer months from early June till late September, they are pastured in the Crowsnest Forest Reserve being shipped by rail from Lethbridge to Coleman and returned by rail again in the fall. The ewes are bred to lamb fairly early, that is, from the middle of March to the latter part of April. In order to accommodate them during the lambing period, a shed 140 feet by 64 feet is used. As the grass in the Forest Reserve is as a rule ready for pasturing early in June, it has been the custom to shear the latter part of May. After shearing they are dipped and branded, completing these operations in time to allow the sheep to be shipped to the mountains during the first week of June. The sheep have been returned to Lethbridge either the last of September or during the first week of October.

October, 1923, completed the fourth year of the experiment and the following statement gives the expenses and returns from October, 1922 to October,1923.

PASTURING SHEEP ON FOREST RESERVE

Expenses October 1922 to October 1923—	
Winter pasture on stubble fields	$ 856 37
Alfalfa hay, 56·7 tons at $10.00 per ton	567 00
Alfalfa hay (mostly weeds— very low grade), 10 tons at $5.00 per ton	50 00
Russian thistles, wheat, and other poor roughage, 7·8 tons at $4.00 per ton	31 20
Oatsheaves, 2·2 tons at $10.00 per ton	22 00
Silage, 82·85 tons at $4.00 per ton	331 40
Grain, whole oats and barley, 11·44 tons at $27.50 per ton	314 60
Whole oats, 4·4 tons at $30.00 per ton	132 00
Salt, 1·75 tons at $32.50 per ton	56 87
Summer pasture on Forest Reserve	89 00
Total freight to and from Forest Reserve	690 24
Shearing, including hire of machine	154 78
Purchase of 9 bucks	190 00
Labour, total for 12 months	1,724 93
	$ 5,210 39
Inventory, October 1922—	
Number of ewes to be bred, 826, valued at $6.50	$ 5,369 00
Number of cull ewes to be sold, 337 at $3.25	1,095 25
Number of ewe lambs on hand, 315 at $6.00	1,890 00
Number of wether lambs on hand, 222 at $5.00	1,110 00
Number of bucks on hand, 15 at $25.00	375 00
	$ 9,839 25
Sales—	
468 ewes, net receipts	$ 2,876 92
454 lambs, net receipts	4,727 66
7 bucks, net receipts	64 15
Net wool receipt, less dip and supplies	2,311 65
	$ 9,980 38
Inventory October 1923—	
Number of ewes to be bred 901 at $8.00	$ 7,208 00
Number o ewe lambs on hand, 133 at $7.00	931 00
Number of feeder lambs on hand, 302 at $6.50	1,963 00
Number of bucks on hand, 17 at $15.00	255 00
	$10,357 00

Financial Summary

Sales for year	$ 9,980 38	
Inventory, October 1923	10,357 00	
Expenses for year		$ 5,210 39
Inventory October 1922		9,839 25
Gross profit		5,287 74
	$20,337 38	$20,337 38

Owing to the fact of the increase in value of sheep in the fall of 1923 as compared to 1922, the inventoried value of the stock on hand had to be raised. Had they been valued at the same figure per head as in 1922 the profit would have been decreased to the extent of $1,936.50.

Details of Test.—On October 5, 1922, the sheep were returned from the Forest Reserve, landing in Lethbridge the morning of October 6. The lambs were separated from the breeding stock and both run on separate stubble fields. After the breeding season the ewes and ewe lambs were run as one band until February 28 when they were brought back to the Station.

The ewes started to lamb the middle of March. During the lambing or to be exact, from the 1st of March a number of the ewes were fed sunflower silage in addition to alfalfa, while a number were fed alfalfa without silage. The results obtained confirmed the findings of the previous season.

The 1922 silage test.—In the early spring of 1922, 100 ewes were fed alfalfa without silage, the balance of the ewes being fed what sunflower silage they would clean up along with alfalfa hay. The lambs from the 100 head getting only alfalfa were more vigorous at the start, no deaths resulted, but the average weight per lamb was less at the end of the lambing period than was the case with the others.

The 1923 silage test.—In 1923 the breeding ewes were divided into 2 nearly equal lots. One lot received alfalfa hay and no silage, while the other lot was given sunflower silage along with the alfalfa. The feeding of the silage began 2 weeks before the first lambs came.

With the silage fed lot the lambs were inclined to be flabby and soft when dropped, the majority were slow in getting on their feet and assistance had to be given in suckling for the first twenty-four hours or more. More deaths also occurred than with the lambs from the other lot. The test resulted as follows:—No silage—Average weight on April 17 of 389 lambs from 362 ewes dropped from March 7 to April 17 was 20.96 pounds. Silage—Average weight of 344 lambs from 340 ewes dropped during the same period average 22.32 pounds being a gain of 1.36 pounds per head in favour of ensilage, but from the lot receiving no ensilage there were 6.3 per cent more lambs. Therefore, the value of ensilage before or during lambing is very questionable, but it appears that after lambing it is very beneficial as it increases the milk supply.

Seven hundred and thirty-five ewes had lambs, bringing the number of yeld ewes up to 91. There were 765 lambs marked. The losses of lambs from the time of marking to the date of shipping to the summer pasture was 36.

Shearing took place from May 8 to May 15, the weather being most unfavourable during this period as well as after shearing. One thousand, one hundred and twenty-eight head were machine clipped, this number being made up of 825 mature or aged ewes and 303 yearling ewes. The average weight of fleece from the 1,128 head was 7.47 pounds, the aged ewes averaged 7.78 pounds and the yearlings 6.64 pounds. The wool clip was sold co-operatively through the Canadian Co-operative Wool Growers and on a graded basis brought from 18 cents to 38 cents per pound. The most of the wool grading from fine to low medium staple, the majority grading medium staple and bringing 34 cents per pound. The average price received for the whole clip was 33 cents per pound.

WOOL GRADING STATEMENT

Grade	Pounds	Prices	Revenue
		cents	$
Fine staple	18	38	6 84
Fine clothing	39	36	14 04
Fine medium staple	1,911	35½	678 00
Fine medium clothing	100	34	34 00
Medium staple	4,776	34	1,623 84
Medium clothing	237	32	107 84
Low medium staple	1,143	26½	302 89
Low staple	74	19½	14 43
Common and braid	27	18	4 86
Fine black	3	18	54
Medium black	68	18	12 24
Medium seedy	12	18	2 16
Hard cloths	4	14	56
Medium tags	6	4	24
Medium gray	5	18	90
	8,523	33	2,803 78

The entire flock was dipped on May 23. It took 18 gallons of creosote for this purpose and required the services of 7 men, 4 hours for the operation.

The deaths from October, 1922, to June, 1923, when the ewes were moved to the mountains, were 44. The loss sustained during the winter was actually light as most deaths occurred just after shearing. On June 12, the sheep were shipped to the Forest Reserve where they remained until September 28. The number shipped was 1,100 head of mature sheep and 700 followers, making a total of 1,800 head.

As in previous years 2 men were with the sheep while in the mountains, one as herder and the other as camp mover. During the summer in the mountains 60 ewes and 32 lambs were lost. The first night alone 10 died from poison. With the exception of these first deaths from poisoning the relatively heavy losses sustained may be attributable in large measure to the inexperience of the herders in charge of the band. Two or three changes with the men in attendance had to be made with the result that only for the first few weeks was there really an experienced man with the sheep. Mountain grazing of sheep doubtless requires a slightly higher degree of skill than is required for prairie grazing.

The total loss of mature sheep for the year from October, 1922 to October, 1923, was 104 head or 7 per cent.

Four Years' Summary.—The reason for inaugurating the experiment was to attempt to solve the problem of cheap summer pasture for the farmers on irrigated lands who were keeping, and for others who would like to keep, a farm flock of sheep. No readily accessible prairie range is within reach of the irrigated farms in the Lethbridge district. The question had been raised from time to time by farmers interested in the matter as to whether it might not be possible to utilize some of the mountain pastures now unoccupied, the suggestion being for a few neighbouring farmers to combine their flocks after shearing time, ship the sheep by rail to the mountains and pool the cost of herding for the three and one-half or four summer months. If a commercial experiment was to be carried out along these lines it would be necessary to have a band of a fair size, otherwise the cost of herding during the summer would be excessive. It is obvious that the larger the number of sheep in a band, provided the number is kept within practical limits, the more cheaply per head can they be carried.

For the past four years the results of each season's work have been given in detail in the annual reports, including a financial statement showing expenses and returns for the respective seasons, but it was thought that the collective summaries might also interest the general reader who cares to analyze the experiment.

FINANCIAL STATEMENT OF SHEEP GRAZING EXPERIMENT COVERING PERIOD FROM OCTOBER, 1919 TO OCTOBER, 1923

Sales for year	$ 4,864 62	
Inventory, October, 1920	7,431 00	
Expenses for year		6,572 08
Inventory, October, 1919		10,050 00
Loss	4,326 46	
	$16,622 08	$ 16,622 08

FOR YEAR ENDING OCTOBER, 1921

Sales for year	$ 3,635 07	
Inventory, October, 1921	7,898 00	
Expenses for year		$ 4,452 19
Inventory, October, 1920		7,431 00
Loss	350 12	
	$ 11,883 19	$ 11,883 19

FOR YEAR ENDING, OCTOBER, 1922

Sales for year	$ 4,248 62	
Inventory, October, 1922	9,839 25	
Expenses for year		$ 4,722 88
Inventory, October, 1921		7,898 00
Profit		1,466 99
	$ 14,087 87	$ 14,087 87

FOR YEAR ENDING OCTOBER, 1923

Sales for year	$ 9,980 38	
Inventory, October, 1923	10,357 00	
Expenses for year		$ 5,210 39
Inventory, October, 1922		9,839 25
Profit		5,287 74
	$ 20,337 38	$ 20,337 38

The first two years showed a loss of $4,676.58, while the last two a profit of $6,754.73. It will be noted that the greatest loss was sustained the first 12 months of the experiment. This was due to the extremely hard winter of 1919-20 so well remembered by all stockmen, with high prices for feed—hay ranging from $25 to $50 per ton—together with the unprecedented shrinkage in the value of sheep. The drop in the value of sheep was no less than 40 per cent. It is only fair to note that the profit or loss shown is gross as no charge for interest on investment is made.

Wool Production.—From the beginning of the experiment to date, Oxford rams have been used. From the standpoint of mutton type, the flock has been distinctly improved, but it is interesting to note that the grade of the wool, as well as the weight of the fleece, has steadily decreased. The average weight of fleece from the whole band was in 1920—9 pounds; 1921—8 pounds; 1922—7.2 pounds, and in 1923—7.47 pounds. The increase in 1923 over 1922 is without doubt due to the use of machines in shearing. Previous to 1923 they had been hand-sheared with "blades." It is generally conceded that the first season the machines are used an increase of about one-half pound per fleece may be expected, so it is reasonable to suppose that for comparative purposes with the other years the yield of wool for 1923 should be placed at 7 pounds.

FOUR YEARS' SUMMARY

Total sales	$ 22,728 69	
Increase in inventory October, 1923 over inventory October, 1919	307 00	
Total expenses		$ 20,957 54
Total gross profit		2,078 15
	$ 23,035 69	$ 23,035 69

As stated the main object of the experiment has been to determine the feasibility of the irrigation farmers carrying small flocks of sheep on their farms and combining them into fairly large sized bands during the summer months and pasturing them on the forest reserve. It will be seen from the above four years' summary that such a scheme is profitable. Although the total gross profit for the four years is not sufficient to pay eight per cent on investment, it must be taken into account that the feeds have been marketed at prices that would realize a good return to the farmer, far more than would have been realized if sold other than "on the hoof." Each fall a vast amount of feed goes to waste on stubble fields, and as scavengers for gleaning stubble fields and cleaning up around straw stacks, the sheep is in a class by itself. In the total expenses for the four years is included an item for $1,946.59 for winter pasture on stubble fields. This is feed which ordinarily goes to waste and for which the average farmer without sheep receives little or no return. Tons of Russian thistle hay as well as other unsaleable roughage has been fed and charged for at the rate of $4.00 to $5.00 per ton. Alfalfa hay has been credited at $13.75 per ton; this is the average price charged for the hay during the four years. In addition to the alfalfa, mixed hay was fed when there was a shortage of alfalfa in 1920 and charged for at the rate of $40 per ton. Other roughages fed have been oat sheaves valued at $10 per ton, silage at $3.50 to $5 per ton, and corn fodder at $12 per ton.

The sheep is an animal that can utilize whole grain to good advantage, thus saving the expense of grinding; screenings and refuse grain of little or no marked value have been fed and charged at prices ranging from $16.65 to $34 per ton. Other grains have been fed and valued at prices ranging from $24.50 to $45 per ton.

When the feeds enumerated, and the stubble pasturage, have been marketed at such relatively high prices, and when current wages are allowed for all necessary work—much of which the farmer would do himself—and a gross profit shown, it can safely be assumed that the sheep pasturing experiment has been a profitable venture.

FIELD HUSBANDRY

TWO FARMS

Two distinct types of farming are carried on in southern Alberta, irrigation farming and dry farming or farming without irrigation. These two types have distinct problems, often as different as those found in widely separated parts of the country. To meet this condition the Experimental Station at Lethbridge was located where one half of the farm could be irrigated and the other half operated as a dry farm. This arrangement really makes two farms operated under one management, so in reporting the field investigations the dry land and irrigated land are reported separately. In each division the dry land is reported first followed by a report of the irrigated land.

CROP ROTATIONS

Records have been kept each year of all items of expense and returns so that it is possible to determine the cost of producing each crop in each rotation and the returns from the various crops.

COST VALUES FOR THE SEASON OF 1923

Rent and taxes dry land	per acre	$ 2 50
Rent and taxes irrigated land	per acre	8 00
Manure	per ton	1 00
Seed wheat	per bushel	1 20
Seed oats	per bushel	0 68
Seed barley	per bushel	0 96
Seed peas	per bushel	3 00
Seed rye	per bushel	1 50
Seed corn	per pound	0 10
Sweet clover seed	per pound	0 10
Alfalfa seed	per pound	0 40
Sugar beet seed	per pound	0 25
Twine	per pound	0 14
Machinery	per acre	1 00
Manual labour	per hour	0 30
Horse labour per horse	per hour	0 10
Threshing wheat and peas	per bushel	0 13
Threshing barley	per bushel	0 10
Threshing oats	per bushel	0 09
Ensiling corn	per ton	1 00

RETURN VALUES FOR THE SEASON OF 1923

Wheat	per bushel	$ 0 75
Oats	per bushel	0 42
Barley	per bushel	0 54
Peas	per bushel	2 00
Sugar beets	per ton	8 00
Alfalfa hay, and peas and oats hay	per ton	7 00
Sweet clover seed	per pound	0 10
Corn ensilage	per ton	3 50
Oat straw	per ton	2 00
Barley straw	per ton	2 00
Pasture one sheep	per month	0 30

Where grass, alfalfa and clover are planted the cost of seed is distributed equally among each hay or pasture year in the rotation unless the seeding fails. If the seeding fails the seed is charged to the entire rotation. The cost of summer-fallow is charged to the next succeeding crop.

DRY LAND ROTATIONS

Five crop rotations were started on the dry land in 1911, and two in 1921. As all these are on land that is similar both as to soil type and topography a comparison of the average returns over a number of years is especially valuable in showing the relative merits of the various rotations. That this comparison may be easily made, the following table is given showing the average costs per acre of handling the fields, returns from crops, and the net profit per acre for the twelve years from 1912 to 1923 inclusive. The cost and return values were based on pre-war prices until 1920, after that time including the year 1920 current values were used.

COSTS, RETURNS AND PROFITS FROM ROTATIONS

Rotation	Number of years duration	Average cost per acre 12 years	Average Returns per acre 12 years	Average profit per acre 12 years
		$	$	$
"B"	2	7 75	10 36	2 61
"C"	3	7 80	11 66	3 86
"M"	6	10 44	12 04	1 60
"S"	9	10 28	11 61	1 33
"T"	10	10 25	18 95	3 70

The two rotations started in 1921 "J" and "Z" are not included in the above table as they have been underway only two years.

FIELD "A," WHEAT CONTINUOUSLY

One field has been seeded to wheat each year since 1912. This field is ploughed in the fall or spring, worked down and seeded. Some years when the rainfall has been satisfactory, a good crop has been secured, but in dry years the crop has failed. The most serious objection to planting wheat after wheat every year without a cleaning crop or summer-fallow is the continually increasing difficulty of controlling weeds. This problem became so acute on this field after eleven crops had been raised that this season it was necessary to cut the crop for hay because of the abundance of weeds.

ROTATION "B", TWO YEARS' DURATION

First year—Wheat.
Second year—Summer-fallow.

Two other rotations "C" and "T" have given a greater average net return than has this rotation. The principal reason for the smaller returns on rotation "B" has been the fact that one-half of the field has been idle each year. Another disadvantage of this rotation is the rapid destruction of soil fibre in the frequent bare summer-fallow.

ROTATION "C", THREE YEARS' DURATION

First year—Summer-fallow.
Second year—Wheat.
Third year—Wheat or coarse grain.

This rotation gave the highest net returns over a period of twelve years of any of the dry-land rotations. It has the advantage over rotation "B" that two-thirds of the field are in crop each year instead of only one-half; the destruction of fibre is not so rapid with a summer-fallow every third year as is the case when summer-fallowed every second year; and the danger of drifting is reduced to some extent. For straight grain farming this rotation, except for the danger of soil drifting, appears to be as satisfactory as any.

ROTATION "J", SIX YEARS' DURATION

First year—Summer-fallow, manured before ploughing.
Second year—Wheat.
Third year—Wheat.
Fourth year—Oats seeded down to western rye grass and alfalfa.
Fifth year—Hay.
Sixth year—Hay.

This rotation was started in 1921, but in that year and 1922 a stand of alfalfa and rye grass was not obtained, due to these seasons being very dry. The past season, however, was more moist and good stands of both alfalfa and rye grass were secured. The principal objection to this rotation is the difficulty experienced in starting either grass or alfalfa in dry years. If this rotation could be successfully operated it would go far toward solving the problem of soil drifting as it provides a grass crop for replacing soil fibre.

ROTATION "M", SIX YEARS' DURATION

First year—Summer-fallow.
Second year—Wheat.
Third year—Coarse grains. Manured in fall.
Fourth year—Summer-fallow.
Fifth year—Peas and oats for hay.
Sixth year—Barley and oats.

Rotation " M " like rotation " C " has a summer-fallow every three years. There is only one wheat crop in six years which is perhaps not a good arrangement for the better wheat producing areas of the district, but near the foothills, where the frost free season is shorter, this rotation may fit in well. The high cost of seed peas is also a drawback which could be overcome by the farmer raising his own peas.

ROTATION " S ", NINE YEARS' DURATION

First year—Summer-fallow.
Second year—Hoed crop.
Third year—Wheat.
Fourth year—Summer-fallow.
Fifth year—Wheat.
Sixth year—Coarse grain.
Seventh year—Summer-fallow.
Eighth year—Peas and oats for hay.
Ninth year—Rye pasture.

This rotation is similar to rotation " M ", but has two wheat crops in nine years instead of one in six years, and has a field of rye for pasture and a hoed crop that helps to keep weeds in check and furnishes a silage crop.

ROTATION " T ", TEN YEARS' DURATION

First year—Summer-fallow.
Second year—Wheat.
Third year—Oats or barley.
Fourth year—Seeded to alfalfa in rows.
Fifth year—Alfalfa hay or seed.
Sixth year—Alfalfa hay or seed.
Seventh year—Alfalfa hay or seed.
Eighth year—Summer-fallow.
Ninth year—Hoed crop.
Tenth year—Wheat, manured on stubble.

The alfalfa in this rotation is seeded in rows 35 inches apart and is handled as an intertilled crop primarily for seed production. The success of this rotation each year depends largely on the setting of alfalfa seed and the securing of a stand of the newly seeded alfalfa. Until the cycle of dry years commencing with 1918, this rotation gave greater net returns than any rotation on the dry land, but from 1918 to 1922 inclusive, it was almost impossible to get a stand of alfalfa, so at no time since 1917 have the returns from the rotation been sufficient to meet the costs of operation.

ROTATION " Z ", FIVE YEARS' DURATION

First year—Summer-fallow, manured before ploughing.
Second year—Wheat.
Third year—Oats.
Fourth year—Seeded to sweet clover (without a nurse crop).
Fifth year—Hay or pasture.

Rotations " J " and " Z " are similar except that sweet clover is used as the hay crop in " Z " instead of grass and alfalfa as in " J ". The same difficulty has been experienced in securing a stand of sweet clover as of grasses, but when a stand is secured a good crop of sweet clover is practically insured.

83337—3½

A comparison of the profit per acre obtained from the various rotations shows rotation "C" to have given the highest net returns. This rotation or one modified to summer-fallow, wheat, wheat is the rotation most generally followed by the farmers of the district. In areas where soil drifting has become a problem, however, straight grain farming is increasingly more difficult and undoubtedly some type of rotation similar to "J", "Z" or "T" will have to be adopted to replace the soil fibre.

ROTATIONS ON IRRIGATED LAND

Two rotations have been established on the irrigated land, one in 1911 and the other in 1913. Both of these have alfalfa as the basic crop. This legume thrives under irrigation in southern Alberta, is unexcelled as a hay crop, returns organic matter and nitrogen to the soil and is valuable as a weed exterminator. In addition to the two rotations, a field was planted to alfalfa in 1909 and has been left in that crop since for the purpose of noting the length of time an alfalfa field would remain productive.

ROTATION "U", TEN YEARS' DURATION

SUMMARY OF YIELDS AND PROFIT

Rotation year	Crop	Yields		Profit	
		1923	Average for 12 years	1923	Average for 12 years
				$	$
1	Alfalfa	2·3 tons	1·9 tons	0 25	7 69
2	Alfalfa	3·8 tons	3·8 tons	9 05	32 65
3	Alfalfa	4·1 tons	4·3 tons	10 61	36 06
4	Alfalfa	4·1 tons	4·4 tons	13 00	38 10
5	Alfalfa	5·7 tons	4·5 tons	22 00	38 46
6	Alfalfa	5·5 tons	4·9 tons	20 93	43 55
7	Potatoes	*	14·9 tons	*	176 29
8	Wheat	52·7 bush.	48·1 bush.	15 62	28 67
9	Oats	95·6 bush.	87·8 bush.	18 05	16 18
10	Barley and alfalfa seeding	51·7 bush.	50·9 bush.	7 12	10 55
	Field average	.....	.....	15 94	42 72

* Potatoes were replaced by sugar beets in 1923. The beets yielded 14·0 tons per acre and gave a net profit of $42.75. Potatoes are only 11 years average.

The alfalfa fields of this rotation were irrigated the previous fall and twice during the growing season just after the first and the second cuttings of hay were taken off. The grain fields were irrigated July 6 and the sugar beets July 7 and September 5. The alfalfa was cut three times, June 25, August 3, and September 28. The wheat was harvested September 4, the oats August 24, the barley August 21 and the sugar beets October 29.

The beets were planted following potatoes this year, half of the field having been ploughed eleven inches deep and the other half merely surface-cultivated before planting. There was practically no difference in the yields of sugar beets on the half of the field ploughed in the spring and the part unploughed. A slight change will be made in the sequence of the crops in the future in that wheat instead of a hoed crop will be put in on the alfalfa sod.

Rotation "U" is a good rotation for the irrigation farmer of southern Alberta as it furnishes hay and coarse grain for feeding livestock, a hoed crop that may be used as a cash crop or an ensilage crop and wheat as a cash crop.

The wheat and oats are so placed in the rotation that the land on which these crops are raised is clean making it ideal for raising high grade seed. Another point that cannot be stressed too much is the fertilizing value of the alfalfa in the rotation and the profitableness of utilizing this fertility by ploughing up the alfalfa occasionally and growing grain and hoed crops for a few years. The statement is often made that grain cannot be produced profitably on irrigated land, but this is true only when grain is grown year after year on the same ground. Where it is rotated with alfalfa and yields of 45 to 60 bushels of wheat per acre and other grains in proportion can be raised, a profit can usually be made. In this connection it is interesting to note that the average yield of grain per acre on this rotation during the past 12 years was wheat 48.14 bushels, oats 87.83 bushels, barley 50.93 bushels.

FIELD "V", ALFALFA CONTINUOUSLY

SUMMARY OF YIELDS AND PROFIT PER ACRE

Crop	Yield		Profit	
	1923	Average for 12 years	1923	Average for 12 years
Alfalfa continuously	3·0 tons	4·2 tons	$8 39	$38 18

A comparison of rotation "U" with field "V" which has been in alfalfa continuously further illustrates the fact that rotating other crops with alfalfa is profitable, for as is shown in the tables giving the data secured from the rotations, the average net income from rotation "U" has been $3.54 per acre more than the average net income from field "V" over a period of twelve years.

ROTATION "X", FIFTEEN YEARS' DURATION

SUMMARY OF YIELDS AND PROFIT PER ACRE

Rotation year	Crop	Yields		Profit	
		1923	Average for 9 years	1923	Average for 9 years
				$ cts.	$ cts.
1- 5	Alfalfa	4·8 tons	2·5 tons	19 13	12 89
6-10	Alfalfa	4·5 tons	2·1 tons	17 42	24 71
11	Barley	62·4 bush.	39·6 bush.	13 82	4 06
12	Corn	10·2 tons	6·3 tons	14 95	1 98
13	Wheat	41·7 bush.	29·6 bush.	10 00	15 43
14	Oats	68·8 bush.	60·8 bush.	8 26	5 38
15	Peas	17·5 bush.	18·2 bush.	11 07	8 82
	Field average			13 52	14 91

Rotation "X" is really a rotation within a rotation. Two-thirds of the gross area is kept in alfalfa. Instead of breaking up one field of alfalfa each year and seeding down one field each year, the breaking is done once in five years and the seeding down done once in five years; under such an arrangement the land is in alfalfa for ten years before it is broken. On the land so broken a rotation of crops consisting of cereals and hoed crops is followed for five years when it is seeded back to alfalfa and another field is broken and so rotated.

The object aimed at in designing this rotation is to have one suitable for the farmer who desires to break up his alfalfa meadows only intermittently. The experience in the Lethbridge district indicates that alfalfa will usually produce profitable crops for ten or more years. The results obtained so far with this rotation have not been as satisfactory as from rotation " U ".

A satisfactory direct comparison, however, of the incomes derived from rotations " U " and " X " cannot be made as the typography and location of " U " makes it more suitable for irrigation than " X ", thus insuring a more uniform distribution of water on rotation " U " with consequent better crops.

IRRIGATION EXPERIMENTS

The work in irrigation is under the charge of Mr. A. E. Palmer, Assistant Superintendent, who has prepared most of the report dealing with this subject.

The experiments started last year for studying the proper use of irrigation water on wheat and potatoes were continued this year, and sunflowers, alfalfa and mixed pasture grasses were added to the tests. Timothy and brome plots were also prepared, but it will be another year before data can be obtained on these crops.

Purpose of investigation.—The purpose of the investigation is to obtain information regarding:—

(1) The stage of development of crops when the first and subsequent irrigations of the season should be applied.
(2) The moisture content of the soil when crops require irrigation.
(3) The number of irrigations necessary for different crops.
(4) The value of fall irrigation.
(5) The optimum depth of water per application for the soil on this station.
(6) The desirability of cultivating crops after irrigating.
(7) The correlating of data obtained, in an endeavour to find a way for relieving the peak load of water required in June and July.

Plan of experiment.—(1) Plots—Duplicate one-twentieth acre plots are used for all crops except sunflowers, one-sixtieth acre being used for this crop. Each plot is made level and is surrounded by a ditch, the bank of which makes a border dike entirely around the plot, thus forming a basin. This arrangement permits the proper control of the amount of water applied and insures even distribution over the plot.

(2) Soil—The soil is a medium sandy clay chocolate loam with a subsoil of similar texture and is remarkably uniform.

(3) Application of water—(a) The stage of plant growth has been used as the basis for determining the time of irrigation. In addition, some of the plots are irrigated in the fall, one pair when the condition of the crop and soil indicates a need of water and one pair of plots receive no irrigation. (b) The depth of water per application for non-intertilled crops is six inches, while for intertilled crops three inches has been decided upon. Where any modification of this practice is made it is for the purpose of studying the effect of heavier or lighter irrigation. This modification consists of four and eight inches for wheat and alfalfa and two, four and five inches for hoed crops. Some of the grass plots receiving frequent irrigations are given but three inches per application.

(4) Soil moisture—Soil moisture determinations are made of each foot of soil to a depth of six feet in the spring, before and after each irrigation, the fall after harvest and at other times as deemed advisable.

WHEAT

Two series of wheat plots were included in the test. One set was on land broken up from alfalfa and planted to corn in 1921, and to wheat in 1922. The other set was alfalfa land broken in the fall of 1921 and planted to sunflowers in 1922.

The wheat was irrigated at one or more of the following stages:—1. Previous fall. 2. Plants just coming through the soil. 3. Five leaves. 4. Shot blade. 5. Flowering. 6. Soft dough. 7. When crop appeared to need water.

WHEAT AFTER WHEAT

During the past season the precipitation was sufficient to produce a good crop of wheat on the non-irrigated plots, so the difference due to irrigation was not great on any of the plots. The principal item of interest was the good yields obtained from very early irrigation, that is, in the single blade stage or just as the crop came up. It is quite generally supposed that irrigation by flooding before the plants are large enough to partially shade the ground is detrimental to the crop. This, however, was not true with these plots this year as the early irrigated grain gave as good yields as any in the series. The feasibility of early irrigation of grain is of great importance as the possibility of using water on the grain fields before the peak load of water is required in late June and July for other crops would help spread the demand for water more evenly over the season, and thus make possible the irrigation of a larger acreage.

One more observation that should be made is that as many as three irrigations did not decrease the yields of wheat. This seems to answer the enquiry so often made by farmers when urged to commence irrigation early. "Is it safe to irrigate grain early in the season if June and July should prove wet months. Will this not result in drowning the crop?" When three six-inch irrigations in addition to the precipitation received this year did not injure the crop, it would appear that there is little to be feared from an early irrigation should the season prove to be a wet one. The only danger would be on very fertile soil where lodging might result.

WHEAT AFTER SUNFLOWERS

The results from the plots of wheat following sunflowers were quite different from the results from the plots of wheat following wheat, for while the sunflowers were irrigated twice the previous season this crop had drawn so heavily on moisture that the soil was very dry in the fall when the crop was harvested; much drier than the soil of the wheat fields. This was clearly shown when soil moisture determinations were made of the plots the following spring. The average amount of water in the top six feet of the field which had produced a crop of sunflowers the previous season was 0.77 acre-foot per acre, while the wheat field contained 1.21 acre-feet per acre or 0.44 foot more water than the sunflower field. This would be equivalent to an irrigation of $5\frac{1}{2}$ inches. The water holding capacity of the soil of the two fields is very similar.

Due to the dryness of the soil the wheat following sunflowers required more water than the wheat following wheat. The non-irrigated plots and the plots irrigated only once late in the season suffered for water, while it took three irrigations to give maximum yields.

Fall irrigation appeared to be especially valuable on the dry soil following sunflowers, as in every case the fall-irrigated plots gave the highest yields of any in their series, in fact, fall irrigation has given good results in most of the

irrigation tests carried on at this Station and is a practice that is meeting with favour throughout the district. The utilization of water in the autumn after crops have been harvested is another practice that spreads the use of water over a longer period, and thus makes possible the irrigation of more land without increasing the construction costs of the system.

ALFALFA

Forty-two plots were seeded with Grimm alfalfa seed at the rate of 15 pounds per acre in June 1922, and each plot irrigated twice during that season. An excellent catch of alfalfa was obtained, every plot having almost a perfect stand in the spring of 1923. All the plots were cut twice during the season except four from which three crops were taken.

Twenty-one different combinations of irrigation were made. Each set of plots was irrigated at one or more of the following stages:—

1. Previous fall.
2. Plants four inches high.
3. Plants 10 to 12 inches high.
4. Ten days before first cutting.
5. Immediately after first cutting.
6. Second cutting 12 to 16 inches high.
7. Immediately after second cutting for three crops.
8. When crop appeared to need water.

Yields were obtained by raking up the crop immediately after cutting and weighing green. Samples of the green forage were obtained from each plot at time of weighing and the dry matter content determined. The yields of hay were computed on a basis of 90 per cent dry matter in the cured hay.

As this is the first year that results have been secured from these alfalfa plots few observations can be made. For a season with as much precipitation as was received this year one irrigation just before or just after the first cutting gave two fair crops of hay, but when one irrigation was given and it was applied early in the season, the first cutting was a little heavier, but the second was light and the total from the two crops was less than where this irrigation was applied just before or just after the first crop was cut. Two irrigations given before the first cutting of hay did not materially increase the yield of that crop over one early irrigation, but the second irrigation appears to have had a marked benefit on the second crop, even though applied when the first crop was only 12 inches high. The best yields were obtained from four or five irrigations but the increase over three irrigations was not sufficient to justify the expense of applying the additional water.

MIXED PASTURE GRASSES

Three sets of duplicate plots were seeded in June 1922 with the following mixture of pasture grasses: western rye grass six pounds, Kentucky blue grass six pounds, meadow fescue six pounds; and alfalfa four pounds per acre. A uniform stand of the grasses and alfalfa was obtained on all plots and came through the winter in good condition.

All the plots were irrigated on May 10, and the subsequent irrigations were applied at intervals of two, three and four weeks. The plots irrigated every two weeks received 0.25 foot per irrigation (except the first irrigation of 0.5 foot), while those irrigated every three and four weeks received 0.5 foot of water per irrigation.

The yields were obtained by cutting one one-thousandth of an acre on each plot when the plants were six to 10 inches high and weighing immediately.

After cutting, sheep were turned on the plots and permitted to eat off all growth. A sufficient number of sheep were used to clean off the field within two days.

The frequent rains of the season were sufficient to keep the top soil of the pasture grass plots fairly moist between irrigations when this interval was as much as four weeks so that the pasture crops did not respond to frequent irrigations as they undoubtedly would have done in a drier season. The plots irrigated every two weeks, however, gave a better yield than the less-frequently watered plots, but there was almost no difference on those irrigated every three and four weeks.

POTATOES

Nineteen different irrigation combinations were tested on duplicate potato plots, each pair of plots having received the first irrigation at one of the following periods:—

1. Previous fall.
2. When tops of plants were half grown.
3. When plants were starting to bloom.
4. When plants were in full bloom.
5. Ten days after full bloom.

Subsequent irrigations were made every 10 and 20 days on plots that received more than one irrigation. The potatoes received one, two, three, four, five and six irrigations, and one set received no irrigation. The subsequent irrigations where more than one was given were made every 10 days in one series and every 20 days in another series. The entire field was cultivated twice before the first irrigation and as soon after each application of water as was practicable. Irish Cobbler was the variety of potatoes used and these were planted May 28 at the rate of 1,300 pounds of sets per acre.

The rainfall of the season was not sufficent to give maximum yields of potatoes without irrigation, but where supplemented with one three-inch irrigation a good crop was obtained. There seemed to be little difference as to when the crop was irrigated after it started to bloom, but in every instance the potatoes irrigated when the tops were half grown gave slightly lower yields. Fall irrigation gave good results as it did with potatoes the preceding year.

SUNFLOWERS

The sunflower plots were seeded May 14 with 25 pounds per acre of Russian Giant Sunflower seed in rows three feet apart. A heavy seeding was made to insure a good stand and when the plants were about four inches high they were thinned to six inches apart in the rows. In this way a uniform stand was obtained on all plots. The stages of plant growth at which the first irrigations were applied were:—

1. Previous fall.
2. Plants four to six inches high.
3. One week after four to six inches high.
4. Two weeks after four to six inches high.
5. Four weeks after four to six inches high.

Subsequent irrigations where more than one irrigation was given were applied every one, two, three and four weeks until July 15, August 1, and August 10 to 15.

The crop was harvested September 22 when the seeds were in the dough stage, weighed immediately, and yields calculated on the basis of the green weights.

Sunflowers gave a good yield this season without irrigation on plots that were planted to potatoes and irrigated last year, but the yield was materially increased by one, two or three irrigations. The best yield was obtained from a fall irrigation and one additional irrigation on July 18.

The poorest results were obtained from the plots irrigated every week and every two weeks. The crops irrigated every week commenced to turn yellow and show other signs of an over supply of water after the fourth irrigation and at harvest the plants averaged only about 55 inches in height, while adjoining plots were six to eight feet high. The sunflowers irrigated every two weeks were more thrifty than those irrigated every week, but after the fourth irrigation showed the effect of too much water.

TOTAL WATER USED ON THE FARM FOR THE SEASON OF 1923

All water used on the farm for irrigation was measured over weirs for the purpose of securing data on the seasonal use of water and total water requirements on a diversified farm.

The area irrigated was 196 acres and with the exception of the irrigation test plots, all crops were irrigated when they appeared to need water.

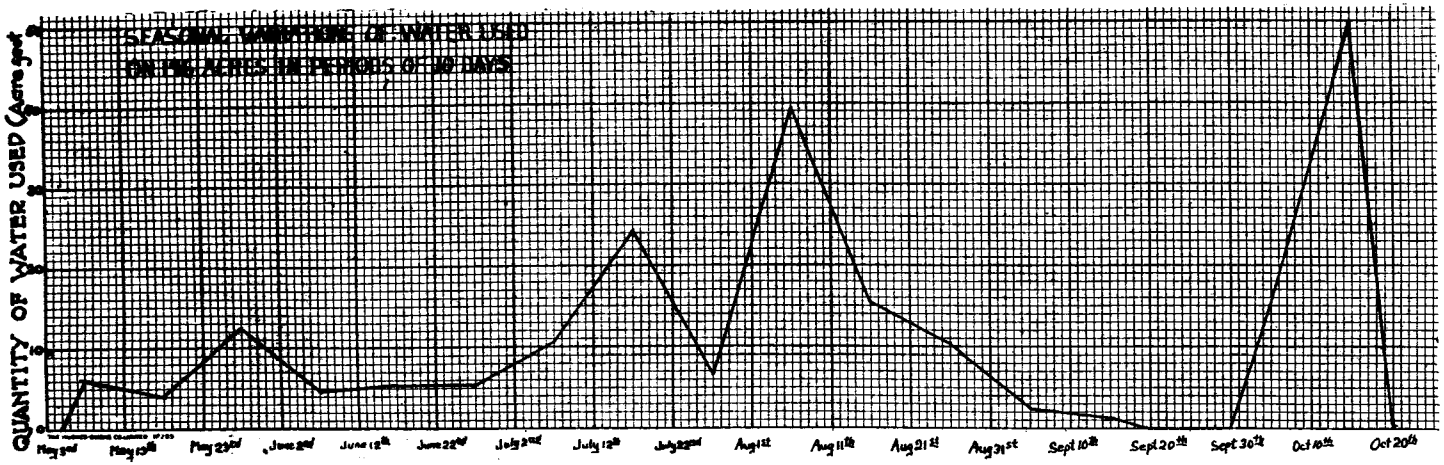
A total of 214.75 acre-feet of water was used during the season or 1.10 acre-feet per irrigated acre. Of this amount 50 acre-feet or almost one-fourth of the total were used for fall irrigation which accounts for the larger amount used this year than in 1922 when 179.6 acre-feet were used, there having been but little fall irrigation done last year.

The use of water in the summer reached its peak about 10 days later in 1923 than in 1922 and this peak was not as great this season due to the heavier rainfall in May and June.

WATER USED ON THE FARM IN PERIODS OF 10 DAYS

Period	May 3 to May 12	May 13 to May 22	May 23 to June 1	June 2 to June 11	June 12 to June 21	June 22 to July 1	July 2 to July 11	July 12 to July 21	July 22 to July 31	Aug. 1 to Aug. 10	Aug. 11 to Aug. 20	Aug. 21 to Aug. 30	Aug. 31 to Sept. 9	Sept. 10 to Sept. 19	Sept. 20 to Sept. 29	Sept. 30 to Oct. 9	Oct. 10 to Oct. 19
Acre-feet.....	6·02	4·02	12·50	4·71	5·43	5·35	10·81	24·11	6·89	39·13	15·55	10·30	2·38	1·18	Nil	15·29	50·08

Total water used during the season, 214·75 acre feet, or 1·10 acre feet per acre.



HORTICULTURE

Two phases of the horticultural work are carried on at the Station, that dealing with dry-land gardening, which serves the purpose of demonstrating the possibilities of a "dry land" farmer's garden, and that dealing with irrigation, which includes more elaborate tests and cultural exepriments.

The season was exceptionally favourable for all garden crops with the exception of a severe hailstorm on July 1 which did considerable damage by setting back the growth. The yield of ripe tomatoes, melons, etc., was greatly lessened on this account. The apples were also marked where the hail hit them; these marks becoming more evident as they reached maturity. All trees and shrubs came through the winter of 1922-23 in good shape. Fruit trees and bushes were well-laden with fruit. The flowering shrubs, perennials and annuals did particularly well and made a splendid showing. Numerous heavy showers of rain during the early part of the season gave all crops an abundance of moisture until well on in the season. The last frost in the spring was on May 29 The first frost in the fall was on September 11 and the first killing frost was on September 22.

DRY-LAND GARDEN

VEGETABLE GARDEN

There was an abundance of moisture in the dry-land garden to germinate the seeds and give the plants a good start. The timely showers of rain during June and July produced excellent results with all kinds of vegetables. The injury from hail, however, was greater on the dry-land garden than was the case with the garden on the irrigated land, which is located about half a mile east and happened to be farther away from the centre of the path of the storm.

The vegetables are planted each year on summer-fallow land; the garden is sheltered by single rows of cottonwood trees placed 200 feet apart. The barnyard manure applied is turned in when the land is being ploughed for summer-fallow; the application of manure, therefore, is made the year previous to the planting of the seeds. The vegetables are planted in rows three feet apart to allow the horse cultivator ample room to operate between the rows.

One or more varieties were grown of each of the common garden vegetables. As last year's report gives detailed information regarding results in the season of 1922; and as the work this season in general has been similar these details are not being repeated, but it should be stated that the yields in practically all instances were higher in 1923.

POTATOES—TEST OF VARIETIES

Fifteen varieties were grown, these were planted on summer-fallowed land on May 22, cultivated four times during the season, and were dug on September 28. The following table gives the yields, and also the average yield for the past 11 years for the varieties that have been grown for that length of time.

POTATOES (DRY LAND)

Variety	Yield of marketable potatoes	Yield of unmarketable potatoes	Total yield	Per cent small	Average yield of marketable potatoes for 11 years
	bush.	bush.	bush.		bush.
Dalmeny Beauty	176	29	205	14·1	179·9
Gold Coin	176	11	187	5·9	219·5
Wee MacGregor	176	16	192	8·3	181·1
Factor	171	8	179	4·5	208·3
Empire State	168	26	194	13·4	202·2
Table Talk	161	37	198	18·7	177·3
Netted Gem	149	13	162	8·0	*
Morgan Seedling	149	16	165	9·7	204·2
Reeves Rose	146	27	173	15·6	184·6
Gold Nugget	141	26	167	15·6	*
Irish Cobbler	136	13	149	8·7	205·7
Royal Russet	126	26	152	17·1	*
Sutton Abundance	121	11	132	8·3	*
Eight Weeks	118	19	137	13·9	*
Early Ohio	89	15	104	14·4	*

* Has not been grown for eleven years.

SPROUTING THE SEED

To obtain new potatoes for use in the summer, two or three weeks earlier than can be obtained by the ordinary methods of planting, the practice of sprouting the seed is very satisfactory. This is done by selecting medium sized potatoes and placing them one layer deep in a light part of the cellar, or in any room or building that is frost proof, the latter part of March. On account of the light, vigorous green sprouts one-fourth inch or more in length develop. When these are planted about the 1st of May they grow so rapidly that by the last of June or the first part of July new potatoes are usually ready for use. In 1923, potatoes sprouted in this manner were planted on April 12th (much earlier than usual) and there were potatoes large enough for use on June 23rd.

SMALL FRUITS

The yields on the dry land of black currants, red currants, white currants and gooseberries were greatly decreased by the hail on July 1. The fruit picked was of good size and excellent quality. The plantation was kept well cultivated and free from weeds. Protection is afforded the bushes by a strong Caragana windbreak.

IRRIGATED LAND

VEGETABLE GARDEN

The irrigated garden was fall ploughed and the lumps harrowed down during a mild spell in March, leaving a well prepared seed bed for the reception of the seed. Owing to the condition of the soil seeding was commenced earlier than has been possible during the past few seasons, the first seed being sown on April 16. All seeds germinated evenly and good growth resulted.

Flea beetles were troublesome again, but were easily controlled by dusting with a powder composed of four parts of copper sulphate, four parts of finely powdered lime, and two parts of any of the following ingredients: arsenate of zinc, arsenate of lead, or Paris green. Onion maggot was also present, but did very little damage, probably due to the control measure used, viz., the onion trap method.

Owing to the hail-storm on July 1, which did considerable damage to tender foliage, the tomatoes, melons, etc., did not ripen fruit as early as would otherwise have been the case.

Most of the varieties grown in 1922 were again tested in 1923, and in addition a number of new varieties were grown.

It is suggested that the reader interested in the detailed results might profitably refer to the 1922 report, where the results for that season are dealt with at some length, and in which there is a table listing the varieties which our experiments have indicated are most suitable for our local conditions. The dates recommended for planting and quantity of seed required are also given, and in addition is shown the dates when the various kinds can be expected to be ready for use.

POTATOES—TEST OF VARIETIES

Fifteen varieties were grown. These were planted on corn land on May 21; they were irrigated July 30 and August 11, and were dug on September 28. The following table gives the yields, and also the average yield for the past eleven years for the varieties that have been grown for that length of time.

POTATOES (IRRIGATED)

Variety	Yield of marketable potatoes	Yield of unmarketable potatoes	Total yield	Per cent small	Average yield of marketable potatoes for 11 years
	bush.	bush.	bush.		bush.
Sutton Abundance	428	26	554	4·7	*
Factor	374	26	400	6·5	476·5
Empire State	374	63	437	14·4	479·7
Dalmeny Beauty	359	31	390	7·9	487·4
Table Talk	356	60	410	14·6	484·2
Wee MacGregor	342	40	382	10·5	460·2
Gold Coin	326	39	365	10·7	470·8
Irish Cobbler	319	44	363	12·1	481·5
Morgan Seedling	295	40	335	11·9	459·0
Reeves Rose	289	69	358	19·2	460·1
Gold Nugget	280	32	312	10·2	*
Royal Russet	270	46	316	14·6	*
Netted Gem	232	30	262	11·5	*
Eight Weeks	224	41	265	19·2	*
Early Ohio	175	39	214	18·2	*

* Has not been grown for eleven years.

SMALL FRUITS

The small fruits set a heavy crop of fruit, but owing to the hail a considerable number of berries were knocked off. The raspberries did not suffer as did the currants and strawberries, the first picking of strawberries being practically worthless.

TREE FRUITS

Apples.—Both the cross-bred and the standard apple trees came through the winter in good condition. A number of the standard apple trees set fruit. Those making the best showing in this regard were Pattens Greening, Yellow Transparent and Hibernal. The Saunders cross-breds were particularly well loaded with fruit. All the apples were marked by the hail, which somewhat spoilt the appearance of the fruit. The recommended cross-breds are Silvia, Prince, Tony, Osman, and Norman.

Plums.—Practically all of the Manitoba-selected seedling plums were exceptionally well loaded notwithstanding the large amount of fruit knocked off by hail. Several named varieties of hardy plums were planted in 1921; two varieties set fruit this year, the Opata and Sapa.

FLOWERS

Annuals.—The annuals did exceptionally well owing to the showery cool weather, which followed transplanting, giving the plants time to get well established before any warm weather set in. Some sweet pea seed was started in narrow collapsible boxes on March 3, and planted in the open border on May 7, making a row 15 feet long; these sweet peas began to bloom on May 31. The aster bed is worthy of special note; it made a splendid showing, there being over 2,000 plants set out, consisting of twenty-eight varieties. Each variety was planted in blocks.

Roses.—Roses are not winter hardy in this climate. Various methods of providing winter protection have been tried, and it would appear, from the tests so far made, that the most satisfactory way is to wrap the rose bushes in sacking and bend them down in an "A" shaped manner. The boards are then completely covered with moist soil. Rose bushes treated in this manner came out in the spring as fresh as when covered in the fall.

Gladiolus.—Four hundred corms were planted and made a splendid showing. The small cormlets were saved from the base of the larger corm, and planted in nursery rows; many of them bloomed this year.

Tulips.—The tulips as usual made a wonderful showing. The early tulips commenced to bloom on May 5, followed by the Darwin tulips which continued to bloom until June 9.

Daffodils.—The daffodils did not do so well as usual; the bloom being undersized with short stems. They started to bloom on May 17 and finished blooming on June 7.

SHRUBS

The shrubs as usual bloomed very freely, giving a wide range of colour.

TREES

All trees continue to do well and are making good growth. Some of the best are:—(deciduous)—native cottonwood, balsam, poplar, weeping birch, ash, and elm; (coniferous)—white spruce, blue spruce, Scotch pine, lodgepole pine, Swiss stone pine, and Douglas fir.

LAWNS

The lawns continue to keep in splendid condition. Two irrigations each year, one in July and one in the fall, keep the lawns in ideal condition.

CEREALS

From an experimental standpoint the hail-storm on July 1 did more injury to the cereals than to any other class of crops. Although the injury on the dry land was estimated to be roughly 25 per cent, it varied materially with different varieties of grain depending upon the various stages of maturity the different varieties had reached at the time the storm occurred. For this reason it has been thought wise to omit the tables giving the results from each sort of cereal tested as is the usual practice and to merely summarize briefly by naming the varieties that have produced the best average yields for the past five years. It might be stated that all the varieties grown on the dry and irrigated land in 1922 were repeated in 1923.

DRY LAND

Wheat.—The average yields per acre for the past five years of the four spring wheats making the best production are:—Marquis (Ottawa 15) 15.6 bushels, Red Bobs 13 bushels, Red Fife 12.9 bushels, and Kubanka 12.9 bushels.

Oats.—The average yields per acre for the past five years of the four oats making the best production are:—Banner 25.2 bushels, Leader 25.2 bushels, Danish Island 24.1 bushels, and Victory 23.2 bushels.

Barley.—The average yields per acre for the past five years of the four barleys making the best production are:—Odessa 21.9 bushels, Barks 18.9 bushels, O.A.C. 21, 18.6 bushels, and Early Chevalier 18.6 bushels.

Flax.—The average yields per acre for the past five years of the four varieties of flax making the best production are:—Premost 1·7 bushels, Common 1.4 bushels, Novelty 1.3 bushels, and Longstem 1.0 bushels.

Peas.—The average yields per acre for the past five years of the four peas making the best production are:—Solo 12.2 bushels, English Gray 9.0 bushels, Prussian Blue 7.8 bushels, and Mackay (Ottawa 25) 7.7 bushels.

IRRIGATED LAND

Wheat.—The average yields per acre for the past five years of the four wheats making the best production are:—Kubanka 51.3 bushels, Marquis (Ottawa 15) 48.8 bushels, Red Bobs 47.1 bushels, and Red Fife 41.68 bushels. It is interesting to note that although Kubanka heads the list on irrigated land it does not on the dry land. This is contrary to popular belief which is that Kubanka is an excellent drought resisting variety, and consequently would be expected to outyield Marquis on the dry land.

Oats.—The average yields per acre for the past five years of the four oats making the best production are:—Danish Island 102.8 bushels, Banner 92.7 bushels, Gold Rain 92.3 bushels, Daubeney 87.9 bushels.

Barley.—The average yields per acre for the past five years of the five barleys making the best production are:—Barks 94.9 bushels, Invincible 70.9 bushels, Guy Maloye 69.5 bushels, Gold 68.4 bushels, O.A.C.21 65.6 bushels.

Flax.—The average yields per acre for the past five years of the three varieties of flax making the best production are:—Novelty 24.5 bushels, Common 23.9 bushels, Longstem 23.1 bushels.

Peas.—The average yields per acre for the past five years of the four peas making the best production are:—Chancellor 32.9 bushels, Prussian Blue 29.4 bushels, Golden Vine 28.9 bushels, English Gray 27.5 bushels.

FORAGE CROPS

The hail storm of July 1 did not damage the forage crops to the same extent as the cereals inasmuch as the recovery from injury was more complete with the former than with the latter.

CORN AND SUNFLOWERS ON DRY LAND

CORN

Ten varieties of corn were grown and their comparative values determined for ensilage purposes. These were seeded in rows three feet apart on May 22 at the rate of 12 pounds per acre, and harvested September 21. The yield was obtained from the green weight of 100 per cent stand and the dry matter content obtained from material chopped fine and dried at 100° to

110° C. The land on which these varieties were grown was in summer-fallow last year. The green weight was determined immediately after cutting.

CORN (DRY LAND)—TEST OF VARIETIES

Variety	Source	Yield per acre	Per cent Dry Matter	Yield per acre Dry Matter
	Where secured	Tons		Tons
White Cap Yellow Dent	Steele Briggs	14·00	23·2	3·25
Leaming	J. Parkes	13·25	20·6	2·73
Wisconsin No. 7	J. Parkes	12·25	20·9	2·56
North Western Dent	A. E. McKenzie	13·25	18·4	2·44
Golden Glow	I. O. Duke	11·75	20·2	2·37
Leaming	I. O. Duke	10·50	21·3	2·24
Longfellow	I. O. Duke	13·75	16·1	2·21
North Dakota	Steele Briggs	11·00	19·6	2·16
Wisconsin No. 7	I. O. Duke	11·00	18·8	2·07
Comton's Early		7·50	20·8	1·56
Average		11·825	19·99	2·359

It will be observed from the above table that the season of 1923 was particularly favourable for corn. All varieties reached at least the dough stage at the time of ensiling. As it is tonnage that is desired, the variety giving the greatest tonnage of dry matter to the acre is desirable. Since there is not such a great difference in yield between a number of the varieties for ensilage purposes it would appear that the main essential is to use northern-grown seed of standard variety.

SUNFLOWERS

Nine varieties of sunflowers were tested. These were seeded on summer-fallow land in rows three feet apart on May 22 at the rate of seven to nine pounds per acre, and harvested September 19. The yields, as in corn, were obtained from the green weight of 100 per cent stand and the dry matter content obtained from material chopped fine and dried at 100° to 110° C.

SUNFLOWERS (DRY LAND)—TEST OF VARIETIES

Variety	Source	Yield per acre	Per cent Dry Matter	Yield per acre Dry Matter
	Where secured	Tons		Tons
Manteca	C.P.R.	19·00	23·7	4·50
Mixed	C.P.R.	17·50	23·4	4·09
Mammoth Russian	K. McDonald & Sons	15·00	26·0	3·90
Ottawa 76	C. E. Farm	14·00	24·8	3·47
Black	C.P.R.	17·00	19·8	3·37
Russian Giant	D. I. S. Co.	21·50	14·4	3·09
Manchurian	A. E. McKenzie	12·50	24·2	3·03
Mixed Mennonite	Rosthern	10·00	30·3	3·03
Giant Russian	C.P.R.	11·50	15·6	1·79
Average		15·33	22·466	3·36

Due to the particularly favourable season, the sunflowers reached a later stage of maturity than in any previous year. Over a period of years it would appear that corn is a much more desirable crop to grow for silage purposes on the dry land in the immediate vicinity of Lethbridge for the reason that in dry years after the middle of July the weather seriously inhibits the growth of the sunflowers while corn does not suffer to the same degree.

CORN AND SUNFLOWERS ON IRRIGATED LAND

CORN

Eleven varieties of corn were tested under irrigation. The method and rate of planting was the same as on the dry land, that is, in rows at 12 pounds per acre. This crop followed a mixture of peas and oats. The varieties were seeded on May 21 and harvested September 19. The yield and dry matter content were obtained as mentioned under corn on dry land. The crop was irrigated twice.

The season proved favourable for corn. Not only was the tonnage obtained satisfactory but all varieties tried reached a good degree of maturity for ensilage purposes.

CORN (IRRIGATED)—TEST OF VARIETIES

Variety	Source	Yield per acre	Per cent Dry Matter	Yield per acre Dry Matter
	Where secured	Tons		Tons
Longfellow	O. Duke	40·7	20·7	8·50
Golden Glow	O. Duke	34·2	22·3	7·63
North Dakota	Steele Briggs	31·7	20·2	7·40
North Western Dent	A. E. McKenzie	26·2	26·6	6·96
Leaming	J. Parkes	36·5	16·9	6·16
Quebec 28	Macdonald College	30·5	19·1	5·83
Wisconsin No. 7	O. Duke	33·5	16·9	5·66
Wisconsin No. 7	J. Parkes	34·5	16·4	5·65
Leaming	O. Duke	38·2	17·3	5·60
White Cap Yellow Dent	Steele Briggs	32·7	18·9	5·18
Compton's Early		33·5	15·1	5·05
Average		33·83	19·14	6·33

SUNFLOWERS

Nine varieties of sunflowers were grown under irrigation. The date of planting was May 21 and the date of harvesting September 19. These were also planted in rows 3 feet apart and at 7 to 9 pounds per acre, and the yield and dry matter content were determined as explained under sunflowers on dry land. The crop was irrigated twice.

SUNFLOWERS (IRRIGATED)—TEST OF VARIETIES

Variety	Source	Yield per acre	Per cent Dry Matter	Yield per acre Dry Matter
	Where secured	Tons		Tons
Russian Giant	D. I. S. Co	40·25	23·1	9·30
Mixed	C.P.R.	23·00	22·3	5·13
Ottawa 76	C. E. Farm	28·50	17·2	4·90
Mammoth Russian	K. McDonald	36·50	14·9	4·44
Manchurian	A. E. McKenzie	19·50	19·6	3·82
Black	C.P.R.	24·50	14·4	3·53
Manteca	C.P.R.	17·50	15·6	2·73
Mixed Mennonite	Rosthern	11·25	15·8	1·78
Average		25·12	17·86	4·45

FIELD LOTS OF CORN AND SUNFLOWERS ON IRRIGATED LAND

A piece of land which was broken from permanent pasture had 2.23 acres seeded to corn and 1.77 acres seeded to sunflowers. Both crops were given the same treatment as to cultivation and irrigation. The yield of sunflowers to the acre was 16.5 tons, while the yield of corn to the acre was 13.1 tons. Another field of 1.1 acres yielded 15.09 tons of corn to the acre. A half acre field that was in potatoes in 1922 yielded at the rate of 24.59 tons of sunflowers per acre. A field of corn 0.85 acre in size on alfalfa breaking yielded 19.5 tons of corn to the acre.

FIELD ROOTS

The work with roots this year both on the dry and irrigated parts of the Station consisted of testing out certain varieties advertised by different commercial seedsmen to determine the value to farmers in this district of these varieties and their trueness to type. On both dry and irrigated land duplicate plots were planted. The number of varieties tested in each case was as follows:—turnips 30, mangels 22, sugar beets 3, and carrots 10. When a three or five year average of these tests are available it is proposed to publish the results.

GRASSES

A number of strains or varieties of western rye grass, 130 in all, were tested on the dry land. The object of testing the various strains of grasses and clovers is to study the characteristics of each individual strain and if possible to obtain more suitable varieties than are avallable at the present time.

A number of other kinds of grasses were also under test on the dry land, including seven strains of timothy.

On the irrigated land a portion of the 130 strains of western rye grass were under test, and all the other kinds of grass referred to, with some promising varieties of clover in addition.

The yield in green weight was obtained and recorded from each as well as the yield of dry matter. The latter was determined by drying in an oven at a temperature of 100° to 110° C.

POULTRY

But one breed, the Barred Rock is used in the poultry work at this Station. This breed has proved satisfactory under prevailing conditions, and has become very popular in the province.

PRODUCTION

For several years careful culling and breeding has been carried on with the result that a good laying strain of Barred Rocks has been developed. During the laying season of 1922-1923 some outstanding records were made. One pullet laid 315 eggs in 365 days, twenty Station pullets entered in the Alberta Egg Laying Contest averaged 229 eggs each; six of these laid 250 eggs or more; four over 225 eggs, and three over 200 eggs. One pen of fifty pullets in the farm flock averaged 211 eggs, and the average for all pullets kept was 200 eggs per bird. Most of these birds were in full lay by November 1.

FEEDING

While correct breeding is essential for egg production the best birds will not make high records unless they receive the proper feed and care. The winter scratch feed given the laying stock which made the records noted, consisted of equal parts of corn, wheat and crushed oats. A small portion of this feed was thrown in the litter in the morning to induce exercise and a liberal feed was

given at night before the birds went to roost. A dry mash composed of equal parts of bran, shorts, middlings, corn meal, beef meal, one-half part ground oats and a little fine salt and charcoal was kept in open hoppers before the birds at all times. A moist mash consisting of the same ingredients as the dry mash, excepting that salt and charcoal were omitted, was fed at noon on each alternate day. No more of this mash was fed than was eagerly consumed in five minutes. By way of variety, a small quantity of wheat and peas were boiled until ready to burst and mixed with the mash. Green feed consisting of mangels, beets, cabbage and alfalfa leaves was fed when the birds could not get out on green runs.

For summer use the scratch feed was changed to one part crushed oats, five parts wheat and one-half part of cracked corn, and a proportionately smaller quantity of corn meal was fed in the mash.

EXPERIMENTAL WORK WITH POULTRY

LINE-BREEDING VS. OUT-CROSSING

Two good males were obtained that had no blood relationship to the females used. These were mated to hens bred at the Station, and the following comparisons noted. One of these cockerels was obtained from the Oregon Agriculture College and one from the Experimental Station at Invermere, B.C.

—	Fertility	Hatchability	Mortality
Pen 1. Line bred cockerel	78·5	64·4	10·9
Pen 3. Line bred cockerel	73·4	58·3	12·5
Pen 4. Line bred cockerel	82·0	70·8	9·7
Pen 2. Out cross. Oregon cockerel	76·8	65·2	8·0
Pen 9. Out cross. Invermere cockerel	75·0	59·2	13·5

It will be seen that no distinct advantage was gained in out-crossing, for where line-bred cockerels were vigorous and well matured just as good results were obtained. Nothing but hens were used, and every pen had equal opportunity so far as it was possible to arrange. In regard to the progeny of above tests, it can be already noted that in the line-bred stock there is much uniformity and it is only exceptional birds that carry different characteristics, whereas in the out-crossing progeny there are several different types of birds varying greatly both in colour, shape and general condition. In many cases individuals did not look like either of the parent stock, and only with certain females in the pen have they given progeny that carry resemblance to one or the other of the parents. However, it may be possible now to line-breed to advantage those that are desirable. It is too early to make a comparison of the production of the progeny from the line-bred pullets vs. the out-crossed pullets.

COMPARISON OF FERTILITY OF EGGS AND MORTALITY OF CHICKS FROM PULLETS VS. HENS

Comparisons were made of the fertility of eggs obtained from pullets and from hens during the months of March, April and May. The mortality of the chicks from these eggs was also noted.

Time of hatching	Fertility of eggs from		Mortality of chicks from	
	Pullets	Hens	Pullet eggs	Hen eggs
March	79·3	84·8	8·3	5·1
April	71·5	78·5	13·4	9·3
May	65·8	70·0	19·7	11·5

It should be stated that no late hatched or immature pullets were used in the test. The fertility and hatchability of pullet eggs was much better in early than late spring. It was noticeable that a number of pullets seldom or never gave a fertile egg; also that eggs from several pullets were very high in fertility and in hatchability. These outstanding pullets, however, began to taper off in fertility as the season advanced. The test would seem to indicate that if one is compelled to use pullets for hatching purposes it is much better to breed early than late, and that it is advisable to discard the eggs from birds that give low fertility. Again during the mortality period much the same conditions prevailed, as the pullet chicks showed less mortality in early spring, even under strict confinement, than they did later in the season. Especially was this made evident in the number of runts and culls. A very noticeable feature of the test was that from the first pullet eggs which were hatched along with the eggs from hens, the resultant pullets from those pullet eggs started in to lay in greater number than did the pullets from hen eggs hatched at the same time. However, a rather higher percentage of pullet-hatched pullets broke down when nearing the maturing stage or immediately following that period.

While it is undoubtedly advisable to hatch from hens wherever possible it would appear from results obtained that the crux of the problem lies in the condition of the breeding stock. At every different period it was noticed that it was almost impossible to raise chicks from certain hens successfully, even under broody hens. This applied to both hen's and pullet's chicks.

COMPARATIVE VALUE OF WATER, BUTTERMILK, AND BOTH BUTTERMILK AND WATER AS DRINK IN BREEDING PENS AS SHOWN BY FERTILITY AND HATCHABILITY OF EGGS AND MORTALITY OF CHICKS

The effect on eggs of the feed and drink given to hens is difficult to determine as many other influences are continually at work, such as the disposition of the male as well as that of the female, and the likes and dislikes that develop among breeding birds. These tests would require to be carried over a much longer period before definite statements could be made concerning their reliability. Two pens of ten hens and a cockerel were included in each test. The results shown in the table are the averages of all the eggs put in incubators from the two pens.

Pen	Drink	Fertility	Hatchability
1st.	Buttermilk only to drink	83·3	65·4
2nd.	Buttermilk and water	87·5	71·8
3rd.	Water only to drink	78·0	53·5

Considering that the first hatch was brought off February 23 and the last hatch April 20, the average fertility and hatchability is fairly good. It will be seen that the best results were obtained where both buttermilk and water were given, owing perhaps to two factors, first—that the hens had freedom to drink their choice, and second—that due to the coldness of the weather in the early spring the milk was often partly frozen or at least cold and this would affect consumption. However, it would appear that buttermilk or milk of any kind would be a help to breeding operations.

CRUSHED OATS VS. MIXED MILL FEEDS AS DRY MASH FOR BREEDING HENS

The mixed mash used in this test to compare with crushed oats was, one part bran, one part shorts, one part middlings, one part beef meal, one part corn meal and half part ground oats. Both the crushed oats and mixed mash were

fed in hoppers as dry mash, two pens of ten hens and a cockerel receiving each kind of feed. Beef meal, charcoal, grit and shell were available in hoppers in each pen. The table gives the average of all eggs used from the two pens in each test.

Kind of mash	Fertility	Per cent of fertile eggs hatched
Crushed oats	71·8	44·9
Mixed dry mash	78·0	53·5

It will be noted that both better fertility and hatchability was obtained from the feeding of the mixed mash. This may be due in a measure to the fattening tendencies of the oats, and the lack of exercise on the part of the birds eating oats, as oats seemed to satisfy their hunger and they would not work for scratch feed.

RELATION OF HUMIDITY IN INCUBATORS TO HATCHING RESULTS

At Lethbridge the weather is usually dry during March and April with strong winds at times, which add to the effect of the dry conditions.

It is possibly due in a measure to the foregoing circumstances that hatching results in past years have not been all that could be desired in many parts of this province. Especially is this noticeable in the earlier hatches at the commencement of the breeding season, hatches usually running very low and bringing disappointment, with the result that most people prefer to hatch their chicks later in the season. This accounts in part for the large numbers of late hatched chicks. In view of the poor hatching results obtained when dry atmospheric conditions prevailed, an experiment was started in February, 1923, to study the effects on hatches of different degrees of humidity in the incubator. Incubators of the same make and size were operated simultaneously with eggs selected as nearly uniform as possible, and all other conditions kept the same except the amount of moisture applied.

The moisture was applied by hanging a moistened pad in the top of the incubator above the egg tray. This pad was made by wrapping alternate layers of burlap and newspaper around a piece of cardboard 8 inches long, until a pad 1½ inches thick was formed.

Breed	Month	Incubator	Temperature	Humidity	Percentage of fertile eggs hatched
B.R.	February	No. 1	103·3	54·5	74·4
B.R.	February	No. 2	103·4	32·8	43·7
B.R.	March	No. 1	103·0	56·0	78·9
B.R.	March	No. 2	103·1	33·2	42·5
B.R.	April	No. 1	103·2	60·1	85·8
B.R.	April	No. 2	103·4	35·0	45·4
Leghorns	May	No. 1	103·0	67·0	97·0
Leghorns	May	No. 2	103·2	53·5	79·5

The following was noted in the experiment:—(*a*) That a machine supplied with moisture gave a more uniform hatch, that the percentage of eggs pipped which failed to hatch was very low, and that the chicks were larger and appeared more active. (*b*) That a machine operated without moisture gave a much

smaller hatch, a high percentage of eggs which pipped failed to hatch out and the chicks were not only smaller, but appeared less vigorous. (c) In the early season when humidity runs low it was not found possible to supply an excess of moisture and even as late as May, the highest humidity did not adversely affect the embryos.

EFFECT OF DIFFERENT FEEDING METHODS ON MORTALITY OF CHICKS

In this experiment the chicks were reared with a colony coal brooder. The various lots were selected to be as nearly the same in vitality as possible. The feeds used in the wet mash were corn meal and shorts and the dry mash was composed of corn meal, shorts, middlings and bran equal parts.

Feed	Drink	Per cent mortality
Wet mash moistened with tomatoes and eggs	Boiled water	4·2
Wet mash moistened with raw eggs	Boiled water	5·3
Dry mash	Boiled water	8·1
Dry mash	Buttermilk	18·7
Commercial dry mash	Buttermilk	15·5

The canned tomato mash and the corn meal and shorts mash moistened with raw eggs proved the most satisfactory. The buttermilk used was pasteurized and the acid neutralized, which may have accounted for the high mortality where buttermilk was used.

ALBERTA EGG LAYING CONTEST

The Fourth Alberta Egg Laying Contest ended October 30, 1923. Interest in the contest is steadily increasing and the performance of the birds sent in is better each year. Comparative results of the four years of the contest shows the increase in production obtained. Experimental Station pens or birds are not included in data given in the table.

Contest year	Production of		Average of three highest pens	Average for contest per bird
	highest pen	highest hen		
1919–1920	1,660	237	1,518	121·5
1920–1921	1,668	246	1,576	127·9
1921–1922	2,027	261	1,882	136·4
1922–1923	2,216	288	2,208	168·2

For a full report of this contest see the Report of the Canadian National Egg Laying contests for the fourth year.

BEES

Beekeeping in the irrigated areas of southern Alberta is fast passing from the experimental stage into a definite commercial proposition which gives promise of developing into an important industry. The first few years' work with bees at the Station was principally to determine the possibilities of beekeeping in the district. This having been quite definitely established, experimental work on the proper management of bees is being gradually developed.

PRODUCTION

The season opened fairly early and continued favourable for the bees throughout. Some sugar and honey was fed in April, but in May and June dandelion, willows, caragana and plum blossoms furnished sufficient feed to permit the bees to build up to good strength. The main honey flow started

about June 24, gradually increased until the middle of July and continued fairly uniformly until the first frost in the fall, September 11. This long honey flow supplied by the alfalfa bloom makes honey production in the irrigated districts somewhat unique.

The following is a brief summary of operations:—

Number of colonies in the apiary, spring count	8
Packages of bees imported	19
Increase during summer (colonies)	9
Average weight of extracted honey from wintered bees	189·9 pounds
Average weight of extracted honey from imported bees	101·2 "
Greatest weight of honey produced by one colony	472·0 "
Selling price of extracted honey per pound after deducting price of container	$ 0 17
Average net returns from wintered bees—spring count	28 53
Average net returns from imported bees	15 85

WINTERING

The fear of meeting with disaster in wintering bees, or the idea that expensive winter quarters must be provided, has kept many from engaging in beekeeping in this locality. This fear is not founded on fact, for wintering bees in southern Alberta is a simple and inexpensive process. At the Station last fall ten colonies were wintered outside in packing cases and eight were alive and strong in the spring. The cases were simply square boxes made large enough to hold one, two or four colonies, with sufficient room between the top, bottom and sides of the cases and hives to permit the filling in of four to six inches of packing. In these cases planer shavings were used for packing but dried leaves, chaff or sawdust are satisfactory for this purpose. Small tunnel openings were made from each hive to let the bees come out at will.

For several years past comparisons have been made between wintering outside and in a dug-out cellar. On the whole, the best results have been obtained from outside wintering; the average results being the same as those of this year.

FALL FEEDING

Before packing for winter the weak colonies were united, all colonies weighed and then fed enough sugar syrup to bring their weight up to 75 to 80 pounds. Each colony was fed at least 10 pounds of sugar, even if this meant the removal of one or two frames of honey already stored. It is considered necessary to have some stores made from sugar in the hive for the winter use, as our alfalfa honey, although an excellent table honey, candies readily and is, therefore, poor winter feed for bees when they cannot get out to get water. Stores made from sugar syrup do not candy readily so its use helps to overcome the difficulty of candied stores.

STARTING AN APIARY

The first problem that confronts the beginner in beekeeping is the securing of disease-free bees. Undoubtedly the best method is to purchase a few strong colonies in the spring, providing these can be secured in the vicinity from an apiary known to be free from disease. It is never advisable to buy bees on comb unless the purchaser has inspected the apiary from which the bees are obtained and knows that it is free from brood diseases. In no case should bees on comb be imported from outside the province, as there is now apparently no bee disease in Alberta and with proper precautions this condition may be maintained.

If full colonies cannot be secured locally, a satisfactory method is to purchase bees in combless packages. There is little danger of importing disease in combless packages if the shipper uses sugar syrups instead of honey in making up the food for the bees.

IMPORTING PACKAGE BEES

The Lethbridge Station has imported combless packages of bees successfully for a number of years. Last spring twelve three-pound and four two-pound packages of bees with queens were imported from the south. These were secured from three different apiaries, one in Mississippi and two in California. All came through in fair condition except one shipment from California which was delayed by floods in British Columbia. Of the four packages in this shipment two were so weak that they were combined.

Two two-pound and two three-pound combless packages of bees with queens were obtained from an apiary in Mississippi and a like shipment from an apiary in California for the purpose of obtaining data as to the most satisfactory weight of package bees to purchase. One shipment was received May 22 and the other May 23, all arriving in fair condition. They were started in ten framed Langstroth hives on drawn comb and each colony fed one frame of honey in comb. The data obtained are given in the following table:—

Hive No.	Weight of honey produced		Number of frames of bees in fall		Weight of colony in fall	
	2-pound package	3-pound package	2-pound package	3-pound package	2-pound package	3-pound package
14	.....	114	.....	8	.....	53
15	.....	32	.....	United with	another colony	
16	125	.....	8	.....	40	
17	57	.....	8	.....	65	
18	.....	22	.....	8	.....	72
19	.....	39	.....	8	.....	60
20	67	.....	7	.....	64	
21	85	.....	7	.....	60	
Average	83·5	51·8	7·5	8	57·3	61·7

It will be noted that the two-pound packages produced the most honey, while the three-pound packages went into the winter in slightly better condition than did the two-pound packages.

STARTING PACKAGE BEES ON DRAWN COMB VS. FOUNDATION

Most of the farmers in the district desiring to purchase package bees have not been keeping bees previously so have no drawn comb on which to start them. To meet this condition an experiment was conducted this year to determine the feasibility of starting on foundation. The following table shows the season's production and condition of the colonies in the fall for three-pound packages obtained from Mississippi May 20.

Kind of frames used	Average production of honey	Frames covered with bees at last examination	Average weight per colony in fall
Drawn comb	93 lb.	8·0	64 lb.
Foundation	76 lb.	7·5	58 lb.

While the bees started on drawn comb produced more honey than those started on foundation, as would be expected, those started on foundation did very well and went into the winter in good condition. From the results obtained it appears quite safe to start package bees on foundation where drawn comb is not available, but the bees will need feeding until they are established and nectar is coming in.

GENERAL NOTES

A tent exhibit was shown at the fairs held at Brooks and Patricia. As both of these towns are surrounded by irrigated lands this part of the Station's activities were emphasized. The growing of small fruits was especially featured as this phase of irrigation farming is not receiving the attention it deserves. The exhibit created a great deal of interest, many visitors remarking that they did not realize such fruit could be grown successfully in the district, and the knowledge that it could convince them of the possibility of making ideal farm homes on their irrigated lands. Besides the rural fairs visited, booth exhibits were made at the Lethbridge Summer Fair and the Calgary and Lethbridge Horticultural Shows.

In addition to the exhibits made at fairs other extension activities were engaged in. The superintendent and various members of the staff addressed farmers' meetings, articles were written for the press, numerous letters of inquiry were answered and hundreds of farmers visited the Station, not only on special occasions when a prepared programme was arranged, but at other times throughout the season.

Special mention should be made of a demonstration of ditch construction and the application of water to the land held especially for the benefit of farmers on the new irrigation projects and the excursion to the Station of the Raymond Women's Institute. About 125 farmers attended the irrigation demonstration and 75 farmers' wives and their husbands were in attendance at the Women's Institute excursion.

EXPERIMENTAL PROJECTS UNDER WAY AT THE EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

ANIMAL HUSBANDRY

PROJECT NO.	TITLE
	HORSES
A. 294.	Cost of rearing colts.
	SWINE
A. 156.	Comparison of breeds of swine and crosses in feeding characteristics.
A. 163.	Cost of pork production.
A. 382.	Value of tankage for hog feeding.
	SHEEP
A. 339.	Grain vs. no grain for finishing lambs on pasture.
A. 342.	Pasturing sheep on forest reserve.
A. 369.	Value of roots for lamb feeding.
A. 383.	Pasturing sheep on cultivated grasses and clover.
A. 384.	Value of cross-breeding for improving mutton type.
A. 385.	Value of sunflower silage for sheep.
A. 386.	Value of corn silage for sheep.
A. 387.	Comparison of farm-bred vs. range lambs for feeding.
A. 388.	Comparison of long vs. short feeding of lambs.
A. 389.	Value of alfalfa for sheep and lambs.
A. 390.	Screenings vs. grain for sheep and lambs.
A. 394.	Oat sheaves for sheep feeding.
A. 395.	Comparison of yearlings vs. lambs for feeding.
	STEERS
A. 183.	Long-keep vs. short-keep steers.
A. 192.	Elevator screenings vs. mixed meal for steers.
A. 194.	Cost of beef production.
A. 195.	Value of sunflower silage for steer feeding.
A. 252.	Value of roots for steer feeding.
A. 273.	Economy of alfalfa as a cash crop vs. marketing as fodder to steers.
A. 371.	Economy of feeding corn ensilage to steers.
A. 391.	Oat sheaves vs. alfalfa hay for steers.
A. 392.	Value of oat straw for steer feeding.
A. 393.	Value of fodder corn for steer feeding.

FIELD HUSBANDRY

	ROTATION EXPERIMENTS
F. 101.	Wheat continuously.
F. 103.	Alfalfa continuously (Irrigated).
F. 105.	Two-year rotation—Summerfallow, wheat.
F. 107.	Three-year rotation—Summerfallow; wheat; wheat.
F. 117.	Five-year rotation—Summerfallow; wheat; oats; seeding to sweet clover; hay.
F. 122.	Six-year rotation—Summerfallow; wheat; wheat; oats; hay; hay.
F. 125.	Six-year rotation—Summerfallow; winter wheat; oats; summerfallow; mixture of oats and peas; oats.
F. 137.	Nine-year rotation—Summerfallow; corn; wheat; summerfallow; winter wheat; oats; summerfallow; peas and oats; hay; winter rye pasture.
F. 139.	Ten-year rotation—Summerfallow; wheat; oats or barley; summerfallow and seeding; alfalfa; alfalfa for 3 years; summerfallow; corn; wheat.
F. 140.	Ten-year rotation (Irrigated)—Potatoes; wheat; oats; barley; alfalfa for 6 years.
F. 141.	Fifteen-year rotation—Corn; wheat; oats; peas; alfalfa for 10 years; barley.
F. 143.	Sequence of crops (Irrigated).

PROJECT NO. | TITLE

CULTURAL EXPERIMENTS

F. 144. Summerfallow treatment.
F. 145. Summerfallow substitutes.
F. 146. Stubble treatment.
F. 155. Dates of seeding spring grain crops.
F. 187. Drainage of irrigated land to prevent alkali accumulation.
F. 188. Water requirements of irrigated crops.

FARM MANAGEMENT EXPERIMENTS

F. 195. Cost of producing farm crops.
F. 196. Cost of operating tractor.

SOIL MOISTURE EXPERIMENTS

F. 200. Influence of various cultural treatments upon soil moisture as determined by moisture determination.
F. 213. Soil moisture as related to irrigation.

HORTICULTURE

POMOLOGY

H. 4. Currant, variety experiment.
H. 6. Gooseberry, variety experiment.
H. 11. Raspberry, variety experiment.
H. 21. Strawberry, variety experiment.
H. 22. Apple, breeding.
H. 35. Apple, variety experiment.
H. 45. Plum, breeding.

VEGETABLE GARDENING

H. 55. Bean, breeding for immunity to anthracnose.
H. 58. Bean,distances of planting.
H. 62. Bean, variety experiment.
H. 63. Bean, weekly sowings for yield.
H. 65. Beets, different dates of sowing.
H. 67. Beets, thinning experiment.
H. 68. Beets, variety experiment.
H. 69. Borecole or Kale, variety experiment.
H. 72. Cabbage, different dates of sowing, for storage purposes.
H. 77. Cabbage, variety experiment.
H. 79. Carrot, different dates of sowing.
H. 82. Carrot, thinning experiment.
H. 83. Carrot, variety experiment.
H. 88. Cauliflower, variety experiment.
H. 90. Celery, blanching experiment.
H. 92. Celery, methods of storage.
H. 94. Celery, variety experiment.
H. 96. Corn, breeding for trueness to type.
H. 101. Corn, suckering experiment.
H. 102. Corn, variety experiment.
H. 106. Cucumber, variety experiment.
H. 107. Egg Plant, variety experiment.
H. 108. "Herbs," variety experiment.
H. 112. Leek, variety experiment.
H. 116. Lettuce, variety experiment.
H. 122. Melon, musk, variety experiment.
H. 125. Melon, water, variety experiment.
H. 126. Okra, variety experiment.
H. 136. Onion, thinning experiment.
H. 137. Onion, transplanting vs. sown in the open.
H. 138. Onion, variety experiment.
H. 140. Parsley, variety experiment.
H. 142. Parsnip, different dates of sowing.
H. 144. Parsnip, thinning experiment.

PROJECT NO.	TITLE
H. 145.	Parsnip, variety experiment.
H. 148.	Pea, different distances of planting.
H. 154.	Pea, variety experiment.
H. 155.	Pea, weekly sowings for yield.
H. 157.	Pepper, variety experiment.
H. 162.	Potato, different dates of planting.
H. 171.	Potato, hill selection for seed.
H. 182.	Potato, spraying experiment.
H. 183.	Potato, sprouted vs. unsprouted for earliness.
H. 186.	Potato, variety experiment.
H. 188.	Pumpkin, variety experiment.
H. 192.	Radish, variety experiment.
H. 193.	Rhubarb, breeding.
H. 194.	Rhubarb, forcing.
H. 197.	Salsify, variety experiment.
H. 199.	Spinach, variety experiment.
H. 201.	Squash, variety experiment.
H. 202.	Sunberry, variety experiment.
H. 203.	Swiss Chard, variety experiment.
H. 207.	Tomato, methods of training.
H. 209.	Tomato, pots and boxes vs. flats.
H. 211.	Tomato, variety experiment.
H. 214.	Turnip, variety experiment.
H. 216.	Vegetable marrow, variety experiment.
H. 218.	Vegetable seed, autumn vs. spring sowing.

ORNAMENTAL GARDENING

H. 261.	Annuals, variety experiment.
H. 274.	Herbaceous perennials, variety experiment.
H. 278.	Narcissus, variety experiment.
H. 289.	Tulip, producing bulbs.
H. 290.	Tulip, variety experiment.
H. 307.	Trees and shrubs, ornamental and shelter, variety experiment.

CEREALS

Ce. 1.	Common spring wheat, test of varieties or strains.
Ce. 3.	Durum wheat, test of varieties or strains.
Ce. 4.	Winter wheat, test of varieties or strains.
Ce. 5.	Oats, test of varieties or strains.
Ce. 6.	Barley, test of varieties or strains.
Ce. 7.	Peas, test of varieties or strains.
Ce. 8.	Beans, test of varieties or strains.
Ce. 9.	Flax, test of varieties or strains.
Ce. 10.	Spring rye, test of varieties or strains.
Ce. 11.	Winter rye, test of varieties or strains.
Ce. 50.	Multiplication of cereals.

FORAGE PLANTS

Ag. 1.	Indian corn, variety tests for ensilage purposes.
Ag. 2.	Indian corn, variety tests for the production of grain.
Ag. 4.	Indian corn, rows vs. hills.
Ag. 7.	Indian corn, breeding.
Ag. 16.	Mangels, variety tests for yield and purity.
Ag. 36.	Carrots, variety tests for yield and purity.
Ag. 51.	Swedes, variety tests for yield and purity.
Ag. 66.	Sugar beets, variety tests for yield and purity.
Ag. 76.	Sunflowers, variety tests for yield and purity.
Ag. 77.	Sunflowers, breeding of pure strains.
Ag. 126.	Alfalfa, variety tests hardiness yield and suitability.
Ag. 131.	Alfalfa, rates of seeding for hay production.
Ag. 146.	Red clover, variety tests for yield and general suitability.
Ag. 162.	Sweet clover, methods of seeding for hay production.
Ag. 221.	Western rye, variety tests for yield and purity.
Ag. 222.	Western rye, methods of seeding for hay production.

PROJECT NO.	TITLE
Ag. 241.	Annual hay crops, variety tests for yield and suitability. (B) Legume varieties, variety tests for yield and suitability. (C) Other grasses, variety tests for yield and suitability.
Ag. 255.	Miscellaneous grasses, variety tests.
Ag. 256.	Miscellaneous legumes, variety tests.
Ag. 258.	(B) Hay and pasture mixtures experiments, alfalfa as a base. (E) Hay and pasture mixtures experiments, mixed clovers as a base. (G) Hay and pasture mixtures experiments, grasses and clovers alone in combination.

CHEMISTRY

C. 42. Rotation check plot investigation 1921.
C. 10. Sugar beets investigation.
C. 11. Agricultural meteorology.

POULTRY

P. 48. Best date for marketing surplus stock Exp. (a) Culled hens.
P. 56. Pedigree breeding for egg production.
P. 58. Best hatching date for egg production.
P. 78. Corn vs. barley
P. 87. Fish-meal vs. beef scrap.
P. 100. Best chick feeds.
P. 104. Feeds for fertility and hatchability.
P. 109. Line breeding vs. out-crossing.
P. 111. Breeding for fertility, hatchability and livability. Exp. (a) Hens vs. pullets.
P. 114. Breeding for egg size.
P. 117. Sex influence on egg colour.
P. 123. Crossing wild and domestic turkeys.
P. 143. Prevention of frozen combs.

APIARY

Ap. 20. Returns from apiaries.
Ap. 21. Comparison of different sizes of hives.
Ap. 22. Package bees as a means of starting colonies.
Ap. 27. The value of honey bees in cross pollenation.
Ap. 28. Study of honey flows.
Ap. 33. Comparison of races of bees.
Ap. 43. Methods of establishing combless packages of bees.

FIBRE PLANTS

E. 4. Testing varieties of hemp.

OTTAWA: Printed by F. A. ACLAND, Printer to the King's Most Excellent Majesty, 1924.