DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT OF THE

DIVISION OF FORAGE PLANTS

G. P. McROSTIE, Ph.D., DOMINION AGROSTOLOGIST

FOR THE YEAR 1928

An improved variety in the making.

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DIVISION OF FORAGE PLANTS

REPORT OF THE DOMINION AGROSTOLOGIST, G. P. McROSTIE, Ph.D.

INTRODUCTION

The spring of 1928 at the Central Experimental Farm established a record for many years past in the matter of delayed planting due to frequent precipitations. The crops that are usually planted first suffered to the greatest degree in this regard. For example, field roots which are normally seeded around the third or fourth of May were not seeded until the fifteenth. The delay in the spring seeding operations was not obviated by more rapid growing weather later on, as the season as a whole was backward, with too frequent precipitations for either the production or harvesting of most forage crops. The net results, with the majority of fodders, were lower yield and poor quality.

The Dominion Range Experiment Station at Manyberries, Alberta, has made substantial progress in the establishment of the various experimental projects being conducted co-operatively by the Field Husbandry and Forage Crop Divisions. A progress report of the forage crop activities will be included in the present report.

The acquisition of additional land for experimental purposes has been of inestimable value in furthering the experimental work of this Division. Sufficient land has now been put at our disposal to make possible not only the testing of individual plants in satisfactory numbers, but also to allow for the multiplication of our best strains of the various forage crops.

The experimental projects reported in this publication as being conducted at the Central Experimental Farm, and at Harrow, Ont. are largely under the personal supervision of Mr. R. I. Hamilton and Mr. F. Dimmock. The forage crop investigations being carried out at the Dominion Range Experiment Station at Manyberries, Alberta, are under the supervision of Dr. S. E. Clarke.

PROJECTS CARRIED ON AT HARROW, ONT.

The following crops were included in the work carried on by the Forage Crop Division at the Dominion Experimental Station, Harrow, Ontario: field corn, soybeans, sugar beets, and broom corn.

The land used, designated as Field D, was in a very much improved condition compared with what it was when taken over by the Station four years previous.

The climatic conditions were quite average, there being no marked fluctuations in either rainfall or temperature from the normal, throughout the entire season.

FIELD CORN

CORN BORER CONTROL—NORMAL VS. DELAYED PLANTING

Delaying the time of planting, instead of seeding corn at the normal time, is one of the various methods adopted in an attempt to reduce the damage to the corn crop by the European Corn Borer. Planting may be delayed one, two or three weeks from the normal, the object being to seed sufficiently late to escape visitation by the moths during the most active period of their egg laying. The chief objection to this method has been the resulting immaturity of the corn in the late-planted crop.

In order to overcome this lack of ripening some farmers have used earlier maturing varieties with varying success.

It must be borne in mind, however, that late planting introduces an abnormal condition which the crop may or may not overcome successfully. Greater dependence is placed upon both soil and seasonal conditions where this practice is followed, and should these not be entirely favourable success can hardly be expected.

In order to determine the advantage, if any, of delayed over normal planting the following test was carried out:—

Beginning with the normal seeding on May 23, two successive delayed plantings were made; one on May 30 and the other on June 8. Early, medium, and late varieties were used in the test, the results of which appear in table 1.

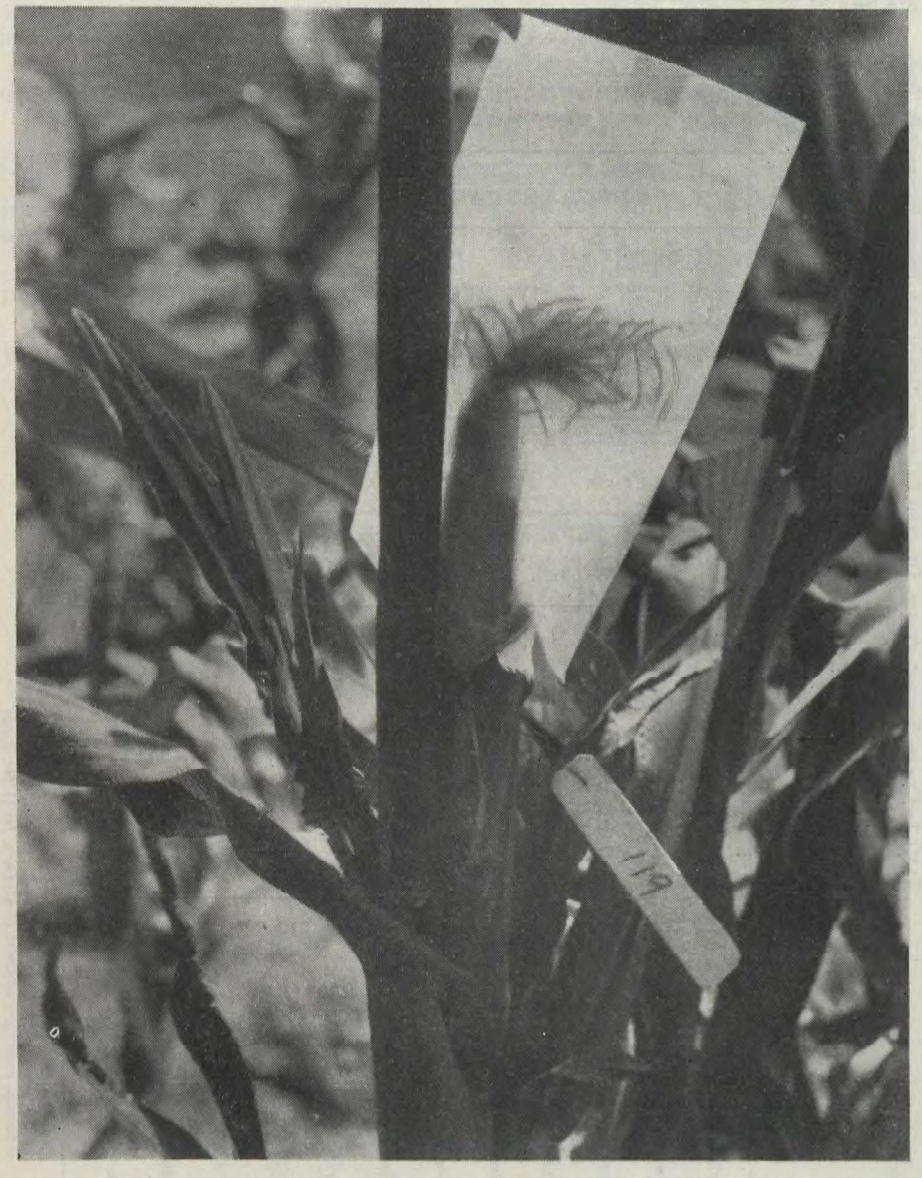
TABLE 1—CORN—NORMAL VERSUS DELAYED PLANTING, 1928—CORN BORER INFESTATION TEST

Variety	Source of seed	Date of planting	Date ripe	Days to maturity	Height	Yield of Ears per Acre					
						No. 1	No. 2	No. 3	No. 4	Total	Marketable ears, No. 1 and No. 2
					ft. in.	bush.	bush.	bush.	bush.	bush.	bush.
Northwestern Dent	Exp. Farm, Brandon, Man.	May 23	Sept. 10	110	5 6	1·1	9·06	8·02	0·91	19·09	10·16
		" 30	" 12	105	5 3	8·77	6·50	6·55	1·60	23·42	14·07
		June 8	" 30	114	5 0	14·92	2·46	4·62	0·13	22·13	19·92
Twitchell's Pride	Exp. Farm, Fredericton, N.B.	May 23	" 12	112	5 6	3·74	6·42	7·69	1·58	19·43	10·16
		" 30	" 15	108	5 3	5·53	10·16	5·35	1·07	22·11	15·69
		June 8	" 28	112	5 0	8·63	6·84	5·19	0·43	21·09	15·47
Quebec No. 28	Macdonald College, Que.	May 23	" 12	112	5 3	5·8	6·15	7·49	0·3	19·74	11·95
		" 30	" 12	108	5 3	8·58	11·47	6·34	0·83	27·22	19·97
		June 8	" 28	112	5 3	12·46	9·33	4·38	0·53	26·70	21·79
Northwestern Dent	Macdonald College, Que.	May 23	" 28	128	6 9	24·25	7·22	5·39	.....	36·86	31·47
		" 30	Oct. 1	124	7 0	26·82	9·73	2·91	.....	39·46	36·55
		June 8	" 5	119	7 0	40·90	6·31	0·91	.....	48·12	47·21
Longfellow	R. J. Johnston	May 23	Sept. 30	130	7 3	33·42	11·79	5·77	.....	50·98	45·21
		" 30	Oct. 6	129	7 3	28·34	11·71	5·48	0·78	46·31	40·05
		June 8	" 8	122	7 6	41·15	7·22	5·99	.....	54·36	48·37
Northwestern Dent	Dakota Improved Seed Co.	May 23	Oct. 3	133	7 0	36·15	14·3	1·44	.....	51·89	50·45
		" 30	" 6	129	7 0	36·68	16·42	2·75	.....	55·85	53·10
		June 8	" 8	122	7 6	48·15	2·22	1·39	.....	51·76	50·37
Minnesota No. 13	Northrup King Co.	May 23	" 4	134	7 6	33·37	5·45	1·67	.....	40·50	38·82
		" 30	" 8	131	7 6	38·71	7·00	4·60	.....	50·31	45·71
		June 8	" 9	123	7 6	47·08	3·85	2·73	.....	53·66	50·93
Pride Yellow Dent	Dakota Improved Seed Co.	May 23	" 7	137	6 3	16·17	5·77	7·35	.....	29·30	21·94
		" 30	" 10	133	7 0	26·87	7·59	3·21	.....	37·67	34·46
		June 8	" 12	126	6 6	25·19	2·14	4·33	.....	31·66	27·33
Silver King	A. C. Popp	May 23	" 8	138	8 3	39·86	2·25	3·37	0·72	46·20	42·11
		" 30	" 10	133	8 0	40·85	5·48	4·17	.....	50·50	46·33
		June 8	" 12	126	8 0	45·12	5·11	2·89	.....	53·12	50·23
Bailey	Darcy Bondy	May 23	" 8	138	7 9	49·22	2·08	3·53	0·61	55·44	51·30
		" 30	" 10	133	8 9	39·49	6·31	4·49	.....	50·29	45·80
		June 8	" 12	126	8 0	46·57	5·43	3·58	.....	55·58	52·00
Lancaster	Hoffman	May 23	" 10	140	10 0	63·66	.....	2·14	.....	65·80	63·66
		" 30	" 11	134	10 6	57·32	2·27	7·06	.....	66·65	59·59
		June 8	" 16	130	10 3	58·87	.....	3·26	.....	62·13	58·87
Burr Leaming	Carter	May 23	" 11	141	9 0	56·73	.....	6·07	.....	62·80	56·73
		" 30	" 13	136	9 6	58·71	7·22	1·60	.....	67·53	65·93
		June 8	" 18	132	9 3	58·48	3·10	3·53	0·64	65·75	61·58

No. 1. Good ears (no borer). No. 2. Good ears (with some borer)—both marketable.
No. 3. Poor ears, but fit for feed. No. 4. Poor ears, not fit for feed—unmarketable.
Average moisture content of all ears, 10-11 per cent.

The ears were separated at the time of harvest and graded according to the method indicated in the table.

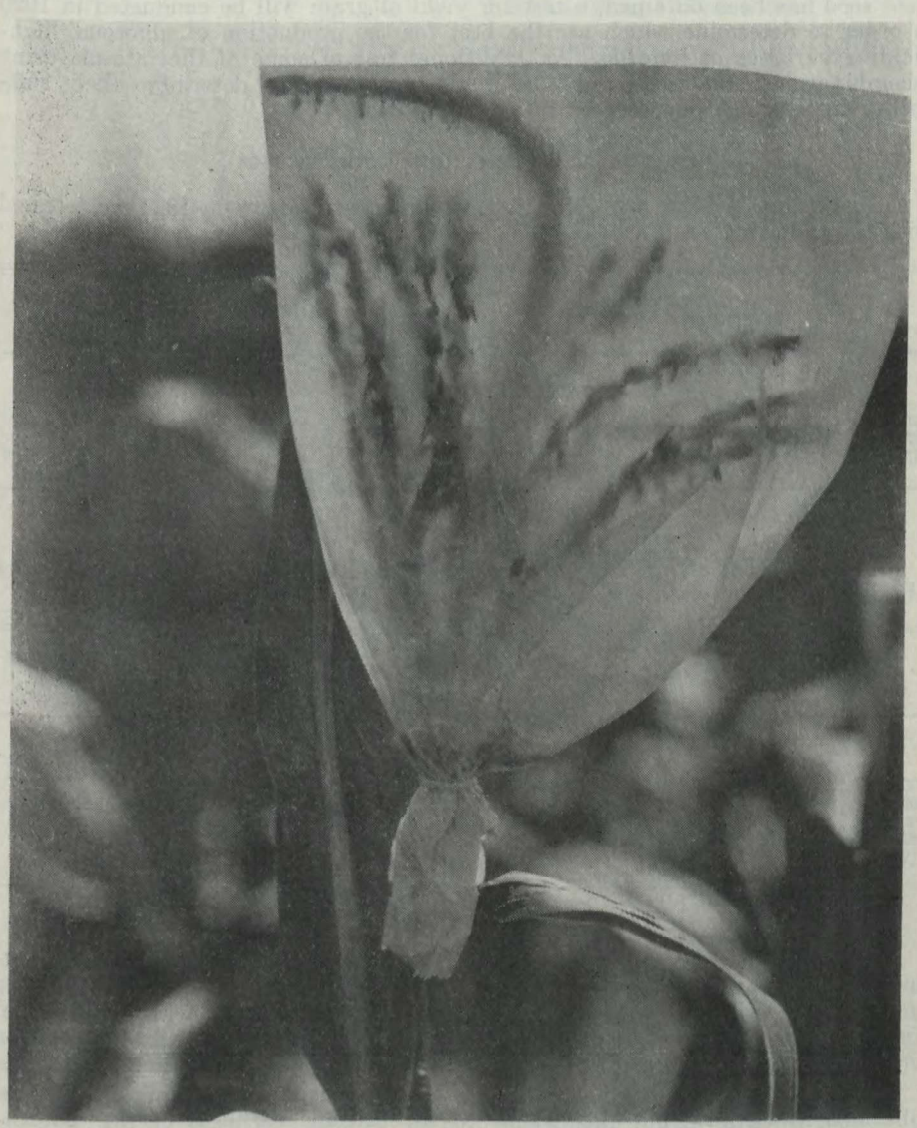
A glance at the results is sufficient to show that the early-maturing varieties used in this test are too low in yielding capacity to receive serious consideration in any scheme of planting. They show a higher percentage of ears partially or totally destroyed throughout the whole test than either the medium or the late varieties.



Covering the silks of an ear of corn to prevent crossing.

The outstanding feature of the test is the comparatively high yields and small amount of ear destruction of some of the later varieties in the normal or first planting. This approximates the results obtained in a similar test conducted on a small scale in 1927, when Burr Leaming in the first seeding gave the highest yield.

Whether or not the results of these tests will be borne out in subsequent trials remains to be seen, but the present indications are that a later variety with strong, sturdy, upright stems will stand up and produce better than a smaller, earlier variety which is liable to go down under a considerably less heavy infestation.



The tassels of all corn in the breeding block are carefully bagged to prevent the escape of pollen.

BREEDING

One hundred inbred strains of the late-maturing varieties, selected in 1927, were grown at the Dominion Experimental Station, Harrow, Ont. One hundred and twenty strains representing the early-maturing varieties were grown at Ottawa. The inbreeding process was continued at both places.

On account of the purity which these strains have attained it was decided to make as large a number of recombinations and crosses as possible. This resulted in 54 strain recombinations and 21 crosses being made at Harrow, while at Ottawa 100 recombinations and 138 crosses were made. Where sufficient seed has been obtained, a test for yield of grain will be conducted in 1929 in order to determine which are the best for the production of vigorous, high-yielding varieties or hybrids. An additional test of some of the late-maturing recombinations and crosses will be made at Ottawa to determine their suitability for ensilage purposes.

TEST OF RECOMBINATIONS AND CROSSES

Six strains of Minnesota No. 13 recombined at Harrow in 1927 were tested with the following results:—

Strains recombined	Date planted	Date ripe	Height	Yield of ears per acre
			ft. in.	bush.
$(24-2)_6 \times (1-13)_4$	May 23	Sept. 27	7 6	68·1
$(27-1)_6 \times (55-1)_9$	" 23	" 28	7 6	69·2
$(57-1)_{12} \times (11-1)_8$	" 23	" 25	7 0	52·3

Moisture content of ears approximately 11 per cent.

Five different strain crosses were made at Ottawa in 1927 and the results obtained from the yield test are shown in the following table:—

Strains crossed	Description	Date planted	Date ripe	Height	Yield of ears per acre
				ft. in.	bush.
69 x 3	Twitchell's Pride x White Flint	May 19	Aug. 27	4 8	30·7
69 x 4	Twitchell's Pride x Howe's Alberta	" 19	" 27	4 8	30·9
60 x 10	Quebec No. 28 x Howe's Alberta	" 19	" 29	5 0	33·4
83 x 10	Northwestern Dent x Howe's Alberta	" 19	" 30	5 4	36·0
112 x 10	Comforth x Howe's Alberta	" 19	" 30	5 4	32·5

Moisture content of ears approximately 10 per cent.

In both the above tests only enough seed was available for duplicate plantings and the rows were short. Placing the yields from these small tests on an acre basis, possibly exaggerates to some extent the yields per acre but the chief factor responsible for high yields from such recombinations and first generation crosses is the production of a good well-filled ear on each individual stalk.

The yields obtained in the test at Harrow are much higher than those obtained at Ottawa, but this is due to the extreme earliness of the material grown in the latter test, in which the length of time required to reach maturity varied from 100-103 days.

SOYBEANS

1. VARIETY TEST

Table 2 gives the results obtained with eighteen varieties of soybeans. The yields of both fodder and seed for this year are shown, also the average yields for the whole period during which the test has been conducted.

All the varieties mature well at Harrow, but they have been grouped according to maturity in the table for the guidance of those interested in this crop and who may be located in districts with a shorter season.

TABLE 2—SOYBEAN VARIETY TEST

Yield per acre of fodder and seed for 1928 and averages for five years (1924-1928)

Variety	Original source of seed	Date planted	Days to Maturity		Maturity group, 1928	Average height, 1928	Fodder				Seed			
							Green Weight		Moisture Free weight		As Harvested		Moisture Free	
			1928	Average 5 years 1924-28			1928	Average 5 years 1924-28	1928	Average 5 years 1924-28	1928	Average 5 years 1924-28	1928	Average 5 years 1924-28
						ft. in.	tons lb.	tons lb.	tons lb.	tons lb.	bush.	bush.	bush.	bush.
Ste. Anne's No. 93	Macdonald College, Que.	May 23	105	107	1	2 4½	7 786	5 90	1 1,500	1 502	26·89	21·59	23·87	19·13
*Early Brown	Salmon Arm, B.C.	" 23	105	108	1	2 4½	8 112	5 1,177	2 632	1 1,152	33·52	26·35	29·71	23·25
†Mandarin	U.S. Dept. Agriculture	" 23	110	113	1	2 6½	8 1,655	5 1,999	2 731	1 1,188	37·15	29·62	32·83	26·10
Yellow 210	China	" 23	118	116	2	2 7½	9 2	6 88	2 740	1 1,094	38·69	31·73	34·28	26·35
Yellow 17	"	" 23	118	117	2	2 6½	9 1,185	7 259	2 916	1 1,667	38·15	31·25	33·82	27·70
Chinatown Echo	"	" 23	117	116	2	2 5½	8 1,515	6 1,461	2 666	1 1,387	32·78	27·48	29·17	24·32
†Italian	?	" 23	120	119	3	2 7½	8 1,385	7 1,712	2 536	2 36	31·13	34·11	27·61	29·85
†O.A.C. No. 211	O.A.C. Guelph, Ont.	" 23	120	120	3	2 7½	9 641	7 779	2 1,053	1 1,978	37·27	34·19	32·70	29·60
O.A.C. No. 81	" "	" 23	119	117	3	2 8½	9 63	6 1,870	2 713	1 1,640	31·34	29·24	27·41	25·66
Summerland	Summerland, B.C.	" 23	120	118	3	2 11	9 643	7 938	2 879	1 1,694	27·33	23·91	23·69	21·15
Black (China)	China	" 23	117	117	2	2 5½	8 539	6 1,763	2 497	1 1,449	29·01	25·92	25·62	22·69
Early Korean	"	" 23	124	123	3	2 10½	10 635	8 325	2 1,497	1 1,967	39·96	36·40	34·91	31·61
Green	J. Noble, Harrow, Ont.	" 23	119	121	3	2 6	8 1,213	6 1,930	2 976	1 1,761	37·24	35·27	32·86	31·16
Manchu	Dakota Improved Seed Co.	" 23	122	122	3	2 11½	9 1,960	8 22	2 1,317	2 118	37·42	35·93	32·85	31·48
Black Eyebrow	" " "	" 23	124	122	3	2 11	9 600	8 19	2 1,057	2 32	34·89	35·81	30·58	31·55
Ito San	J. Noble, Harrow, Ont.	" 23	124	122	3	2 11½	8 1,728	8 246	2 598	2 46	28·30	31·16	24·51	27·21
Golden	" " "	" 23	126	125	4	3 0½	9 1,171	8 191	2 943	2 133	36·83	36·81	31·86	32·09
†A. K.	U.S. Dept. Agriculture	" 23	127	126	4	3 4	10 282	9 266	2 1,546	2 741	38·40	39·94	33·31	34·56

*Averages for 3 years only (1926-28). †Averages for 4 years only (1925-28).
Add 15 per cent moisture to yield of moisture free weight of fodder to obtain approximate yields of hay.
(Rows 2½ feet apart. Plants in rows approximately 3½ inches apart.)

Most of the varieties gave a considerably higher yield of both fodder and seed than in any previous year. Only one variety yielded less than two tons of moisture-free fodder and only four less than thirty bushels of seed per acre. This increase was in all probability due largely to a very high percentage of nodule formation in the roots. The soybeans this year were grown in the same field as in 1924, while in former years they have been grown in fields which had never grown a crop of soybeans previously, and although the seed was inoculated each year at the time of planting, the percentage of nodule formation was very small, undoubtedly insufficient to have any appreciable effect upon the ultimate yields.

The good condition of the soil both at seeding time and throughout the season probably also had some effect in influencing the yields. Climatic conditions were just about normal and in all likelihood had little or no influence in affecting yields favourably or otherwise.

The seed of the varieties tested has been produced each year at the Station, since the original introduction. The seed rows are isolated to avoid the possibility of any crossing taking place, and rigorous selection is practised. Any off-type or diseased plants are destroyed with the result that all varieties are now extremely uniform and very vigorous.

2. INTRODUCTION OF NEW VARIETIES

The following varieties were introduced and tested in order to determine their suitability for Canadian conditions. All were secured from the United States and the names of the seedsmen from whom they were obtained appear in brackets following the variety names: Wilson (Stump & Walters), Wilson Black (Hoffman), Virginia Soys (Hoffman), Mammoth Yellow (Hoffman), Mammoth Yellow (Stumpp & Walters).

All of the varieties made a very prolific growth but are much too late for any section of Canada and should not be grown in this country, for either hay or seed purposes.

SUGAR BEETS

TEST OF VARIETIES AND STRAINS

The ultimate object of this experiment is to increase the sugar production per acre of sugar beets. This may be accomplished by increasing (*a*) the tonnage, (*b*) the sugar content, or (*c*) tonnage and sugar content combined. Selection of promising material from the tests is made for subsequent breeding work each year.

The varieties commonly grown in the sugar beet area and distributed by the Dominion Sugar Co., Ltd., Chatham, Ontario, were tested for yield in addition to a large number of strains, seed of which was again obtained through the courtesy of the United States Department of Agriculture.

Plots were planted in three different localities; one at the Dominion Experiment Station, Harrow, one at Chatham, and one at Kingsville. The results for each individual plot appear in table 3.

TABLE 3—SUGAR BEETS, 1928—TESTS OF VARIETIES AND STRAINS

	Variety or strain	Source of seed	Dominion Experimental Station, Harrow, Ontario Soil—Black sandy loam									
			Beets, yield per acre				Average weight per beet	Per cent sugar	Purity	Sugar (sucrose) per acre (% sugar x yield	Relative yield of sugar	Tops, yield per acre, green weight
			Actual		Corrected							
			tons	lb.	tons	lb.	lb.			lb.		tons lb.
1	60500	Mich. State College	14	1,664	14	1,664	1·2	15·4	88·5	4,568	102·6	8 668
2	61000	" "	12	1,677	12	1,677	1·1	16·3	85·8	4,185	94·2	5 379
3	61100	" "	15	648	15	648	1·3	16·7	89·3	5,118	115·2	5 1,495
4	62500	" "	10	1,888	10	1,888	0·9	15·6	84·1	3,415	76·8	5 1,736
5	64900	" "	14	30	14	1,454	1·2	16·8	88·5	4,948	111·3	4 1,288
6	65700	" "	16	54	16	1,052	1·4	17·5	88·0	5,784	130·4	6 859
7	66300	" "	14	1,333	14	1,333	1·2	15·0	87·4	4,400	99·0	5 1,974
8	68200	" "	13	309	13	1,560	1·2	17·2	86·2	4,740	106·6	7 501
9	69100	" "	11	1,758	12	113	1·0	17·0	86·2	4,099	92·2	5 937
10	Re. Gr. No. 19	" "	10	1,865	10	1,865	0·9	18·1	88·8	3,958	89·1	6 150
11	" No. 25	" "	12	1,086	12	1,086	1·1	17·2	86·3	4,315	97·1	6 1,914
12	" No. 28	" "	12	1,402	12	1,402	1·1	18·2	86·9	4,623	104·2	5 1,059
13	" No. 30	" "	11	1,285	11	1,285	1·0	16·9	87·8	3,935	86·5	4 698
14	" No. 37	" "	11	1,255	11	1,255	1·0	16·9	86·1	3,930	88·4	5 1,592
15	" No. 38 AC. 5	" "	13	1,360	13	1,360	1·2	16·3	85·0	4,460	100·6	8 20
16	554-24	U.S.D.A., Fort Collins, Col	11	75	11	75	0·9	17·2	89·6	3,797	85·4	5 22
17	882-24	" "	14	728	14	728	1·2	18·0	89·9	5,171	116·6	5 1,736
18	1340-23	" "	14	1,910	14	1,910	1·2	15·5	82·0	4,636	104·3	6 114
19	1612-24	" "	16	196	16	196	1·4	15·2	88·2	4,894	110·1	7 501
20	1749-24	" "	15	1,211	15	1,211	1·3	15·2	88·6	4,744	106·7	5 1,754
21	2361-23	" "	14	512	14	1,880	1·3	15·0	86·0	4·482	100·8	6 1,824
22	4477-24	" "	12	1,056	12	1,056	1·1	17·4	85·9	4,360	98·1	7 292
23	Schreiber	Dominion Sugar Co., Chatham	14	1,635	15	80	1·3	16·2	85·4	4,873	109·7	6 1,486
24	R. & R.	" "	13	496	14	192	1·2	16·3	85·3	4·595	103·4	6 1,968
25	Horning	" "	14	481	14	481	1·2	15·0	89·0	4·272	96·1	6 38
26	Strube	" "	13	1,243	15	549	1·2	14·2	87·3	4,083	91·9	5 958
27	Home Grown	" "	12	768	12	1,536	1·1	16·8	86·2	4,290	96·5	6 1,644
28	Dieppe	" "	11	599	11	599	1·0	18·1	86·0	4,090	92·0	5 480
29	Buszczynski	" "	10	1,361	11	23	0·9	15·7	88·0	3,458	77·8	5 429
30	Fredriksen	" "	13	933	13	933	1·1	19·0	86·2	5,117	115·1	6 632

Yield per acre based upon stands corrected to beets 12 inches apart in the rows.
Per cent sugar—Figures obtained from analysis made by Dominion Sugar Co., Ltd., Chatham, Ont.
Sugar per acre—Per cent sugar x yield.
Relative yield of sugar—Comparison with average yield of sugar of all varieties and strains in each individual test (average=100).

TABLE 3—SUGAR BEETS, 1928—TEST OF VARIETIES AND STRAINS—*Continued*

	Variety or strain	Source of seed	Farm No. 1, near Chatham, Ontario Soil—Clay loam							
			Beets, yield per acre		Average weight per beet	Per cent sugar	Purity	Sugar (sucrose) per acre (% sugar x yield)	Relative yield of sugar	Tops, yield per acre, green weight
			Actual	Corrected						
			tons lb.	tons lb.	lb.			lb.		tons lb.
1	60500	Mich. State College	9 1,763	16 1,342	1·4	12·5	85·2	4,168	100·3	10 542
2	61000	" "	14 962	15 1,858	1·3	13·4	76·2	4,269	102·7	5 1,120
3	61100	" "	15 95	16 1,140	1·4	13·9	86·4	4,601	110·7	7 969
4	62500	" "	12 1,013	15 565	1·3	14·2	84·4	4,340	104·4	5 1,290
5	64900	" "	12 1,094	16 1,124	1·4	11·8	84·4	3,909	94·0	7 1,617
6	65700	" "	17 874	19 333	1·6	14·5	87·1	5,558	133·7	7 1,214
7	66300	" "	13 1,642	19 925	1·6	13·0	79·8	5,060	121·7	6 715
8	68200	" "	13 242	15 912	1·3	16·0	85·3	4,946	119·0	5 1,970
9	69100	" "	11 465	12 1,565	1·1	16·1	86·3	4,116	99·3	6 125
10	Re. Gr. No. 19	" "	12 395	14 1,810	1·3	13·5	82·7	4,024	96·8	6 971
11	" No. 25	" "	10 1,041	12 1,349	1·1	14·7	84·1	3,712	89·3	7 1,109
12	" No. 28	" "	11 1,554	15 479	1·3	13·2	82·5	4,023	96·8	5 1,192
13	" No. 30	" "	14 1,319	18 1,937	1·6	13·0	83·3	4,932	118·7	3 1,632
14	" No. 37	" "	12 648	14 517	1·2	14·6	85·3	4,163	100·2	4 1,439
15	" No. 38 AC. 5	" "	11 930	12 810	1·0	14·1	82·0	3,498	84·2	9 1,390
16	554–24	U.S.D.A., Fort Collins, Col.	9 451	11 546	1·0	15·8	86·3	3,562	85·7	4 510
17	882–24	" "	9 1,376	12 1,576	1·1	13·8	84·5	3,529	84·9	7 389
18	1340–23	" "	11 1,812	12 1,526	1·1	14·7	83·4	3,752	90·3	5 1,520
19	1612–24	" "	14 48	16 452	1·4	15·2	84·1	4,933	118·7	6 1,889
20	1749–24	" "	9 1,074	11 889	1·0	14·0	81·8	3,204	77·1	4 896
21	2361–23	" "	12 57	16 405	1·2	13·6	83·2	4,407	106·0	5 278
22	4477–24	" "	12 41	16 1,056	1·4	13·9	81·2	4,595	110·5	5 1,419
23	Schreiber	Dominion Sugar Co., Chatham	10 333	12 1,314	1·1	14·8	84·6	3,746	90·1	5 789
24	R. & R.	" "	11 1,039	14 683	1·2	14·5	81·6	4,159	100·1	5 1,394
25	Horning	" "	10 1,214	12 1,925	1·1	13·8	82·6	3,578	86·1	4 1,594
26	Strube	" "	11 1,168	14 844	1·2	15·3	84·6	4,413	106·2	2 975
27	Home Grown	" "	11 1,221	12 1,543	1·1	15·4	83·6	3,934	94·6	4 1,724
28	Dieppe	" "	9 158	11 189	0·9	14·8	84·7	3,284	79·0	5 1,959
29	Buszczynski	" "	7 944	10 1,982	0·9	17·5	87·7	3,847	92·6	5 1,822
30	Fredriksen	" "	10 1,384	14 804	1·2	15·4	83·4	4,436	106·7	5 616

Yield per acre based upon stands corrected to beets 12 inches apart in the rows.
Per cent sugar—Figures obtained from analysis made by Dominion Sugar Co., Ltd., Chatham, Ont.
Sugar per acre—Per cent sugar x yield.
Relative yield of sugar—Comparison with average yield of sugar of all varieties and strains in each individual test (average=100).

TABLE 3—SUGAR BEETS, 1928—TESTS OF VARIETIES AND STRAINS—*Concluded*

	Variety or strain	Source of seed	Kingsville, Ontario Soil—Clay loam										
			Beets, yield per acre				Average weight per beet	Per cent sugar	Purity	Sugar (sucrose) per acre (% sugar x yield)	Relative yield of sugar	Tops, yield per acre, green weight	
			Actual		Corrected								
			tons	lb.	tons	lb.	lb.			lb.		tons	lb.
1	60500	Mich. State College	10	432	12	69	1·0	16·4	86·3	3,947	102·5	5	1,326
2	61000	" "	12	1,386	12	1,386	1·1	17·6	87·1	4,468	116·1	4	546
3	61100	" "	10	742	10	1,385	0·9	17·1	87·9	3,657	95·0	3	1,859
4	62500	" "	8	98	9	14	0·8	16·5	86·0	2,972	77·2	3	1,222
5	64900	" "	11	1,442	14	1,185	1·2	16·6	90·7	4,845	125·9	3	1,747
6	65700	" "	11	1,616	13	1,324	1·2	17·1	92·3	4,672	121·4	4	1,900
7	66300	" "	11	1,004	13	1,099	1·1	17·3	86·2	4,688	121·8	3	912
8	68200	" "	8	1,423	9	852	0·8	15·0	84·9	2,828	73·5	3	1,416
9	69100	" "	9	373	10	908	0·9	17·2	86·5	3,596	93·4	3	106
10	Re. Gr. No. 19	" "	9	1,007	10	908	0·9	16·9	87·4	3,533	91·8	3	826
11	" No. 25	" "	10	1,051	11	777	1·0	17·2	86·3	3,918	101·8	3	1,265
12	" No. 28	" "	9	1,641	10	908	0·9	16·5	88·9	3,450	89·6	3	106
13	" No. 30	" "	10	1,224	11	1,750	1·0	17·2	90·0	4,085	106·1	2	1,940
14	" No. 37	" "	11	1,528	12	1,458	1·1	16·4	86·5	4,175	108·5	4	186
15	" No. 38 AC. 5	" "	9	1,957	14	1,278	1·2	17·4	91·7	5,094	132·3	6	1,507
16	554–24	U.S.D.A., Fort Collins, Col	10	1,060	10	1,060	0·9	16·5	81·4	3,475	90·3	3	1,290
17	882–24	" "	12	948	13	1,443	1·2	16·0	87·9	4,391	114·1	4	1,090
18	1340–23	" "	9	1,210	10	785	0·9	15·5	80·1	3,222	83·7	2	1,587
19	1612–24	" "	9	1,210	13	971	1·1	16·9	85·6	4,558	118·4	2	1,846
20	1749–24	" "	9	1,541	10	1,859	0·9	15·5	87·5	3,388	88·0	2	190
21	2361–23	" "	9	1,440	10	373	0·9	16·8	85·7	3,423	88·9	6	294
22	4477–24	" "	11	680	12	154	1·0	16·7	86·6	4,034	104·8	2	1,310
23	Schreiber	Dominion Sugar Co., Chatham	9	1,210	9	1,210	0·8	18·1	85·3	3,477	90·3	2	795
24	R. & R.	" "	8	1,423	9	1,496	0·7	17·9	88·3	3,490	90·7	2	939
25	Horning	" "	10	88	11	478	0·9	17·4	91·0	3,911	101·6	3	642
26	Strube	" "	8	789	10	147	0·8	17·8	84·9	3,586	93·2	2	982
27	Home Grown	" "	7	1,876	8	1,464	0·7	18·2	88·9	3,178	82·6	2	1,292
28	Dieppe	" "	9	57	9	1,538	0·8	16·9	89·6	3,302	85·8	2	579
29	Buszczynski	" "	10	1,224	10	1,885	0·9	18·0	85·6	3,939	102·3	3	890
30	Fredriksen	" "	10	412	12	45	1·0	17·4	83·9	4,184	108·7	2	932

Yield per acre based upon stands corrected to beets 12 inches apart in the rows.
Per cent sugar—Figures obtained from analysis made by Dominion Sugar Co., Ltd., Chatham, Ont.
Sugar per acre—Per cent sugar x yield.
Relative yield of sugar—Comparison with average yield of sugar of all varieties and strains in each individual test (average=100).

Climatic conditions throughout the season were about normal but the yields throughout the sugar beet area were, if anything, slightly below average. The sugar content, however, was probably a little above average. This is reflected in the test results with the exception of that conducted at Chatham, where the sugar content was unquestionably low.

The relative yield of sugar is the index used to determine the value of the individual variety or strain. Whenever this exceeds 100 it shows that the yield is in excess of the average for that particular test.

A glance at the results shows that several strains gave a yield of sugar considerably in excess of the average in each test while only one variety was similarly consistent in doing this. The results for the two years (1927-28) have been summarized for relative yield of sugar and are given in table 4.

TABLE 4—RELATIVE YIELDS OF SUGAR BEETS FOR 1927 AND 1928 AND AVERAGE FOR TWO YEARS

Variety of strain	1927				1928				1927-28
	Harrow	Chatham (1)	Chatham (2)	Average	Harrow	Chatham	Kingsville	Average	Average 6 tests
60500	98·6	106·6	107·2	104·1	102·6	100·3	102·5	101·8	103·0
61000	97·5	109·1	87·2	97·9	94·2	102·7	116·1	104·3	101·1
61100	103·8	88·6	84·2	92·2	115·2	110·7	95·0	107·0	99·6
62500	78·5	84·1	90·5	84·4	76·8	104·4	77·2	86·1	85·3
64900	110·1	107·3	102·2	106·5	111·3	94·0	125·9	110·4	108·5
65700	99·8	101·7	112·3	104·6	130·4	133·7	121·4	128·5	116·6
66300	101·9	104·9	99·3	102·0	99·0	121·7	121·8	114·2	108·1
68200	112·6	134·9	112·8	120·1	106·6	119·0	73·5	99·7	109·9
69100	102·0	126·9	123·0	117·3	92·2	99·3	93·4	95·0	106·1
xRe. Gr. No. 19					89·1	96·8	91·8	92·6	92·6
xRe. Gr. No. 25					97·1	89·3	101·8	96·1	96·1
xRe. Gr. No. 28					104·2	96·8	89·6	96·9	96·9
xRe. Gr. No. 30					88·5	118·7	106·1	104·4	104·4
xRe. Gr. No. 37					88·4	100·2	108·5	99·0	99·0
xRe. Gr. No. 38					100·6	84·2	132·3	105·7	105·7
554-24	92·5	83·9	88·3	88·2	85·4	85·7	90·3	78·1	87·7
882-24	91·5	87·4	105·7	94·9	116·6	84·9	114·1	105·2	100·0
1340-23	104·6	80·1	99·3	93·7	104·3	90·3	83·7	92·8	93·7
1612-24	116·1	114·4	91·6	107·4	110·1	118·7	118·4	115·7	111·6
1749-24	98·9	92·9	81·7	91·2	108·7	77·1	88·0	90·6	90·9
2361-23	85·5	89·9	97·1	90·8	100·8	106·0	88·9	98·6	94·7
4477-24	84·8	78·5	97·9	87·1	98·1	110·5	104·8	104·5	95·8
Schreiber	119·8	92·3	115·2	109·1	109·7	90·1	90·3	96·7	102·9
R. and Y.	104·0	113·3	104·7	107·3	103·4	100·1	90·7	98·1	102·7
Horning	108·8	.....	111·1	110·0	95·1	86·1	101·6	94·3	100·5
sStrube	117·9	.....	.....	.....	91·9	106·2	93·2	97·1	102·3
Home Grown	86·8	100·9	84·8	90·8	96·5	94·6	82·6	91·2	91·0
sDippe	100·8	.....	.....	.....	92·0	79·0	85·8	85·6	89·4
sBussczynski	94·7	.....	.....	.....	77·8	92·6	102·3	90·9	91·9
xFredriksen	.....	.....	.....	.....	115·1	106·7	108·7	110·2	110·2

Relative yield of sugar = comparison with average yield of sugar of all varieties and strains in each individual test. (Average yield of sugar = 100). xStrains and varieties not included in 1927 tests. sVarieties tested only at Harrow in 1927.

The above summary includes the results obtained in six tests for the majority of strains and varieties. While it covers but two years' work there are indications that some of the material tested might prove of value in increasing the production of sugar per acre from beets.

BREEDING

Mother beets selected from the high-yielding strains and varieties were grown and isolated for seed production. The set of seed was so small that it is probable that conditions at Harrow are unfavourable for this phase of the work, which will in all probability be carried on at Ottawa in future.

BROOM CORN

VARIETY TEST

This is being continued for a number of years sufficient to obtain reliable results for all varieties under test, so that accurate information can be furnished to any who desire it concerning this crop.

Eighteen varieties representing dwarf, intermediate, and standard types were grown and the yield and length of brush and yield of fodder of each variety obtained.

Table 5, in addition to giving yields, etc., for this year, shows also the averages for the three years (1926-28).

TABLE 5—BROOM CORN—VARIETY TEST

Yields, etc., for 1928 and Average for 3 years (1926-1928)

Variety	Type	Original source of seed	Date of planting	Date of harvesting		Height	Air dry yield of brush per acre						Length of of brush				Yield of fodder per acre			
							1928			Average 3 years 1926-1928			1928		Average 3 years, 1926-1928		1928		Average 3 years 1926-1928	
				Brush	Seed		Good	Poor	Total	Good	Poor	Total	Good	Poor	Good	Poor	Green weight		Green weight	
						ft. in.	lb.	lb.	lb.	lb.	lb.	lb.	in.	in.	in.	in.	ton lb.		tons lb.	
													approx.		approx.					
Longbrush Evergreen 26-9-0	Standard	U.S. Dept. Agriculture.	June 2	Sept. 13	Oct. 10	10 5	522	304	826	408	351	759	21½	19½	19	17	8 1,300		10 787	
Longbrush Evergreen 56-g-O-3	Standard	U.S. Dept. Agriculture.	" 2	" 14	" 11	11 1	374	249	623	423	278	701	21½	19	19	17	10 473		11 986	
Standard C.I. No. 583	Standard	U.S. Dept. Agriculture.	" 2	" 13	" 11	10 5	528	298	826	492	289	781	22	19	19	16	10 224		11 454	
Standard (Illinois)	Standard	Salser, Illinois	" 2	" 20	" 17	11 3	512	262	774	496	288	784	22½	19	19	17	10 1,905		11 108	
Black Spanish	Standard	Oklahoma	" 2	" 12	" 11	10 5	601	331	934	488	326	814	23	19½	20	17	9 980		9 1,093	
Black Spanish	Standard	Pfeifer, Illinois	" 2	" 12	" 7	10 7	534	275	809	462	317	779	22	18	19½	16	9 731		9 539	
Illinois Favorite	Standard	Pfeifer, Illinois	" 2	" 19	" 11	11 0	678	247	925	569	272	841	21	18	19	16	10 1,469		11 170	
Canada Evergreen	Intermediate	C.E.F., Ottawa	" 2	" 5	Sept. 25	8 4	519	226	745	538	310	848	21	19	20	18	7 1,246		8 292	
C.E.F. (1922)	Intermediate	C.E.F.	" 2	" 5	" 25	8 4	541	259	800	521	368	889	2	18	18	14	7 1,868		8 78	
Black Seeded	Intermediate	C.E.F. (Robert, Ste. Eustache, Que.):	" 2	" 6	" 25	8 4	558	224	782	493	376	869	23	19	19	14½	7 1,682		8 500	
Black Seeded (Que.)	Intermediate	C.E.F. (Que.)	" 2	" 6	" 25	8 4	480	250	730	508	323	831	23	18½	19	15	7 126		7 650	
Black Seeded (1921)	Intermediate	C.E.F.	" 2	" 6	" 25	8 4	496	229	725	466	350	816	22½	19	19	15	6 1,753		7 477	
Acme C.I. No. 243	Dwarf	U.S. Dept. Agriculture.	" 2	" 22	Oct. 12	5 5	1,152	76	1,228	764	164	928	22	17½	19	15	10 1,905		10 887	
Jap Dwarf C.I. No. 442	Dwarf	U.S. Dept. Agriculture.	" 2	" 21	" 7	4 0	665	165	830	427	281	708	18	13½	16	13	8 926		9 868	
European C.I. No. 559	Dwarf	U.S. Dept. Agriculture.	" 2	" 24	" 17	6 5	809	531	1,340	582	526	1,108	20½	19	19	17	10 1,905		11 474	
Dwarf Evergreen	Dwarf	Salser, Illinois	" 2	" 21	" 7	5 4	807	154	961	572	239	811	19½	16	18	14	7 1,308		8 1,848	
Scarbough	Dwarf	Oklahoma	" 2	" 24	" 17	5 6	967	206	1,173	579	305	884	20	17½	18	16	10 1,842		11 485	
Improved Evergreen	Dwarf	Steele-Briggs, Toronto	" 2	" 24	" 17	5 5	987	138	1,125	635	145	780	20	17½	17	14	9 1,851		9 529	

Poor brush includes those with: (*a*) large central stems; (*b*) twisted straws.
Fodder=whole plant minus the brush. Brush harvested when seed in milk stage. Rows 3½ feet apart. Plants 6 inches apart in rows.

The yields of brush this year were very good, especially those of the dwarf varieties. The length of brush of the latter also compares favourably with that of the other types, while the quality of the brush is superior to that of the standard and intermediate varieties as a whole.

One thing in particular is worthy of notice and that is the high percentage of good brush of the dwarfs as compared with that of the other types. The chief reason for this is the enclosure of the lower portion of the brush within the upper leaf sheath in the dwarf varieties, while in the standard and intermediate types the brush is entirely exserted from the sheath, resulting in a considerable number of goose necks and spreading heads. Such heads are largely included in the poor grade of brush.

EXPERIMENTAL PROJECTS AT THE CENTRAL FARM, OTTAWA, ONT.

ENSILAGE CORN

VARIETY TEST

The corn variety test was located on land that had been fall ploughed the previous autumn after growing a crop of cereals in 1927. All of the varieties were planted in triplicate plots on June 1.

The corn made excellent growth during midsummer and continued its growth into the fall months at the expense of maturity. The harvesting operations were carried out as quickly as possible after the first severe fall frost. As usual duplicate shrinkage samples were extracted from each plot and the final value of the different varieties determined by the yields of absolute dry matter that they produced.

TABLE 6—VARIETY TESTS OF INDIAN CORN—1928

Variety	Source	Date cut	Maturity when cut	Fodder corn, yields per acre			
				Green		Dry	
				tons	lb.	tons	lb.
Eureka	Jos. Harris	27-9-28	E. Milk	45	805	8	880
Pride of Nishna	K. McDonald	26-9-28	L. Milk	38	1,518	7	818
Ninety Day White Dent	Oscar Will	27-9-28	Dough	30	1,744	7	425
Burr Leaming	Carters	26-9-28	Milk	34	1,622	7	183
Wisconsin No. 7	Northrup King	26-9-28	L. Milk	34	934	7	159
Wisconsin No. 7	Dupuy & Ferguson	26-9-28	Milk	34	1,649	7	122
Lancaster Sure Crop	Hoffman	27-9-28	Milk	34	1,872	6	1,858
White Cap Yellow Dent	Dupuy & Ferguson	26-9-28	Milk	31	529	6	211
Rustler's White Dent	Northup King	27-9-28	Ripe	26	1,826	6	120
Wisconsin No. 7	K. McDonald	26-9-28	E. Milk	31	720	5	1,888
Early Northern	Dupuy & Ferguson	19-9-28	Glaze	25	1,384	5	1,791
White Cap Yellow Dent	Steele Briggs	26-9-28	Milk	28	1,684	5	1,747
Bailey	Wm. Rennie	26-9-28	Milk	28	747	5	1,599
Northern Prol fic	Wm. Rennie	27-9-28	Ripe	30	1,235	5	1,184
Hall's Golden Nugget	Jos. Harris	26-9-28	L. Milk	24	72	5	991
Early Compton	K. McDonald	26-9-28	Milk	27	67	5	968
Wisconsin No. 25	Northrup King	17-9-28	Dough	24	1,998	5	856
Smoky Dent	K. McDonald	26-9-28	L. Milk	25	187	5	766
Leaming	J. O. Duke	26-9-28	Milk	23	1,125	5	435
North Dakota White Flint	Wm. Ewing	26-9-28	L. Milk	27	1,273	5	235
Minnesota No. 13	Northrup King	19-9-28	Dough	21	1,834	5	150
Wisconsin No. 3	Northrup King	17-9-28	Dough	22	1,655	4	1,932
Minnesota No. 13—Haney Strain	Northrup King	19-9-28	Glaze	17	907	4	1,466
Minnesota No. 13—Howe's Cross	Northrup King	17-9-28	Glaze	16	19	4	952
Silver King	Dakota Improved Seed Co	27-9-23	Dough	18	743	4	823
Silo King	Wm. Rennie	26-9-28	Dough	19	1,523	4	768
Squaw	Dakota Improved Seed Co	5-9-28	Glaze	22	243	4	726
Mandan King	Oscar Will	10-9-28	Ripe	19	56	4	574
Minnesota No. 13	Oscar Will	19-9-28	Glaze	16	1,257	4	589
Northwestern Dent	Macdonald College	18-9-28	Ripe	16	1,544	4	561
Improved King Philip	K. McDonald	27-9-28	Dough	19	1,645	4	548
Minnesota No. 13	International Harvester Co	17-9-28	Glaze	15	636	4	270
Minnesota No. 13—Double Cross Strain.	Northrup King	19-9-28	Glaze	15	1,380	4	165
Pioneer	Oscar Will	17-9-28	Ripe	13	1,202	8	1,839
Northwestern Dent	D. W. Treece	17-9-28	Ripe	13	1,000	3	1,732

TABLE 6—VARIETY TESTS OF INDIAN CORN—1928—*Concluded*

Variety	Source	Date cut	Maturity when cut	Fodder corn, yields per acre	
				Green	Dry
				tons lb.	tons lb.
Champion White Pearl	Dupuy & Ferguson	14-9-28	Dough	15 368	3 1,664
Payne's White Dent	J. M. Bucholz	14-9-28	Dough	16 967	3 1,658
Pride Yellow Dent	Dakota Improved Seed Co	18-9-28	Glaze	15 506	3 1,257
Northwestern Dent	Exp. Farm, Lethbridge	17-9-28	Ripe	12 1,244	3 823
Gehu	A. E. McKenzie Seed Co	14-9-28	Glaze	14 1,344	3 718
Northwestern Dent—Crookston Strain.	Northrup King	18-9-28	Ripe	11 539	3 521
Twitchell's Pride	Exp. Farm, Fredericton	10-9-28	Ripe	14 761	3 455
Gehu	D. Hollinger	10-9-28	Ripe	12 526	3 258
Manitoba Amber	Man. Agric. College	5-9-28	Ripe	13 89	3 256
North Dakota White Flint	A. E. McKenzie Seed Co	10-9-28	Ripe	11 1,677	2 1,713
Quebec 28	Macdonald College	10-9-28	Ripe	11 1,008	2 1,665
Mercer	Northrup King	26-9-28	Ripe	11 913	2 1,417
Manalta	Manitoba Agric College	5-9-28	Glaze	10 657	2 1,030
Triumph	Northrup King	18-9-28	Ripe	11 1,917	2 1,022
Smut Nose	Northrup King	18-9-28	Ripe	10 1,060	2 993
Northwestern Dent	Exp. Farm, Brandon	18-9-28	Ripe	7 1,936	2 954
Manitoba Flint	Manitoba Agric. College	18-9-28	Ripe	8 797	2 560
Howe's Alberta Flint	C. E. Farm, Ottawa	5-9-28	Ripe	5 438	1 1,208

The results recorded in table No. 6 are interesting from several points of view. In the first place it will be noticed that the varieties of corn producing the top yields of dry matter belong to the maturity groups not considered as most suitable for silage purposes in the Ottawa district. It would appear that the long continued fall growth produced sufficient tonnage to more than compensate for the lower percentage of dry matter which these varieties contained. If the chemical analysis of the dry matter all of the varieties could be obtained it is quite likely that the increased yield of the late lots would be considerably reduced. A further point of interest is the fact that so many varieties ripened at Ottawa in a growing season none too favourable for the ripening process.

There does not appear to be any good reason why farmers on, at least, the earlier soils could not grow much of their own requirements of ripe corn for feeding purposes.

In spite of the exceptional showing of the late corns in the summer of 1928 our previous experience has indicated that in the great majority of seasons more feed units per acre can be secured from varieties of corn that will reach, as nearly as possible, the glazed stage of maturity.

SUNFLOWERS

VARIETY TEST

Five lots of sunflowers were grown in triplicate plot tests on land similar to that used for the corn variety test. The lots tested consisted of two representatives of a late maturity group, two of medium maturity, and one early type. The following table presents the yields secured.

TABLE 7—YIELD OF FODDER OF SUNFLOWER VARIETIES

Variety	Source	Green Yield	Total yield dry matter	Relative yield
		tons lb.	tons lb.	
Mennonite	Rosthern	17 1,454	3 311	69·15
Manchurian	A. E. McKenzie Co	29 1,580	4 1,768	107·02
Ottawa 76	C. E. Farm, Ottawa	24 447	3 1,401	81·09
Mammoth Russian	K. McDonald & Sons	40 551	6 955	141·94
Mammoth Russian	Disco Co	27 1,378	4 1,202	100·82

Where silage is the desired commodity the table of yields indicates that the larger growing Mammoth Russian type is the most profitable to plant. The 1928 findings are in accord with those of previous years in this regard.

In districts where corn cannot be grown to advantage, and in particular instances where the smothering of weeds is of special importance, the sunflower offers possibilities worth consideration.

SEED RAISING

There has been a constantly increasing demand for information concerning the possibility of raising sunflower seed. In order to secure definite figures in this connection seed was harvested from the various varieties. The results are recorded in the following table.

TABLE 8—YIELD OF SEED OF SUNFLOWER VARIETIES

Variety	Source	Yield per acre
		lb.
Mennonite	Rosthern	881
Manchurian	A. E. McKenzie Co.	665
Ottawa 76	C. E. Farm, Ottawa	1,290
Mammoth Russian	K. McDonald & Sons	382
Mammoth Russian	Disco Co.	345

As would be expected, the seed yield from the later maturing types is very light. Their yield is so light, in fact, that members of the maturity group to which they belong would be of little or no value for the commercial production of seed in the Ottawa district or other districts with the same or less favourable growing seasons.

A fair yield of seed was secured from the Ottawa 76. This lot offers some possibility for the production of seed where such a commodity is desired.

BREEDING

Only the most promising inbred strains of sunflowers are being continued in the breeding block. Of these lots some twenty-five thousand individual heads were bagged. The more promising of the inbred strains, which are now breeding remarkably true to type are being included in a yield test in 1929 along with the best commercial mixtures.

FIELD ROOTS

VARIETY TEST

The variety test of field roots was seeded in one of the usual rotational areas. Seeding was uncommonly late, this operation not being completed until May 15. The germination and initial stands were well up to normal but the continued wet weather that occurred during the later growing season kept the field root area so wet that the final stands were so uneven that they were considered unfit for comparative test purposes. On the few high spots of the experimental area, excellent crops were secured.

BREEDING

Stecklings, for the production of a 1929 seed crop were raised of the C.E. Farm strains of Yellow Intermediate Mangel, Purple Top Swede and Danish Champion Carrot. A seed crop of the same selection was also raised from stecklings grown in 1927.

FLESHY ANNUAL PASTURES

VARIETY TEST

Thirteen lots of fleshy annual pasture crops were grown in replicated test plots in 1928. Of these lots rape and common kale are the only two at all commonly grown in Canada.

The following table records the yields secured from the current year's crop.

TABLE 9—YIELDS OF FODDER OF FLESHY ANNUAL CROPS

Variety	Source	Green yield per acre	Dry matter yield per acre
		tons lb.	tons lb
Small Seeded Winter or German Rape	Vilmorin	5 1,468	— 1,946
Large Seeded Winter Com	Vilmorin	7 170	1 434
Rape Large Seeded Winter Umbrella	Vilmorin	7 43	1 525
Rape Improved Dwarf Essex	McDonald	8 1,603	1 1,397
Rape or Cole	Sutton & Sons	11 523	2 95
Giant Rape	Sutton & Sons	10 1,970	2 —
Curled Sheep Kale	Sutton & Sons	4 1,972	— 1,742
1,000 Headed Kale	Sutton & Sons	6 1,650	1 678
Improved 1,000 Headed Kale	Sutton & Sons	7 1,022	1 854
Green Stem Marrow Kale	Webb & Son	17 1,505	2 1,844
New French or Purple Stem Marrow Kale	Webb & Son	28 310	4 1,139
French Marrow Kale	Sutton & Sons	16 62	2 1,082
Marrow Stemmed Kale	Sutton & Sons	8 783	1 739

By far the largest yields were secured from several of the strains of marrow kale. These plants have thick, fleshy stems and make an exceptionally thrifty growth. One lot in particular secured from Edward Webb & Sons of Stourbridge, Wordsley, Worcester, England, produced the exceptionally large yield of over four and a half tons of dry matter to the acre.

The Marrow kales would seem to be worthy of more serious consideration on the part of farmers who are now making use of the common rape or the ordinary types of kale.

BIENNIAL AND PERENNIAL CROPS

HAY AND PASTURE MIXTURES

COMPARATIVE TEST.—A second year's harvest was taken off the plots seeded to the hay and pasture mixture, the results of which were recorded in the annual report of 1927. As the findings were in accord with the 1927 figures the yield tables are not being included in the present report. Under favourable conditions the addition of alfalfa and alsike clover to the more commonly seeded timothy and red clover was found to be profitable. In a wet season like that of 1928 the alsike clover, white clover and meadow fescue played a more prominent part in the mixture than they would be expected to do in a normal season.

BREEDING OF MISCELLANEOUS GRASSES

A large number of individual plants were set out of timothy, meadow fescue, orchard grass and red top. These plants were from seed that had been harvested from strains of the crops in question, that have been under improvement for a number of years. In 1929 further selections of the most desirable individuals will be continued.

Seed was harvested from a large number of promising selections of Western rye grass. The more promising strains of this grass are now being multiplied on several Prairie Experimental Farms and two of them are already being distributed in commercial quantities.

RED CLOVER

VARIETY TEST

Seven lots of red clover were tested in replicated test plots. As all the lots were from sources known to produce hardy seed, little winter killing resulted. The following table records the yields secured from the two cuttings secured in the summer of 1928.

TABLE 10—RED CLOVER VARIETY TEST

—	First cut hay 15 per cent moisture yield	Second cut Hay 15 per cent moisture yield	Total yield 15 per cent moisture	Relative yield
	tons lb.	tons lb.	tons lb.	
Alta Swede	3 679	.. 935	3 1,614	96·73
Ottawa	2 1,236	1 1,794	4 1,030	114·72
Oxdrift	3 411	.. 1,495	3 1,906	100·44
St. Clet	2 1,695	1 502	4 197	104·14
Danish	3 249	1 267	4 516	108·19
Late Swedish	3 220	.. ...	3 220	79·02
Russian	2 698	1 914	3 1,612	96·71

Red clover as commonly grown in Canada is of two distinct sorts. One a single cut which as the name implies only produces a single set of seed stalks. The other produces a seed crop after the first cutting has been removed.

During the past few years the Alta Swede and Oxdrift clovers have been almost entirely composed of single cut types. The crop secured in 1928, however, contained a much larger proportion of two cut type plants. This is evidenced by the fact that a reasonably good second cutting was secured from the Oxdrift and Alta Swede lots, whereas the Late Swedish, a pure single cut type, did not produce any second cut at all.

The Central Experimental Farm selection of two cut clover again heads the list in the matter of total yield.

HARDINESS TEST

Sixty-four lots of seed collected in 1927 by the Seed Branch from incoming shipments were tested for suitability for our Canadian conditions. All of the lots presented a satisfactory stand in the fall of planting. Checks on the per cent of winter killing were made in 1928.

The lowest percentage of winter killing incurred by any of the imported lots was 33·91 per cent while the highest winter killing was 75·49 per cent. The average of the sixty-four lots was 52·1 per cent. Most certainly the extent of winter killing exhibited by the imported lots when compared to the excellent stands secured from our home-grown seed in the variety tests would point conclusively to the necessity of developing a source of hardy seed as rapidly as possible.

BREEDING

One thousand individual plants spaced three feet apart each way were set out from seed produced by plants that continued to live and produce seed each successive year for the past nine years.

A multiplication block was also set out in rows planted with seed of the same desirable hardy parentage. A seed crop will be harvested from this block in 1929.

ALFALFA

VARIETY TEST

Nine lots of alfalfa were tested in replicated test plots from which the border was removed before harvesting. The following table presents the results obtained from the test plots in 1928.

TABLE 11—YIELDS OF FODDER OF ALFALFA VARIETIES

Variety	First cut		Second cut		Totals		Relative Yield
	Green Yield per acre	Yield of Hay per acre 15 per cent moisture	Green Yield per acre	Yield of hay per acre 15 per cent moisture	Green Yield per acre	Total hay per acre, 15 per cent moisture	
	tons lb.	tons lb.	tons lb.	tons lb.	tons lb.	tons lb.	
Canadian variegated	10 1,150	3 82	4 850	1 776	15 —	4 858	116·51
Macsel	12 1,200	3 704	.....	.....	12 1,200	3 704	88·18
Cossack "D.I.S.C." Co.	12 500	3 38	5 325	1 1,207	17 825	4 1,245	121·60
Cossack "Par Al. Farm"	11 50	2 1,814	4 1,650	1 1,010	15 1,700	4 824	116·06
Medicago Falcata	8 150	2 123	.....	.....	8 150	2 123	54·23
Variegated	10 —	2 1,188	4 1,850	1 881	4 1,850	4 69	106·13
Grimm (Alta. Seed Gr.)	11 250	2 1,753	4 750	1 783	15 1,000	4 536	112·27
French Grown	9 525	2 768	3 500	1 17	12 1,025	3 785	89·24
Grimm 666	10 600	2 1,556	2 1,350	— 1,728	12 1,950	3 1,284	95·80

The yields secured from the varieties of alfalfa harvested in 1928 were quite similar in their general trend to the results secured in former years. The Cossack, Grimm and Ontario Variegated have given the highest yields while the Falcata type has been at the bottom of the list.

BREEDING

In the summer of 1927 one thousand individual plants of Grimm alfalfa and an equal number of Ontario variegated were set out. These plants were spaced three feet apart each way in order to permit of accurate study of the individual units. In addition to the foregoing several plots from individual selections were put in for further observation and selection.

The winter of 1927-28 was extremely hard on the alfalfa breeding block with the result that many promising looking individual selections were destroyed. However, a considerable number survived and reserve seed is available of the majority of the others.

TURF GRASS EXPERIMENTS

The turf grass experiments started a number of years ago were continued and extended. Twenty-nine plots representing the best seed mixtures and vegetative strains are now being kept under the most exacting turf conditions.

Large quantities of stolons of the more desirable strains of creeping bent grass are also being distributed to the various sporting organizations desiring the same. Tests of various fertilizers, fungicides and worm exterminators are being conducted. At the same time numerous requests for advice on turf matters are being taken care of. On the whole the turf grass experimental work appears to be filling a definite place in providing a needed service.

EXPERIMENTAL METHODS

DRY MATTER LOSS IN EXPRESSED MANGEL JUICE

In connection with the increased interest displayed during recent years in the possibility of speeding up harvesting processes by the use of artificial heat several interesting points have arisen. As the drying of a crop with as high a water content as the mangel would be expensive under present methods, it has been suggested that the greater part of the juice might be extracted by pressure from the pulped roots and the drying process continued by artificial heat. That such a process would speed up the drying operation was certain, but some doubt existed as to the amount of dry matter that might be lost in the expressed juice.

An experiment was carried out by the Forage Plant Division to secure evidence on this point. A quantity of mangels representing the various general types was selected and divided into three lots. The first lot was run through a pulper and the greater portion of the juice squeezed out by a cider press. The remaining pulp was then immediately dried in the dehydrator to an air dry condition. The second lot of mangels was pulped and the pulp containing all the moisture put immediately in the dehydrator. The third lot was sliced reasonably thin and then put in the dehydrator.

The net results of the experiment was that the mangels that had been pulped and pressed in the cider press dried out with a very appreciable saving of time. The sliced mangels were second in this regard while the lot that had been simply pulped took the longest time to dry.

If the experiment had not been carried a little farther the conclusion would have been reached that expressing the juice by pressure before artificial drying was profitable.

Nine samples of the expressed juice were evapored in the dehydrator and the average per cent of dry matter secured was 7·42, most of this dry matter resembling dried out molasses. When one considers that there is from 88-90 per cent of juice in the average crop of mangels, a rate of loss of 7·42 per cent of dry matter due to expressing the juice is serious indeed. This loss is somewhat exaggerated by the fact that the mangels used had been in storage for several months, however it would be quite sufficient to more than obviate any gain secured through shortening the process of artificial drying.

LOSS OF DRY MATTER DUE TO IMMEDIATE DRYING

Quadruplicate shrinkage samples were taken from each experimental plot of hay and pasture crops. Two of these were dried immediately in the dehydrator and the remaining part air dried in special trays.

In the case of corn and field roots eight samples were extracted at harvest time. One half of these were dried immediately and the other half air dried.

The results secured this year in accord with those of previous years in that the immediately dried material exhibits an appreciably higher dry matter percentage than does the material that has been air dried. Several thousands of samples have been saved for complete chemical analyses to determine the exact ingredients lost during the slower drying process. To date inadequate facilities for chemical analyses have prevented any results being obtained.

BORDER EFFECT

All of the hay and pasture mixture plots had the borders carefully removed and weighed entirely separate from the plots themselves. Dry matter determinations were made of both borders and plots and the influence of the border effect calculated.

At the present time our results to date indicate that with most hay crops there is an appreciable and variable influence of border.

SPECIAL ACTIVITIES

In co-operation with the Division of Extension and Publicity, exhibits were prepared for the larger Eastern Canadian exhibitions. A representation from the Forage Crop Division was also in attendance at the majority of these.

Special articles and press notices were prepared from time to time and a speaker supplied for a number of farmers' gatherings. Various members of the Division also acted as judges at several seed fairs.

A bulletin on experimental methods was compiled. The title and number of the bulletin is as follows: Tables for Computing Yields of Forage Crops —Bulletin No. 97 New Series. This bulletin presents several series of tables for shortening and increasing the accuracy of experimental computations.

RANGE INVESTIGATIONS

The season of 1928 saw the inception of a large number of projects at the Dominion Range Experiment Station, near Manyberries, Alta. As the fields had been fenced during the previous year, cattle were placed on the pastures early in May. For information regarding the handling of the stock, the gains made by the different classes of stock, etc., the reader is referred to the report of the Field Husbandry Division.

On the whole, conditions on the range areas were quite favourable for all classes of live stock. Owing to the unusually heavy precipitation of 1927, the soil had gone into the winter in a moist condition and many of the sloughs were well filled with water. The spring run off from the melting snows filled the reservoirs to overflowing. Therefore, although the season of 1928 was somewhat dry, with practically no rain previous to June 17, the range was well watered; many of the sloughs and pot-holes holding water throughout the entire summer. Certain species of native vegetation made some growth during the latter part of March, but low temperatures during April retarded their development. May was unusually hot and dry. However, the soil was moist and practically all species made rapid growth. With a few good showers during May and the early part of June, there would have been a wonderful growth of vegetation. As it was, a fair growth was produced. Certain very early species such as *Carex filifolia* made a good growth and produced much seed. Slightly later species such as *Koeleria gracilis* and some of the Poas made a fair growth and reached the flowering stage, but the continued hot, dry weather prevented seed formation. The various species of *Stipa* and *Agropyron* produced a small amount of seed, while still later species such as *Boutelous gracilis, Deschampsia purpurea* and *Mulhenbergia cuspidata,* profiting by the late June rains, made a heavy growth and produced an abundance of seed. All of the grasses cured well and were not subsequently subjected to "washing". There was very little precipitation during the fall and early winter months and the soil went into winter in a very dry condition.

The work carried on by this division might be classified as follows:—

(1) A study of the native vegetation. (Ten projects.)
(2) A study of the effects of different grazing practices upon the vegetative cover. (Nine projects.)
(3) The improvement of range pastures by artificial means, such as reseeding, surface cultivation, and the application of fertilizers, etc. (Nine projects.)
(4) The growing of cultivated forage crops.

A STUDY OF THE NATIVE VEGETATION

Approximately 300 species of native plants have been collected, identified, mounted and placed in the herbarium. These include all the more common species found on the short grass plains area, as well as a number from other range areas.

In order to study pasture conditions it is necessary to be able to recognize the more common species in any of their growth stages, and therefore a study is being made of the morphology of the root, stem and leaf parts of many of the native plants.

A study is being made of the palatability and nutritive value of the more common species. Each species is collected at several different stages of its development throughout the summer months, as well as after being subjected to winter conditions, and also in different districts representing a wide range of soil and climatic conditions. This study will be extended over a period of several years in order to determine the nutritive value of the various species. To date, eighty samples have been collected and forwarded to the Division of Chemistry at Ottawa for analysis.

Considerable progress has been made in the matter of determining the correlation between soil types and the distribution of vegetative species. This project is being conducted in co-operation with Mr. S. Barnes, the soils specialist of the Field Husbandry Division. A large number of sites are selected, representative of different soil types and vegetative associations. At each site a study is made of the soil and of the vegetative cover. Samples of the soil, taken at different depths, are collected for further analysis. While much more work must be done before we can arrive at definite conclusions, the results so far obtained indicate that there is a definite and very marked relationship between the nature of the soil and the vegetative species found growing upon it. If such be the case, then a knowledge of the vegetation would enable one to predict the nature of the soil, and vice versa. It would then be possible to quickly and accurately determine just what kind of agriculture any particular area was best suited for. Other influencing factors such as climatic conditions, altitude, slope, exposure and plant succession would of course have to be taken into account.

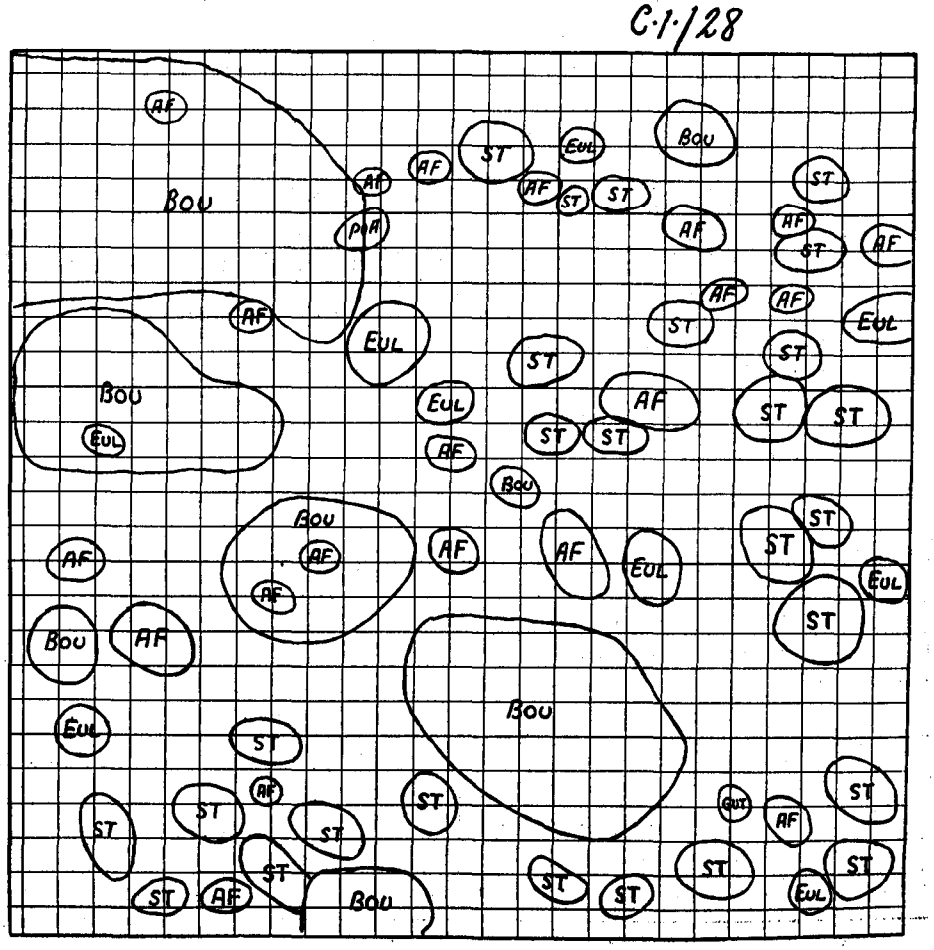
Some time has been devoted to a classification of vegetative areas and to a study of poisonous plants.

A STUDY OF THE EFFECTS OF DIFFERENT GRAZING PRACTICES UPON THE VEGETATIVE COVER

The station lands have been divided into four fields of equal size. One of these fields is grazed continuously from early spring until late in the fall, a practice that is followed in most of the summer ranges. On the other three fields, a system known as Deferred and Rotation Grazing is being practised. In order to compare the effects of different methods of grazing upon the native vegetation, it is necessary to be able to detect and measure even very slight changes in the vegetative cover. This is being done by means of charted quadrats. One hundred sites have been selected on each of the four fields. Each site is termed a Major Quadrat and the notes taken on each quadrat include: Number of quadrat, date, location, altitude, exposure, slope, kind of soil, names of principal species of native plants on the quadrat, density and height of vegetation and seed production. On each of the Major Quadrats an area of one square metre termed a Minor Quadrat is staked out and charted. The charting is done by the aid of a pantograph. The chart is one-sixteenth the size of the quadrat and on it is mapped the area occupied by each shoot tuft or patch of vegetation found growing on the quadrat. The name of each species is placed on the map for each of the areas occupied by it. The area occupied by each species is calculated and expressed both in square cm. and in per

cent of the area of the whole quadrat. We then have the area occupied by each species, the total area occupied by grasses, the total area occupied by weeds, and the total area devoid of vegetation. These quadrats will be recharted every year or as often as significant changes are found to occur. No plant can disappear from, nor become established on the quadrat, nor can the area occupied by any patch of vegetation already on the quadrat increase or decrease in size without the change being detected and measured. Thus it will be possible to detect and measure any changes that take place in the vegetative cover from year to year, and on this basis to compare the different grazing practices being tested.

Furthermore, an attempt is being made to arrive at a nutritive index and a yield index for each species, and this together with a knowledge of the area occupied by each species, will make it possible to determine the forage acre value of each quadrat and hence of the whole field.



The exact area occupied by each species of grass is recorded on permanent record sheets. Bou.=Bouteloua gracilis (grama grass). St.=Stipa comata (spear grass). Koel.—Koeleria gracilis (June grass). Ag.=Agropyron Smithii (Blue Joint grass). Poa.=Poa (various species). Art. f.=Artemisia frigida (Prairie sage). Eu.L.=Eurotia lanata (Winter fat).

On each of the four fields a number of plots have been permanently fenced. Each plot has an area of four square rods. One half of each plot is left untouched in order to determine the changes that take place in the vegetation when protected from grazing. The remaining half of each plot is clipped as a yield test. Yield tests are being conducted also under actual grazing conditions.

The effects of early spring grazing are being studied by means of plots enclosed by hurdles. On the continuously grazed field, 16 plots were enclosed at the time the cattle were placed on the field. In two weeks time half of these plots were opened to grazing and after another period of two weeks the remainder of them were thrown open. The changes that take place in the vegetative cover of these plots are studied by means of mapped quadrats. During the summer of 1929 it is proposed to increase the number both of the permanently and of the temporarily enclosed plots.

SAMPLE QUADRAT RECORD SHEET ON WHICH IS RECORDED DEFINITE INFORMATION REGARDING THE VEGETATIVE COVER

Quadrat No. C-1

1. Date Charted—September 4, 1928.
2. Location—Sec. 22, S.W.
3. Character of Site—
   (*a*) Elevation: On side of low ridge.
   (*b*) Exposure and slope: Medium east slope.
   (*c*) Soil: Deep, sandy loam.
4. Plant Type—
   (*a*) Principal species on major quadrat: Bouteloua gracilis; St; Koel; Ag; Poa; Art. f; Eu. L; Gut. S; Gr. S; Cactus.
   (*b*) Density of vegetative cover: A fairly good cover; much Art. f.
   (*c*) Height of vegetation: 4 inches-6 inches.
   (*d*) Seed production: Bou. and a little Stipa and Ag.
5. SUMMARY OF MINOR QUADRAT DATA

(*a*) Grasses:

									Totals
Symbol	Bou.	St.	Poa						
Number of specimens	13,300	5,500	125						
Nutritive index									
Yield index									
Area occupied (sq. cm	2,128	880	20						3,028
Area occupied (%)	21·28	8·80	·20						30·28
Relative forage value									

(*b*) Broad Leaved Plants:

									Totals
Symbol	A.F.	Gut.	Eu. L.						
Number of specimens	2,500	75	1,400						
Nutritive index									
Yield index									
Area occupied (sq. cm	400	12	224						636
Area occupied (%)	4·00	·12	2·24						6·36
Relative forage value									

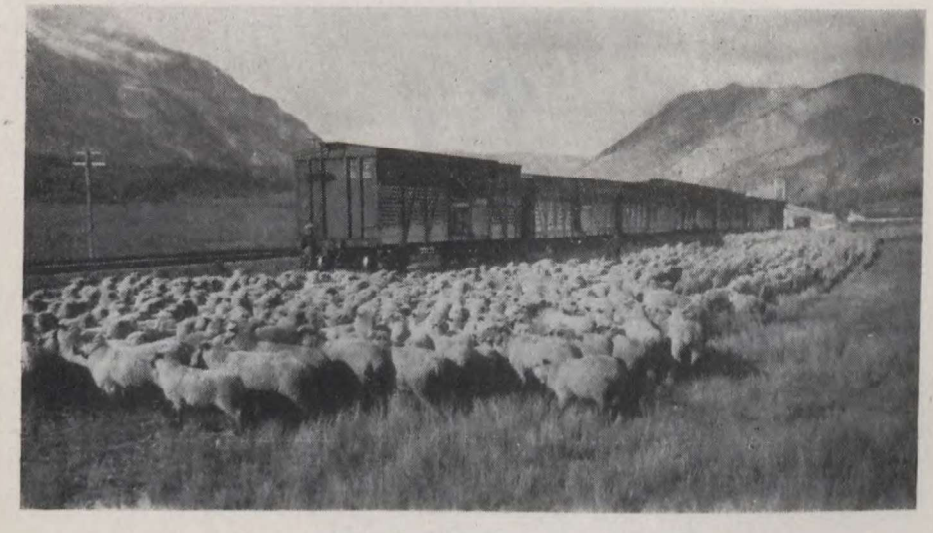
6. Relative Forage Value of Minor Quadrat.....
7. Distance of Quadrat from nearest watering place.....
8. Remarks .....

For these tests, three blocks of land have been selected, representing different types of soil and different conditions of elevation, exposure and slope. On each block a large number of plots have been staked out, and seeded to different grasses and legumes. The seed was sown broadcast by hand. Some of the plots were disked after seeding while others were left untreated. The varieties sown include Western rye grass, blue joint, crested wheat grass, Brome grass, June grass, spear grass, fescue grass, meadow grass, alfalfa and sweet clover. Some reseeding has been done also on abandoned fields. The history of these fields has been obtained and notes were taken on the nature of the soil and on the vegetation already on the fields. On some of the plots the seed was disked in while on others it was left to be tramped in by the stock.

Other plots were disked in order to determine the effects of surface cultivation upon the native species. A few plots were treated with well rotted manure at the rate of 25 tons per acre, one half of each plot being disked after the manure was spread. One large plot was burned off late in the fall in order that the effects of burning might be determined. On all of these plots the changes that may take place in the vegetative cover are being studied by means of mapped quadrats.

CULTIVATED FORAGE CROPS

Experimental work carried on in co-operation with the ranchers in the growing of forage crops such as alfalfa, sweet clover, corn and crested wheat grass, is giving very promising results, and has led to a marked increase in the acreage devoted to such crops on the range areas. At the request of individual ranchers many areas have been studied with a view to determining whether or not such areas could be irrigated and whether it would be advisable to break them up and attempt the growing of forage crops. On the Great Sand Hills area northeast of Maple Creek there are large tracts of sandy land where the water table is not far from the surface but on which the native vegetation is of low forage value. Previous to the inception of this work in 1927 very little alfalfa or sweet clover was grown on this area. Since then several fields of these crops



Homeward bound after a summer on the range.

have been established and are in a very promising condition at the present time. It is believed that the amount of forage produced on such areas can be greatly increased by the growing of alfalfa and sweet clover.

Good progress has been made in the testing of different strains of corn. During 1928, one hundred strains were tested for earliness of maturity and for yielding ability. The chief purpose of these tests is to determine which strains are best suited for different purposes such as, hogging off, fodder production, seed corn production, etc. The yields of fodder from different strains varied from 2 tons to 8½ tons per acre, while the yields of grain ranged from 10 bushels to 36 bushels per acre. On the whole the season of 1928 was not a favourable one for corn production. Some of the more promising strains are: Gehu, Dakota White Flint, Falconer, Minnesota 23, Minnesota 13, Haney strain, Northwestern Dent, Crookston, Brooks and Lethbridge strains, Twitchell's Pride and Payne's White Dent.

INVESTIGATIONS ON MOUNTAIN RANGE LANDS

A short time was devoted to a study of range conditions in the Nicola valley and near Kamloops in British Columbia. In these districts many of the pastures have become seriously depleted. Valuable forage species such as Blue-bunch wheat grass (*Agropyron spicatum*) have been largely killed out and the area occupied by species of very inferior forage value. Arrangements have been made to co-operate with a number of ranchers on these areas in reseeding and other projects pertaining to range improvement.

A few days were spent on the Forest Reserve near Coleman, Alberta. Here there are large burned over areas, parts of which are not yet coming back to forest and on which very little vegetation of forage value is produced. During 1929 it is proposed to establish test plots of a large number of different grasses and legumes, at different altitudes on these burned over areas. An attempt will be made also to establish clumps of vegetation by scattering seed up near the snow line in order that it might be carried down by the water from the melting snows. If a scattered stand could be established and allowed to produce seed, the whole area would soon become covered with vegetation. This work will be conducted in co-operation with the Forest Rangers and with the Lethbridge Dominion Experimental Station.

Knee deep in a good stand of grama grass.

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