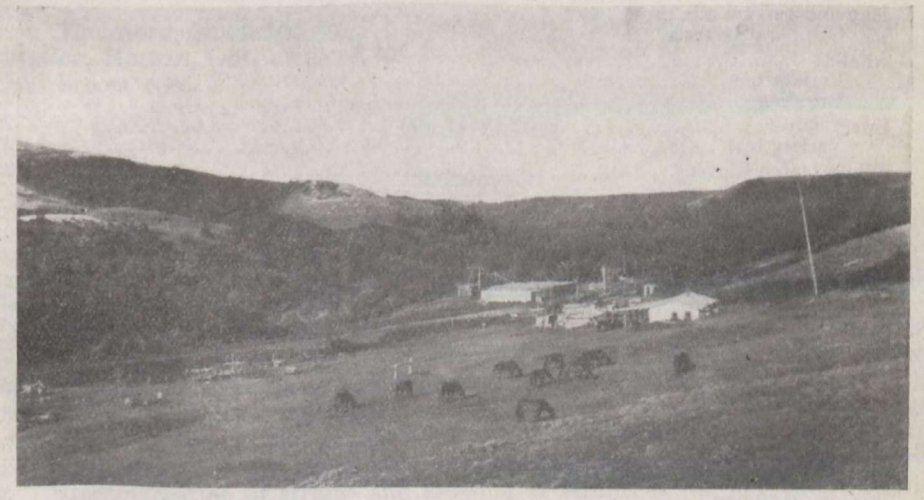
DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT OF THE

DIVISION OF FORAGE PLANTS

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

FOR THE YEAR 1927



Headquarters of a Saskatchewan ranch.

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DIVISION OF FORAGE PLANTS

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

The season of 1927 was characterized on the whole by being cool and above normal in precipitation. The retarding of the early and mid-season growth due to an abnormal climatic condition was compensated for to some extent by a rather open fall. As a consequence the yields of corn, sunflowers and field roots and other fall harvested crops were well up to the average.

The range investigations being conducted co-operatively by the Field Husbandry and Forage Plant Divisions were further advanced by the establishment of the Dominion Range Experiment Station at Manyberries, Alberta. Here, approximately 15,000 acres of leased range land is being set aside for the investigation of range problems.

The experimental projects reported as being conducted at the Central Experimental Farm are for the most part under the personal supervision of Mr. R. I. Hamilton, and those at Harrow under the direction of Mr. F. Dimmock. The range experiments being conducted under the Forage Plant Division are carried out by Dr. S. E. Clarke.

PROJECTS CARRIED ON AT HARROW, ONTARIO

The work conducted by the Forage Crop Division at the Experimental Station, Harrow, Ont. included the following crops: corn, soybeans, sugar beets and broom corn.

FIELD CORN

BREEDING

Of the 200 strains selected for breeding purposes in 1926 only 100 were grown at Harrow this year. These consisted of strains representative of the medium and late maturing varieties. It was considered advisable to grow the strains of the early varieties at Ottawa on account of the extremely heavy damage which they suffered last year due to the heavy corn borer infestation.

Inbreeding was continued with the strains both at Harrow and at Ottawa and as most of them have now been inbred for five years there is very little discarding necessary. Hereditary weaknesses have been discovered and eliminated during the process of inbreeding and purity is now evident in the similarity of type of the plants in the individual strains.

Recombination of strains and crossing of strains is the next step in order to determine which are the best for the production of vigorous high yielding varieties or hybrids. In 1926 a few recombinations were made to be tested for yield, etc., in 1927. The strains were selected at random, no previous attempt having been made to determine which of them would be the most suitable for crossing purposes.

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TEST OF RECOMBINATIONS

The yield results obtained from the recombinations mentioned above are shown in the following table. The number of days required by each lot to mature is also given:—

RESULTS OF TESTS OF RECOMBINATIONS

Strains recombined	Variety	Days to maturity	Yield of corn (containing 15 per cent moisture			Average per cent grain on ear
			Ears	Shelled corn	Cob	
			bush*.	bush.†	lb.	
121 x 128	N. W. Dent	128	75·9	75·4	1,090·6	79·5
129 x 124	N. W. Dent	128	65·9	67·4	837·6	81·8
155 x 158	Yellow Dent	134	76·1	75·3	1,108·2	79·2
161 x 159	Yellow Dent	134	69·6	71·8	850·6	82·5
165 x 164	Wisconsin No. 7	130	69·4	70·3	916·5	81·1
167 x 169	Wisconsin No. 7	132	75·7	72·3	1,244·7	76·5
169 x 187	Wisconsin No. 7	129	45·0	44·0	690·6	78·1
172 x 184	Variegated	129	54·9	52·8	884·7	77·0
183 x 180	Wisonesin No. 7	129	41·0	41·0	576·5	79·9

* Bushels of 70 pounds. † Bushels of 56 pounds.

From these results it is obvious that some strains recombine to give better results than others. It is also evident that the same strain used in different combinations may give widely different results. The yields of the higher yielding recombinations are very appreciably higher than the average yield of the common commercial sorts.

CORN BORER CONTROL

A series of four plots was arranged and planted with five varieties in each plot. The varieties included, Twitchell's Pride, an early flint; Longfellow, a medium early flint; Pride Yellow Dent, a medium early dent; Wisconsin No. 7, a fairly late dent and Burr Leaming, a late dent. Thus the varieties covered a fairly wide range of maturity.

The first plot was planted with the five varieties at the normal time of corn planting. Each of the three succeeding plots were planted at intervals of one week after the preceding one. This was in order not only to determine the effect of late planting on the amount of borer infestation but also to determine just how late the corn could be planted and still result in a high yield coupled with sufficient maturity.

One-third of each plot received an additional supply of nitrate and phosphate fertilizer at the time of planting, while another one-third received the same amount of additional fertilizer at the time when the corn plants were one foot in height. The remaining one-third received no fertilizer other than that which was ordinarily applied to the whole field. The object of the additional fertilizer was to determine whether or not maturity could be speeded up and the yield increased especially in the late plantings, while in the early plantings it was considered that it might give increased strength and vigour to the plants, sufficient to enable them to stand up under the attacks of the borer.

Unfortunately seasonal and growth conditions resulted in very little differences in the growth of the plants, due to the additional fertilizer. While the maturity of some of the plants appeared to be increased somewhat by the fertilizer added, the infestation of the corn borer was certainly not decreased.

The unfertilized portion of the three of the most promising appearing varieties was allowed to mature as much as the season would permit. The first

CLASSIFICATION AND DESCRIPTION OF THE MORE COMMON VARIETIES OF FIELD CORN IN CANADA—DENTS, SWEETS AND FLOUR

+ = Range of variability of character.
⊕ = Average condition of character.
8 = Variation of character of only occasional occurrence.
* = Number of rows of kernels different in one of three years.
x = Three groups later in second year than first.
† = Flint one year—dent the following year.
z = Different kernel and cob colours in consecutive years.
G = Green
(i) = Taken one year only.

CLASSIFICATION AND DESCRIPTION OF THE MORE COMMON VARIETIES OF FIELD CORN IN CANADA—FLINTS

Group	Variety	Source	Number of years tested	100 Kernel Size: Ave. length (cm.)	Ave. width (cm.)	Ave. thickness (cm.)	Ave. cubic content (cu. cm.)	Average shelling (%)	Ear Length: Range (inches)	Ear Length: Average (inches)	Circumference Upper: Range (inches)	Upper: Average (inches)	Circumference Lower: Range (inches)	Lower: Average (inches)
	Flints													
I	Howe's Alberta	Univ. of Alberta	3	79·3	95·1	40·0	18·2	83·9	4·75–7·75	6·0	3·0–4·3	3·6	2·2–4·4	3·9
	White Flint	H. Trellé, Wembley, Alta.	1	87·2	100·0	42·8	21·4	82·8	4·25–5·75	4·8	3·5–4·0	3·7	3·9–4·4	4·2
II	Huston	G. MacLaren, Pipestone, Man.	1	96·0	103·0	48·4	25·3	83·9	6·0–7·5	6·7	3·8–4·8	4·2	4·3–5·2	4·7
	Manitoba White	" "	1	86·8	90·2	44·5	22·8	84·3	5·6–7·5	6·5	3·9–5·0	4·4	4·5–5·6	4·8
	Six-twenty-six	" "	1	87·2	105·3	47·5	27·0	86·2	5·1–6·6	5·9	3·6–4·5	4·1	4·3–5·0	4·6
	Gehu	A. E. McKenzie	3	86·2	88·1	46·0	20·2	85·2	6·0–9·5	7·4	3·8–5·2	4·4	4·3–5·5	4·9
	N. Dakota White Flint	"	3	97·5	98·9	44·0	22·7	83·7	5·3–9·3	7·4	3·9–5·2	4·3	4·5–6·0	4·9
	Dakota Flint	O. Will	3	90·4	103·4	46·4	26·0	83·6	6·0–9·6	7·5	3·8–5·4	4·4	4·0–5·8	4·9
	Dakota White Flint	"	3	90·4	101·2	47·5	24·9	84·3	5·3–9·3	7·6	3·8–5·3	4·5	4·3–6·0	5·1
	Shota	"	3	90·1	95·9	46·0	22·9	83·0	6·0–9·5	7·7	3·5–5·0	4·4	4·1–5·6	4·8
	Improved Squaw	A. E. McKenzie	3	88·6	102·9	46·9	24·6	83·9	5·5–10·0	7·7	3·8–4·8	4·3	4·1–5·6	4·8
	Burleigh	O. Will	3	88·4	93·5	43·9	22·2	84·1	5·5–9·0	7·1	3·6–5·0	4·2	4·0–5·6	4·7
	Early Squaw (O.A.C.)	F. D. Richey, Wash., D.C.	2	92·4	103·6	46·6	28·8	85·7	5·5–9·5	7·8	3·8–5·2	4·5	4·3–5·8	5·0
	White Squaw (N.-K.)	" "	2	86·6	91·6	45·4	21·1	83·7	6·0–11·0	8·7	4·0–4·8	4·4	4·5–5·5	5·0
	Minnie Chesney	G. MacLaren	1	93·2	99·2	46·0	24·2	85·5	6·0–8·8	7·5	4·1–4·9	4·4	4·5–5·3	4·8
	Gehu	O. Will	3	90·3	93·1	45·8	21·1	85·1	5·5–9·0	7·1	4·0–5·4	4·5	4·3–5·8	5·0
	"	Disco	3	93·9	93·2	42·8	21·1	85·9	5·5–9·5	7·2	3·8–5·2	4·4	4·3–6·0	4·9
	"	Colquhoun	1	95·2	92·8	41·9	21·8	87·2	6·0–9·0	7·7	4·0–5·0	4·5	4·5–5·5	5·0
	Quebec No. 28	Macdonald College, P.Q.	3	96·0	88·8	43·8	19·0	81·4	6·3–10·0	7·8	3·8–5·4	4·6	4·5–5·9	5·1
	Twitchell's Pride	Twitchell	2	86·6	99·6	43·0	23·8	85·9	6·5–11·5	9·3	3·6–4·6	4·1	2·8–5·3	4·5
	"	Exp. Farm, Fredericton	3	88·0	104·4	46·4	25·7	83·0	6·3–12·5	9·7	3·5–4·6	4·2	3·8–5·3	4·6
	Manitoba Amber	Man. Agric. College	1	92·4	101·6	43·9	24·0	82·9	5·5–8·2	6·7	4·0–4·9	4·5	4·5–5·4	4·7
*	Canada Yellow	Dupuy & Ferguson	3	88·8	90·2	45·5	21·0	81·7	6·5–9·5	8·3	3·8–5·3	4·8	4·5–5·8	5·3
III	Amber Flint	Wimple	3	75·5	86·7	39·1	16·0	81·6	5·5–8·4	7·2	3·0–4·0	3·5	3·5–4·4	4·0
	Rhode Island White	Rhode Island Exp. Station	1	93·0	114·8	44·2	27·6	83·6	7·0–9·5	8·1	4·0–4·9	4·3	4·3–5·3	4·8
	Mandan King	O. Will	3	91·8	102·3	45·8	24·8	85·0	6·0–11·0	8·2	3·8–5·0	4·4	4·0–5·6	4·9
IV	Imp. King Phillip	Macdonald	2	94·8	111·2	45·1	28·8	81·6	8·5–11·5	9·8	3·6–4·9	4·4	4·4–5·3	4·9
	King Phillip	Dupuy & Ferguson	2	101·4	119·6	44·6	32·2	82·4	8·0–12·0	10·7	4·4–5·5	4·9	4·5–6·0	5·4
	"	Ewing	2	97·2	118·0	42·2	30·5	83·7	7·0–12·0	10·0	4·5–5·6	5·0	4·9–5·9	5·3
	"	Dery	2	99·6	120·3	45·2	33·4	83·2	7·3–12·0	10·1	4·3–5·5	4·9	4·5–5·9	5·2
	"	Rennie	2	100·6	120·8	45·5	34·6	84·7	8·0–12·0	10·0	3·9–5·4	4·7	4·5–5·8	5·2
	"	Steele Briggs	2	99·0	111·4	45·3	30·0	81·7	7·0–12·0	10·4	4·2–5·4	4·9	4·6–5·8	5·3
	"	Bruce	1	92·8	112·0	42·6	27·6	81·0	8·0–10·3	9·2	4·0–5·5	4·2	4·0–5·2	5·0
	Early Yellow Flint	Steele Briggs	2	95·2	111·0	46·6	29·5	84·7	9·0–12·3	11·0	4·0–4·9	4·5	4·3–5·8	4·9
	Longfellow	R. J. Johnston	3	96·0	118·4	47·5	32·0	84·0	9·3–12·0	10·8	4·0–5·2	4·6	4·5–5·4	5·0
	"	A. S. Campbell	3	97·9	110·2	46·1	32·4	84·4	9·0–12·3	10·0	3·9–4·9	4·5	4·4–5·8	4·9
	"	Clark	2	98·6	125·6	46·2	30·0	84·2	8·0–12·0	10·8	4·0–4·9	4·6	4·5–5·5	5·0
	"	Dery	3	97·0	112·0	44·2	28·1	83·9	8·0–12·3	10·4	4·0–5·1	4·7	4·3–5·8	5·0
	"	Rennie	3	95·3	117·3	44·0	30·3	84·4	8·5–12·5	10·7	3·9–5·0	4·6	4·5–5·5	5·0
	"	Dupuy & Ferguson	3	99·1	113·9	42·5	27·7	83·5	8·0–12·3	9·8	4·2–5·5	4·6	4·5–6·1	5·0
	"	Ewing	3	98·8	112·5	44·1	28·5	82·8	8·0–12·5	10·7	4·0–5·3	4·0	4·4–5·5	4·9
	"	Graham	1	88·4	112·4	41·7	26·6	85·7	8·0–10·0	9·1	3·9–4·5	4·1	4·3–4·9	4·6
	"	Duke	1	97·2	124·0	43·0	30·2	82·4	8·0–10·9	9·8	4·3–4·9	4·5	5·0–5·9	5·3
	"	Disco	1	97·2	113·2	41·3	25·2	84·9	8·5–12·0	9·9	4·4–5·3	4·6	4·6–5·5	5·0
	"	S. B.	3	97·7	116·4	41·7	28·9	82·4	7·5–11·6	10·2	4·0–5·3	4·7	4·4–5·6	5·0
	"	Macdonald	1	98·0	119·2	46·1	30·0	80·9	8·5–12·3	10·4	4·5–5·3	4·8	4·8–5·6	5·2
	"	Bruce	3	98·4	118·3	43·9	30·5	82·4	7·0–13·5	10·2	4·4–5·0	4·8	4·3–6·5	5·3
	Early Longfellow	Graham	2	97·6	107·8	41·6	27·0	82·4	8·0–12·5	10·1	4·2–5·8	4·9	4·6–6·0	5·2
*	Angel of Midnight	Rennie	3	94·2	115·0	44·3	28·5	83·7	8·3–11·0	10·0	4·0–5·5	4·7	4·3–6·0	5·1
	"	S. B.	3	99·1	114·0	40·6	27·7	84·8	8·0–12·3	10·3	4·0–5·4	4·7	4·4–5·9	5·1
	Early Canada Yellow	Ewing	2	94·8	103·4	44·1	26·5	83·5	9·0–12·0	10·7	4·2–5·5	4·8	4·5–5·9	5·3
	Rainbow Flint	O. Will	3	98·3	105·9	45·4	29·2	81·7	7·8–12·0	9·7	4·2–5·8	5·0	4·6–6·6	5·7
	Extra Early Australian White Flint	Bruce	3	100·5	106·7	47·0	29·9	80·2	9·0–12·5	10·2	4·1–5·9	5·1	5·0–6·6	5·7
	Squaw	Disco	3	101·5	104·3	45·8	29·9	80·4	7·5–12·3	9·9	4·3–6·0	5·3	4·8–7·0	5·8
	North Dakota White Flint	Macdonald	1	102·0	120·8	42·5	32·4	83·4	8·5–12·0	9·7	4·0–4·6	4·4	4·5–5·8	5·0
	North Dakota	S. B.	2	96·8	118·8	43·4	30·3	83·5	7·5–11·5	9·9	4·0–5·0	4·7	4·8–6·3	5·3
	"	Dery	2	93·2	110·8	46·2	29·2	82·8	8·0–13·1	10·4	4·0–5·3	4·7	4·6–5·9	5·1
	"	Rennie	3	93·9	113·7	43·5	27·7	84·3	8·0–12·8	10·8	4·1–5·2	4·5	4·1–5·8	5·0
	"	D. & F.	3	98·9	108·8	48·3	29·3	80·1	7·7–12·0	9·9	4·5–7·0	5·1	4·7–7·8	5·6
	"	Graham	3	95·4	116·0	43·2	30·4	83·8	7·0–12·1	9·0	4·0–5·6	4·5	4·5–5·5	5·1
	"	Ewing	3	95·9	116·0	48·1	30·9	83·9	8·5–12·7	10·4	4·5–5·2	4·7	4·2–5·2	5·1
	Salzer's N. Dakota	R. J. Johnston	3	98·3	117·1	48·6	31·9	84·4	8·5–13·0	10·2	4·5–5·2	4·6	4·5–5·5	5·0
	"	A. S. Maynard	3	97·1	118·8	45·7	30·3	84·5	7·5–13·8	10·5	4·5–5·5	4·8	4·2–5·4	5·2
	"	A. S. Campbell	3	97·6	121·1	45·6	31·3	84·0	9·5–13·0	10·5	4·2–5·3	4·8	4·7–5·5	5·1
	"	Laird	2	99·8	114·0	42·7	30·4	86·2	7·5–12·2	10·6	4·2–5·2	4·9	5·0–6·5	5·2
	N. Dakota Early White Flint	Bruce	3	97·1	118·3	42·6	31·1	83·4	8·0–11·2	10·5	4·5–5·2	4·8	4·5–5·5	5·2
	Sanford	Dery	2	96·0	121·6	42·9	30·2	84·3	8·2–11·3	10·5	4·2–5·1	4·8	4·5–5·6	5·2
	Sandford's White Flint	Rennie	3	93·7	114·5	42·3	28·8	82·4	8·5–13·1	10·2	4·0–5·2	4·9	4·5–5·6	5·0
	" "	Ewing	3	96·9	113·7	42·3	28·0	83·8	8·2–11·5	9·8	4·2–5·2	4·7	4·5–5·7	5·2
	" "	S. B.	2	96·4	112·6	44·2	28·9	84·1	8·0–13·0	10·0	4·0–5·0	4·8	4·2–5·2	4·9
	Compton's Early	J. Brisley	3	97·6	125·3	45·7	26·8	81·7	7·2–11·5	9·4	4·2–5·8	4·9	5·0–6·3	5·4
	"	Duke	2	106·0	99·2	44·4	28·0	84·5	9·7–12·1	10·2	4·7–6·0	5·5	5·5–6·7	5·8
	"	S. B.	3	98·0	96·9	44·9	24·8	82·2	7·0–10·7	9·3	4·1–5·7	4·9	4·7–6·2	5·5
	Early Compton	D. & F.	3	100·0	95·4	44·7	24·2	81·3	7·2–11·4	9·8	4·2–5·5	4·9	4·5–6·2	5·4
	"	Ewing	3	100·6	106·0	45·1	26·3	80·6	8·5–13·5	9·9	4·8–5·8	5·3	5·1–6·9	5·8
	"	Graham	3	100·1	95·4	43·6	23·8	80·3	7·0–12·0	9·6	4·4–5·0	5·2	4·7–6·1	5·7
	Compton	Ewing	2	94·4	90·0	42·0	21·5	81·0	8·0–11·5	9·4	4·7–5·4	5·2	4·7–6·6	5·6
	Compton's	Rennie	2	95·6	89·8	43·6	23·0	80·9	7·3–12·3	9·8	4·6–5·6	5·1	4·9–6·1	5·6
	"	Macdonald	1	96·0	90·0	42·0	22·5	80·6	7·8–11·8	9·5	4·8–5·8	5·2	5·2–6·3	5·7
	Early Kent	W. Backus, Chatham, Ont.	1	101·2	100·8	44·8	27·4	82·0	8·5–11·2	10·0	5·0–5·8	5·2	5·1–6·0	5·6
	Gold Nugget	J. Brisley	3	99·6	120·5	43·0	30·7	83·3	7·0–12·0	9·5	4·3–5·6	4·9	4·6–6·3	5·8
V	Angel of Midnight	Bruce	3	97·7	119·3	43·5	29·6	82·9	7·0–12·6	10·5	4·1–5·5	4·9	4·4–6·1	5·1
	Compton's Early	"	2	95·2	93·8	42·3	22·3	81·8	7·0–12·5	9·9	4·2–5·3	5·1	4·6–6·6	5·7
	"	Rennie	1						7·7–12·7	9·6	4·6–5·2	5·0	5·1–6·0	5·5
	Hall's Gold Nugget	Harris	2	109·8	138·4	43·3	33·4	83·1	8·7–11·5	10·5	5·0–6·1	5·5	5·2–6·6	6·0
	Northern Prolific	Rennie	3	99·5	117·9	45·4	31·7	81·2	8·2–12·0	10·4	4·1–5·5	4·8	4·5–6·1	5·2
	Golden Nugget	Bruce	2	107·6	122·8	43·7	32·7	78·7	8·7–12·5	10·4	4·8–6·0	5·3	5·0–6·6	5·7

+ = Range of variability of character.
⊕ = Average condition of character.
S = Variation of character of only occasional occurrence.
* = Number of rows of kernels different in one of three years.
x = Three groups later in second year than first.
G = Green.
(1) = Taken one year only.

planting of Burr Leaming one of the three varieties harvested, yielded 83·3 bushels of ears per acre while Pride Yellow Dent planted three weeks later yielded 70·2 bushels to the acre. Twitchell's Pride the third variety selected yielded 32·5 bushels per acre from the third planting. It appears significant that the only first planting worth harvesting was from Burr Leaming, which variety is a product of a double cross. The inherent vigour of the plant apparently enabled it to stand up more than ordinarily well under heavy borer attacks.

CLASSIFICATION OF CANADIAN GROWN VARIETIES OF FIELD CORN

During each of the three years 1924-26, from 130 to 200 lots of corn, representative of the different varieties of field corn commonly grown in Canada, were grown at the Dominion Experimental Station, Harrow, Ont., for the purpose of classification. The seed was obtained from as many different sources as possible throughout Canada and the United States. An attempt was also made to secure seed of all the different lots from the same source each year, but this was found to be impossible. The actual number of years each lot was tested is shown in the accompanying folder.

The test as a whole was intended to be continued for a longer period than three years, but the rapid spread and increase of the European corn borer in the district in which the work was being carried on makes its continuance impossible.

Accurate records of both plant and ear characters were taken in each year, also the length of time required by each lot to mature.

The primary classification has been made on the basis of maturity. Maturity groups from No. I to No. VIII appear in the table, the group centres being one week apart. The lower limit of group No. 1 represents the average number of days required to mature Howe's Alberta Flint over the full period of three years. This was the earliest variety in the test and its maturity period in the three years varied from 86 to 92 days, with an average of 89 days. Therefore Group No. 1 includes all varieties maturing within 89 to 95 days; Group No. II, 96 to 102 days; and so on up to Group No. VIII. The average maturity period of each of the different lots was used for grouping purposes.

Plant and ear characters were very carefully and accurately recorded. They not only show the difference between varieties but also the great variability, within different lots, of the same variety. This, of course is to be expected in a normally cross-fertilized crop like corn and indicates the difficulty of classifying with the exactitude possible with self-fertilized crops.

It was found in many instances that a variety bearing the same name in consecutive years and coming from the same source, would show differences in type for which the seedsmen were responsible. For example, an eight-rowed yellow flint in one year would sometimes be found to be a twelve-rowed flint the following year although bearing the same name in the two years. Dent varieties with yellow kernels and red cobs in one year in a few cases showed white kernels and white cobs the following year. So-called dent varieties sometimes turned out to be flints and vice-versa. Attention is drawn to such cases in the table.

A study of the table will show that a number of so-called varieties, while differently named, exhibit characters which show no greater variation than is found within either of the varieties themselves. In such cases, the inclusion of similar varieties under a common name would result in a greater simplicity and less confusion. For example, we have Longfellow, Early Yellow Flint, Angel of Midnight, Early Longfellow and Early Canada Yellow exhibiting as wide variations within themselves as from one another. They come within the same maturity group and could easily be included under a common varietal

name. The same is true of some of the so-called varieties of white flint, and is especially true in the case of a number of yellow dent varieties. Leaming, Golden Glow, and Bailey as they are sold commercially might easily be given a single varietal name.

A number of the lots appearing in the table were tested for one year only. They are included for the sake of comparison with other lots bearing the same name and which were in the test for a longer period. The length of time required to mature even for the one year also gives some indication as to which maturity group these lots belong.

The Dominion Experimental Station at Harrow, Ont., is located at practically the most southern point on the mainland of Canada. Any variety that just matures in the average season in this district is undoubtedly late enough for silage purposes in most sections of Canada and too late for some sections. Groups V and VI contain the varieties that will ripen nicely in the section in which the test was conducted. Varieties in Group VII will ripen in an exceptionally good year, and are quite suitable for silage purposes in this section, but they are much too late for silage purposes in Eastern Ontario and Quebec, also further East. All varieties in Group VIII are too late for any purpose in Canada.

SOYBEANS

VARIETY TEST

Eighteen varieties of soybeans were tested both for yield of fodder and of seed. The yields as shown in the following table were well up to the average.

TABLE 2.—SOYBEANS—YIELD PER ACRE OF FODDER AND SEED FOR 1927 AND AVERAGES FOR FOUR YEARS 1924–1927

Variety	Source	Days to Maturity		Fodder								Seed			
				Green Weight				Moisture-free dry weight				As harvested		Moisture-free dry weight	
		1927	Average 4 years 1924–27	1927		Average 4 years 1924–27		1927		Average 4 years 1924–27		1927	Average 4 years 1924–27	1927	Average 4 years 1924–27
				tons	lb.	tons	lb.	tons	lb.	tons	lb.	bush.	bush.	bush.	bush.
Ste. Anne No. 92	MacDonald College, Que.	108	108	4	1,932	4	917	1	685	1	252	24·82	20·27	21·82	17·95
xEarly Brown	Salmon Arm, B.C.	108	109	4	1,362	4	710	1	633	1	412	24·53	22·76	21·56	20·02
xxMandarin	U.S. Dept. of Agr.	110	114	4	1,816	5	114	1	684	1	673	30·67	27·11	26·95	23·85
Yellow 210	China	113	116	5	687	5	609	1	939	1	682	31·43	29·99	27·76	24·37
Yellow 17	"	114	117	6	1,939	6	1,027	1	1,898	1	1,355	29·04	29·52	25·36	26·17
Chinaton Echo	"	114	116	6	661	6	448	1	1,393	1	1,067	30·73	26·16	26·92	23·11
Black (China)	"	115	117	6	1,649	6	1,069	1	1,423	1	1,187	27·95	25·15	24·42	21·96
xxItalian	"	115	119	6	1,242	7	1,155	1	1,740	1	1,869	32·79	35·10	28·52	30·59
xxO.A.C. No. 211	O.A.C., Guelph, Ont.	115	120	7	622	6	1,491	2	32	1	1,619	36·48	33·16	31·96	28·57
O.A.C. No. 81	"	115	116	7	505	6	822	2	91	1	1,372	37·21	28·72	32·41	25·22
Summerland	Summerland, B.C.	117	118	6	923	7	12	1	1,534	1	1,395	24·32	23·05	21·14	20·51
Ito San	J. Noble, Harrow, Ont.	120	122	7	1,536	7	1,876	2	30	1	1,908	36·78	31·87	31·75	27·89
Manchu	Dakota Impr. Seed Co.	121	122	7	1,638	7	1,037	2	227	1	1,818	38·93	35·56	33·83	31·13
Black Eyebrow	"	121	122	7	1,159	7	1,374	2	50	1	1,776	37·09	36·04	32·23	31·79
Green	J. Noble, Harrow, Ont.	122	122	6	1,968	6	1,109	1	1,961	1	1,457	41·69	34·78	36·29	30·73
Early Korean	China	123	123	8	1,787	7	1,247	2	294	1	1,584	47·98	35·51	41·53	30·78
Golden	J. Noble, Harrow, Ont.	123	125	8	771	7	1,446	2	468	1	1,930	43·50	36·81	37·03	32·15
xxA.K.	U.S. Dept. of Agr.	123	126	8	451	8	1,594	2	460	2	473	41·56	40·45	36·20	34·98

x=Averages for two years only (1926–1927). xx=Averages for three years only (1925–1927).
Add 15 per cent moisture to yields of M–F dry weight of fodder to obtain approximate yields of hay.

The beans were grown in rows two and a half feet apart, the plants in the rows being spaced approximately 3 to 4 inches apart. This rate of planting appears to give excellent results so long as the rows are kept free from weeds.

The above table shows some very interesting results. All of the varieties with the exception of one have been tested for either three or four years and the average yields for these periods are shown. The A. K. variety over a three-year period has averaged the highest yield of both fodder and seed. This is followed by five other varieties the average yields of which, both of fodder and seed, are approximately the same. The average yield of seed of these six varieties is well over 35 bushels per acre for the four-year period.

A. K. leads in the production of hay with an average yield for the three-year period of slightly over 2½ tons. More than half the varieties in the test have given an average yield, over the three- or four-year period, of between 2 and 2½ tons of hay.

These results demonstrate the value of the soybean as an annual hay crop.

SUGAR BEETS

TEST OF VARIETIES AND STRAINS

Through the courtesy of the United States Department of Agriculture the seed of a number of sugar beets was obtained from the Michigan and the United States Department of Agriculture testing station at Fort Collins, Colorado.

The seed thus obtained was planted in a preliminary test along with seed of a number of varieties that are commonly grown in the sugar beet areas of southwestern Ontario.

The seed obtained was divided into four lots, one lot of which was planted at the Dominion Experimental Station, Harrow, Ont., and the remaining three lots on the farms of three representative sugar beet growers in the area producing the bulk of the sugar beet crop. Those who are responsible for the conducting of these experiments wish to thank the Dominion Sugar Company, who kindly furnished the commercial seed and who put us in touch with their growers, for their hearty co-operation. Appreciation is also expressed for the co-operation and interest of the growers on whose farms the tests were conducted.

On the whole the season would be considered as only fair for the production of sugar beets, the crop being considerably lighter in yield than the average. To compensate for this, however, the average per cent of sugar appeared to be higher than normal. The chief cause for the lowering of yield was evidently drought which occurred during the growing period of the crop. The entire month of September was particularly dry and also more than ordinarily warm during the first part of the month.

The results of the various tests conducted are recorded in table No. 3.

TABLE 3—SUGAR BEETS, 1927—STRAIN AND VARIETY TEST

Variety or Strain	Source	Dominion Experimental Station, Harrow, Ontario. Soil—Sandy loam to clay, gravelly.								Farm No. 1, near Chatham. Soil—Clay loam.							
		Beets, yield per acre	Average weight per beet	Per cent sugar	Purity	Sugar per acre (p.c. x yield)	Relative yield of sugar	Tops, Yield per acre, green weight		Beets, yield per acre	Average weight per beet	Per cent sugar	Purity	Sugar per acre (p.c. x yield)	Relative yield of sugar	Tops, Yield per acre, green weight	
		tons lb.	lb.			lb.		tons	lb.	tons lb.	lb.			lb.		tons	lb.
1 Kleinwanzlebener	Columbia Sugar Co., Mich.[1]	13 1,460	0·9	17·6	88·4	4,832·96	88·6	7	679	17 821	1·5	16·0	84·4	5,571·36	111·3	9	478
2 60500	Mich. St. College[2]	16 28	1·0	16·8	87·8	5,380·70	98·6	9	681	20 1,057	1·7	13·0	83·7	5,337·41	106·6	15	800
3 61000	" "	15 1,844	1·0	16·7	89·5	5,317·95	97·5	8	1,890	17 1,957	1·5	15·2	82·4	5,465·46	109·1	11	680
4 61100	" "	16 1,310	1·1	17·0	87·9	5,662·70	103·8	9	1,087	16 162	1·4	13·8	85·9	4,438·36	88·6	10	1,960
5 62500	" "	14 748	0·9	14·9	89·0	4,283·45	78·5	9	586	13 821	1·1	15·7	84·9	4,210·90	84·1	10	1,496
6 64900	" "	18 1,518	1·2	16·0	89·7	6,002·88	110·1	7	1,646	20 95	1·7	13·4	85·1	5,372·73	107·3	11	1,364
7 65700	" "	15 1,639	1·0	17·2	87·3	5,441·91	99·8	7	1,432	18 364	1·5	14·0	87·6	5,090·96	101·7	9	480
8 66300	" "	16 1,485	1·1	16·6	85·0	5,558·51	101·9	7	400	19 331	1·6	13·7	87·4	5,251·35	104·9	9	480
9 68200	" "	18 1,458	1·2	16·4	87·5	6,143·11	112·6	9	1,008	22 450	1·9	15·2	86·9	6,756·40	134·9	16	120
10 69100	" "	15 1,977	1·0	17·4	88·3	5,564·00	102·0	10	698	20 489	1·7	15·7	87·0	6,355·66	126·9	13	1,720
11 Home grown	H. Stokes, Dom. Sugar Co., Chatham.[3]	14 680	0·9	16·5	87·9	4,732·20	86·8	8	1,841	15 1,971	1·3	15·8	86·0	5,051·42	100·9	10	1,960
12 554-24	U.S.A. Ft. Collins[4]	13 980	0·9	18·7	89·7	5,045·26	92·5	9	1,404	12 1,304	1·1	16·6	88·5	4,200·46	83·9	9	1,008
13 882-24	" "	14 1,003	0·9	17·2	86·3	4,988·52	91·5	7	40	14 1,379	1·2	14·9	88·3	4,377·47	87·4	10	834
14 1340-24	" "	16 1,545	1·1	17·0	87·6	5,702·65	104·6	7	1,840	14 1,084	1·2	13·8	86·4	4,013·59	80·1	11	680
15 1612-24	" "	17 1,377	1·1	17·9	87·8	6,332·48	116·1	9	317	18 473	1·5	15·7	88·2	5,726·26	114·4	12	1,842
16 1749-24	" "	16 123	1·0	16·8	86·3	5,396·66	98·9	6	362	15 1,660	1·3	14·7	87·6	4,654·02	92·9	10	1,459
17 2361-23	" "	14 96	0·9	16·6	86·0	4,663·94	85·5	7	293	16 157	1·4	14·0	88·5	4,501·98	89·9	10	1,674
18 4477-24	" "	14 538	0·9	16·2	85·4	4,623·16	84·8	7	1,238	15 934	1·3	12·7	86·9	3,928·62	78·5	9	1,937
19 Schreiber	Dom. Sugar Co.[5]	18 929	1·2	17·7	87·8	6,536·43	119·8	7	1,461	15 1,021	1·3	14·9	87·9	4,622·13	92·3	11	680
20 R. & G	" "	16 412	1·0	17·5	87·5	5,672·10	104·0	6	1,953	17 1,922	1·5	15·8	89·3	5,675·68	113·3	11	1,758
21 Horning	" "	17 298	1·1	17·3	87·1	5,933·55	108·8	8	200								
22 Strube	" "	17 1,724	1·1	18·0	87·2	6,430·32	117·9	9	1,902								
23 Dippe	" "	17 137	1·1	16·1	87·8	5,496·06	100·8	7	1,238								
24 Basseczyski	" "	15 203	1·0	17·1	86·5	5,164·71	94·7	8	1,278								

Variety or Strain	Source	Farm No. 2, near Chatham, Soil—Fairly heavy clay loam.							Farm No. 3, Kingsville. Soil—Sandy loam to clay.	
		Beets, yield per acre	Average weight per beet	Per cent sugar	Purity	Sugar per acre (p.c. x yield)	Relative yield of sugar	Tops, yield per acre green weight	Per cent sugar	Purity
		tons lb.				lb.		tons lb.		
1 Kleinwanslebener	Columbia Sugar Co., Mich.[1]	16 587	1·4	15·1	84·1	4,920·64	102·7	7 1,840	16·0	82·6
2 60500	Mich. State College[2]	17 943	1·5	14·7	84·2	5,136·62	107·2	6 1,902	15·6	84·9
3 61000	" "	13 1,463	1·1	15·2	85·6	4,174·37	87·2	6 337	16·0	88·2
4 61100	" "	13 886	1·1	15·0	82·0	4,032·90	84·2	9 103	16·7	85·3
5 62500	" "	14 338	1·2	15·3	85·2	4,335·71	90·5	6 1,001	16·7	86·7
6 64900	" "	16 1,630	1·4	14·7	81·3	4,943·61	102·2	5 715	16·6	83·8
7 65700	" "	18 102	1·5	14·9	84·0	5,379·20	112·3	5 80	15·8	89·4
8 66300	" "	17 958	1·5	13·6	84·4	4,754·29	99·3	5 1,627	16·5	84·8
9 68200	" "	19 329	1·6	14·1	86·2	5,404·39	112·8	6 1,251	16·6	89·7
10 69100	" "	19 757	1·6	15·2	84·4	5,891·06	123·0	7 155	16·8	89·7
11 Home grown	H. Stokes, Dom. Sugar Co., Chatham[3]	13 1,087	1·1	15·0	88·9	4,063·05	84·8	5 347	15·9	90·6
12 554-24	U.S.A. Ft. Collins[4]	13 1,838	1·2	15·2	84·3	4,231·38	88·3	6 552	16·4	79·2
13 882-24	" "	17 425	1·4	14·7	79·9	5,060·48	105·7	4 640	16·0	86·1
14 1340-24	" "	16 1,242	1·4	14·3	85·3	4,753·61	99·3	8 1,703	15·9	81·7
15 1612-24	" "	14 133	1·2	15·6	83·9	4,388·75	91·6	9 1,277	16·9	89·0
16 1749-24	" "	13 1,186	1·1	14·4	85·2	3,914·78	81·7	4 814	16·4	83·5
17 2351-23	" "	16 520	1·4	14·3	83·5	4,650·36	97·1	5 847	16·1	86·8
18 4477-24	" "	15 1,903	1·3	14·7	85·2	4,689·74	97·9	4 1,936	16·5	85·6
19 Schreiber	Dominion Sugar Co.[5]	18 298	1·5	15·2	85·1	5,517·30	115·2	7 173	16·8	87·5
20 R. & G.	" "	16 1,203	1·4	15·1	85·9	5,013·65	104·7	6 728	17·7	86·9
21 Horning	" "	17 780	1·5	15·3	84·4	5,321·34	111·1	9 1,111	17·3	89·1
22 Strube	" "									
23 Dippe	" "									
24 Bussczyski	" "									

Yield per acre based upon stands corrected to beets 9 inches apart in the row at Harrow and 12 inches apart in the row on the Brown and Clement Farms.
Per cent sugar = figure obtained from analyses made by Dominion Sugar Co., Ltd., Chatham, Ontario.
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).
No yields obtained from plots on Golden Farm owing to poor stand. Sample of each lot only sent in for analysis.

[1] Columbia Sugar Company, Bay City, Mich. [2] Michigan State College. [3] H. Stokes, Dominion Sugar Company, Chatham, Ontario. [4] U.S.D.A., Fort Collins, Col.
[5] Dominion Sugar Company, Chatham, Ontario.

The figure indicating the relative yield of sugar is probably the most reliable index of the value of a strain or variety. The average yield of sugar of all varieties is given the value of 100. Varieties whose relative yield is higher than this figure are therefore more desirable from the standpoint of sugar production, whereas varieties falling below 100 can be considered as less desirable than the average under the current year's climatic conditions. Strain No. 9 (68200), for example, has given a relative yield of sugar of 112·6, 134·9, and 112·8 in the three tests. In each case it is appreciably higher than the average.

Unfortunately the stand obtained on farm No. 3 was so unsatisfactory that it was considered inadvisable to report the yields. The stands on the remaining farms, however, were satisfactory.

While one year's results cannot be considered as conclusive evidence as to the yielding ability of any strain or variety, it indicates that some of the improved strains secured give promise of outyielding commercial seed by a profitable margin. Further tests are planned to ensure a greater reliability of data in this comparative test.

BROOM-CORN

VARIETY TEST

Eighteen varieties of broom-corn were grown for the purpose of determining the yields of brush and its suitability for manufacture into brooms and whisks.

The yield and length of brush and the yield of fodder for the different varieties appear in the following table. The average yields for the two years 1926-27 are also given along with last year's length of brush, shown for purposes of comparison.

TABLE 4—BROOM CORN—VARIETY TEST—1927

Variety	Original source of seed	Type	Date of planting 1927	Date of harvesting brush 1927	Date of ripening seed 1927	Height 1927	Air dry yield of brush per acre: Good 1927	Good Average 1926-27	Poor 1927	Poor Average 1926-27	Total 1927	Total Average 1926-27	Length of brush: Good 1927	Good 1926	Poor 1927	Poor 1926	Yield of fodder per acre: Green weight 1927	Average 1926-27
						feet ins.	lb.	lb.	lb..	lb.	lb.	lb.	inches	inches	inches	inches	tons lb.	tons lb.
Longbrush Evergreen 26-g-0	U.S. Dept. of Agr.	Standard	May 31	Sept. 14	Oct. 15	10 6	348	351	282	374·5	630	726	15	21	13	18·5	11 651	11 531
Longbrush Evergreen 56-g-o-3	"	"	" 31	" 16	" 15	11 0	418	448	212	291·5	630	739·5	15½	21	13½	19·5	11 1,087	12 243
Standard C.I. No. 583	"	"	" 31	" 14	" 15	10 6	385	474	220	284	605	758	15	21	12	17	10 909	11 1,569
Standard (Illinois)	Salzer, Illinois	"	" 31	" 27	" 20	10 6	556	487·5	123	301·5	679	789	15	20·5	13	18	10 598	11 220
Black Spanish	Oklahoma	"	" 31	" 12	" 10	10 0	356	432	313	323	669	755	18	19	16	15·5	9 544	9 1,149
Black Spanish	Pfeifer, Illinois	"	" 31	" 14	" 11	10 0	364	426	348	338·5	712	764·5	16	20·5	13½	16	9 1,291	9 444
Illinois Favourite	"	"	" 31	" 21	" 19	11 0	599	515	150	284	749	799	15	21	13½	17·5	10 1,469	11 521
Canada Evergreen	Botany Div., Ottawa	Interm.	" 31	" 8	Sept. 27	7 3	531	548	325	352	856	900	18	20·5	16	18	6 1,628	8 816
Black Seeded	Botany (Rob, Ste. Eustache)	" ..	" 31	" 7	" 26	7 3	585	460	340	452·5	925	912·5	17	16	14	10·5	8 1,051	8 909
" (Que).	Botany (Quebec)	" ..	" 31	" 8	" 26	7 6	694	522	229	359·5	923	881·5	17	16	15	11	7 1,713	7 912
" (1921)	Botany	" ..	" 31	" 8	" 26	7 9	560	450	296	411	856	861	18	15·5	16	10·5	7 904	7 839
C.E.F. (1922)	"	" ..	" 31	" 8	" 26	7 6	655	511	274	422·5	929	933·5	16	15	14	10·5	7 1,433	8 183
Acme C.I. No. 243	U.S. Dept. of Agr.	Dwarf	" 31	" 19	Oct. 17	5 9	622	570	146	208·5	768	778·5	14	21·5	12	16·5	10 1,002	10 378
Jap Dwarf C.I. No. 442	"	" ...	" 31	" 12	" 11	4 0	383	308	224	338·5	607	646·5	13	16·5	12	13·5	10 1,002	9 1,839
European C.I. No. 559	"	" ...	" 31	" 19	" 20	5 4	630	468·5	426	523	1,056	991·5	15½	20·5	15	18	11 278	11 759
Dwarf Evergreen	Salzer, Illinois	" ...	" 31	" 16	" 10	5 3	459	455	259	281·5	718	736·5	16	19	12	14·5	8 1,735	9 1,118
Scarbough	Oklahoma	" ...	" 31	" 27	h " 20	5 6	521	385	169	354	690	739	14½	20·5	13	18·5	10 878	11 806
Improved Evergreen	Steele Briggs	" ...	" 31	" 27	h " 20	5 6	465	459·5	152	147·5	617	607	14	19	11½	13·5	9 140	8 1,868

Brush harvested when seed in milk stage. Poor brush included those with (*a*) large central stems; (*b*) twisted straws: (*c*) crooked heads.
Fodder = whole plant minus the brush.
h = seed harvested but not entirely ripe.

A glance at the table is sufficient to show that for the standard and dwarf types this year's yield of brush is below that of last year in every case except two. In both these types the brush is also considerably shorter in length than that of the previous year, while the yields of fodder remain approximately the same.

In the case of the varieties designated as belonging to the intermediate type the exact reverse of the above is true. The yields of brush are approximately as high and in two cases higher than last year, and the brush is longer in all of the varieties. These varieties it may be noted were obtained in 1924 from the Botany Division, Central Experimental Farm, Ottawa, Ont., where they had been grown for several years. Since that time they have been undergoing selection at Harrow.

Just what was responsible for the behaviour of the standard and dwarf varieties this year is not definitely known, but it is believed that unfavourable weather conditions at certain stages of growth was in part responsible.

It might be mentioned here that while broom-corn is attacked by the European corn borer the amount of infestation and consequent damage has not been as heavy as in field corn. The presence of the borer in broom-corn, however, undoubtedly affects the development of the brush and its final quality.

A representative sample of brush from this year's test was sent to the National Woodenware Company, Limited, St. Thomas, Ont., to determine its suitability for manufacture into brooms and whisks and to obtain its approximate value per pound.

After having been put through the regular processes the brush was stated to be of good average grade and its market value approximately $100 per ton. As with other crops, the price varies according to market conditions.

PROJECTS CARRIED ON AT OTTAWA (1927)

CORN

VARIETY TEST

Forty-one lots of field corn were tested in 1927 for yield and general suitability for the agricultural area represented by the Central Experimental Farm. The following table presents the results in tabular form.

TABLE 5—VARIETY TEST OF CORN 1927

Variety	Source	Maturity Group	Green yield		Dry matter yield		Average yield, dry matter 1924-27 (a)	
			tons	lb.	tons	lb.	tons	lb.
Gehu	A. E. McKenzie Co.	2	18	616	2	975	2	1,634
N. D. White Flint	A. E. McKenzie Co.	2	13	195	3	983	3	37
Quebec No. 28	Macdonald College, Que.	2	12	162	3	928	3	833
Twitchell's Pride	Ex. Farm, Fredericton	2	11	1,645	3	412	3	1,847
Northwestern Dent	Ex. Farm, Brandon	2	12	610	3	824	3	369
Canada Yellow	Dupuy & Ferguson	2	11	1,574	3	210	3	1,178
Pioneer	Oscar Will	3	12	177	3	544	2	1,689
Falconer	A. E. McKenzie	3	13	1,057	3	441	*3	579
Northwestern Dent	A. E. McKenzie	3	12	1,421	4	735	4	74
Mandan King	Oscar Will	3	13	351	3	44	3	790
Northwestern Dent	Macdonald College	4	19	940	4	694	*4	594
Impr. King Philip	K. McDonald & Sons	4	20	1,214	5	905	4	1,725
Pride Yellow Dent	Dak. Impr. Seed Co.	4	22	542	4	1,063	*4	378
Minnesota No. 13	Oscar Will	4	20	652	4	1,682	3	1,393
Early Northern	Dupuy & Ferguson	4	24	1,685	5	214	4	1,022
Rainbow Flint	Oscar Will	4	21	646	4	1,524	3	463
Squaw	Dak. Impr. Seed Co.	4	24	1,589	5	607	.....	
N. D. White Flint	Wm. Ewing Co.	4	27	535	5	1,695	.....	
Sanfords White Flint	Wm. Ewing Co.	4	27	564	5	858	*4	1,479
Early Compton	Dupuy & Ferguson	4	32	1,599	7	225	.....	
Smoky Dent	K. McDonald & Sons	4	26	1,914	6	858	*5	1,658
Silo King	Wm. Rennie	5	20	761	4	1,675	4	1,888
White Cap Yellow Dent	Steele Briggs	5	34	212	7	831	5	495
Smoky Dent	John A. Bruce	5	19	1,477	4	969	4	1,709
Angel of Midnight	John A. Bruce	5	19	1,983	5	1,255	.....	
Bailey	Wm. Rennie	5	18	1,458	4	451	4	299
Hall's Golden Nugget	Jos. Harris	5	31	859	6	1,423	**6	270
Northern Prolific	Wm. Rennie	5	18	1,718	3	1,866	4	839
Golden Glow	John A. Bruce	5	28	1,627	6	0	.....	
Wisconsin No. 7	K. McDonald & Sons	5	23	1,100	4	1,375	4	829
90 Day White Dent	Dak. Impr. Seed Co.	5	24	618	5	678	4	1,275
White Cap Yellow Dent	Dupuy & Ferguson	6	34	680	7	415	5	1,124
Improved Leaming	John A. Bruce	6	29	1,824	6	240	5	658
Wisconsin No. 7	Dupuy & Ferguson	6	23	367	4	1,565	4	962
Leaming	J. O. Duke	6	19	1,265	4	840	4	1,060
Mammoth Southern Sweet	Graham Bros.	6	22	723	5	1,219	4	1,597
Pride of Nishna	K. McDonald & Sons	7	28	475	6	579	.....	
Burr Leaming	Carter	7	26	1,676	5	659	3	1,040
Champion White Pearl	Dupuy & Ferguson	7	20	1,924	4	431	4	279
Cuban Giant	Graham Bros.	8	27	1,150	5	282	.....	
Eureka	J. Harris	8	28	1,262	5	414	4	1,825

* Average for two years only. ** Average for three years.
(a) Differences in yield of less than 15 p.c. should not be considered as significant.

Under the climatic conditions obtaining in Canada the question of the length of time that any variety of corn takes to mature is of prime importance. For ensilage purposes the variety that will reach the glazed stage in an average year is liable to be the most profitable to grow. For the production of grain the necessity of a corn reaching maturity in an average season is self evident.

In view of the foregoing, the 1927 data as well as the averages including the preceding three years yields have been arranged on the basis of the maturity group into which the various varieties segregated. The maturity groups as listed are separated by intervals of one week but the extremes of the various groups grade into each other.

Varieties belonging to the same maturity group would be expected to be equally suitable climatically for any particular area. The highest yielding member of each group should therefore be the most desirable to grow.

The average yield of dry matter for the years 1924-27 is the safest basis of comparison for the varieties listed.

It will be noted that there is considerable variation in the yielding ability of varieties within a common maturity group.

Because of greater maturity, some of the earlier maturing varieties also yield approximately as much dry matter per acre as the majority of the later maturing types.

SUNFLOWERS

VARIETY TEST

Three varieties of sunflowers were tested in 1927. These represented the different maturity groups occurring in commercial lots. Ottawa 76 was the earliest maturing, Manchurian a mid-season type, and the Mammoth Russian the latest maturing variety. As in previous years the late Mammoth Russian considerably out-yielded the other types both in material as harvested and absolute dry matter.

BREEDING

Breeding operations were continued with all of the more promising inbred strains of sunflowers resulting from five generations of previous inbreeding. The various strains are now comparatively pure as to growth type. The different strains exhibit a striking difference in their reaction to climatic conditions and attacks of disease producing organisms. A few of the lots are remarkably free from injury resulting from the sunflower rust (*Puccinia helianthi*, Schw.) The recombination of similar appearing strains and also some intercrossing between dissimilar types is planned for 1928.

FIELD ROOTS

MANGELS

Variety Tests.—One hundred and fifty three lots of mangels were planted in the variety tests in 1927. These represented practically all of the lots of mangels offered for sale to Canadian farmers. The object of including so many varieties is to get a definite check on the purity of the various lots offered for sale.

While there has been a decided improvement in the trueness to type of mangels as a whole during the past few years, some of the lots offered to growers are still extremely variable. For the information of growers at large, a complete table for all of the varieties tested in 1927 is included. In this table will be found the variety, source from which seed was obtained, yields of green and dry matter, the general type to which the variety is supposed to belong and the percent of off-types present.

TABLE 6—VARIETY TEST OF MANGELS FOR 1927

Variety	Source	Green yield		Dry matter		Relative yield	General type	Off types present
		tons	lb.	tons	lb.			
Giant Yellow Half Long Intermediate	Wm. Rennie & Co	37	860	4	1,695	141·18	Interm. yellow (lemon and orange).	5·7% ovoid, 2·4% long, 1·6% red.
Select Giant White Sugar	Ralph Moore	37	1,522	4	1,154	133·30	Half long white	12% long, 5% ov oid, 4% intermediate.
Roster Barres	Hjalmar Hartmann Co	39	1,051	4	925	129·97	Interm. yellow (orange)	3·7% long, 2·2% ovoid, 2·2% tankard.
Danish Sludstrup	F. James	40	1,955	4	846	128·82	Interm. yellow (orange)	Very uniform.
Champion Gatepost	Graham Bros	38	851	4	770	127·71	Interm. yellow (lemon orange)	16·7% long, 7·9% ovoid, 1·8% tankard, 1·8% red
Barres Half Long	General Swedish Seed Co	38	319	4	442	122·94	Interm. yellow (orange)	2·8% ovoid, 2·8% long.
Monarch White	A. E. McKenzie Co	26	778	4	338	121·42	Half long white	7·4% long, 3·7% ovoid, 7% Interm., 3·7% rose
Yellow Intermediate	MacDonald College	35	558	4	253	120·18	Interm. yellow (orange)	3·6% ovoid, 1·5% long.
Giant White Half Sugar	Wm. Ewing Co	28	1,954	4	233	119·89	Intermediate white	9·1% half long, 8·3% ovoid, 4·1% long, 2·5% rose.
Giant Sugar White	Graham Bros	37	1,786	4	218	119·67	Half long white	5% long, 5% ovoid, 1·7% Interm. 2·5% rose.
Giant Rose Intermediate	Wm. Ewing Co	32	794	4	190	119·27	Half long rose	6% long, 1% ovoid, 6·6% half long white, 6% long white, 2% ovoid white ·7% ovoid red
Red Intermediate	Edward Webb & Son	41	269	4	186	119·21	Intermediate red	16·8% ovoid, 6·9% long, 1% tankard, 1% globe.
Non such	Gartons Ltd	37	56	4	137	118·49	Globe yellow (orange)	9·6% ovoid, 3·7% interm. 3·7% tankard.
Giant Yellow Intermediate	Kenneth McLonald Co	40	1,378	4	126	118·33	Interm. yellow (orange)	4·9% ovoid, 8% tankard, 8% red.
Giant White Feeding	Wm. Rennie Co	39	181	4	118	118·22	Half long white	6·2% long, 2·5% ovoid.
Red Eckendorffer	General Swedish Seed Co	40	1,342	4	109	118·09	Tankard red	6·1% ovoid.
Danish Improved	Lupuy & Ferguson	27	1,820	4	91	117·82	Half long rose	5·8% long, 3·2% intermediate, 6% red, 8·3% white, 3·2% long white.
Giant Yellow Intermediate	Steele Briggs Co	36	1,425	4	·77	117·62	Long yellow (orange)	6·9% intermediate, 0·8% tankard, 0·8% red.
Danish Sludstrup	Graham Bros	34	639	4	72	117·55	Interm. yellow (orange)	3·9% ovoid, 2·6% long, 1·3% red.
Red Intermediate	Sutton & Sons	37	1,583	4	49	117·21	Intermediate red	7·5% ovoid, 5% long, 2·5% tankard, 2·5 globe.
Eckendorffer Yellow Tankard	Hjalmar Hartmann Co	35	1,183	4	48	117·20	Tankard yellow	
Stryno Barres	Hjalmar Hartmann Co	40	1,919	3	1,949	115·76	Intermediate yellow (orange)	3·9% long, 2·3% ovoid.
Manitoba Giant Yellow	A. E. McKenzie Co	28	973	3	1,931	115·49	Intermediate yellow	16·6% ovoid, 4·6% very light yellow, 0·7% red.
Danish Sludstrup	Wm. Rennie Co	37	940	3	1,920	115·33	Intermediate yellow (orange)	6·3% ovoid, 0·9% long, 1·8% Intermediate yellow (lemon).
Yellow Intermediate	University of British Columbia.	38	373	3	1,840	114·17	Intermediate yellow (orange).	2·8% ovoid.
Mammoth Golden Giant	Graham Bros	28	1,634	3	1,838	114·14	Intermediate yellow (lemon and orange).	3·3% ovoid, 1·7 % globe, 1·7% long.
Sludstrup	J. A. Steves	35	131	3	1,801	113·60	Intermediate yellow (orange)	4·5% ovoid, 2·2% long.
Peerless	A. E. McKenzie Co	35	1,746	3	1,781	113·31	Intermediate yellow (orange)	1·4% red, 2·8% long, 1·4% ovoid.
Giant White Feeding	John A. Bruce	33	378	3	1,766	113·09	Half long white	7·3% long, 4% ovoid, 1·6% half long rose.
Improved Giant	Halifax Seed Co	34	41	3	1,765	113·08	Half long white	4·9% long, 4·9% intermediate, 1·6% ovoid, 3·3% half long rose.
Red Tankard	Graham Bros	37	1,055	3	1,763	113·05	Tankard red	3·4% ovoid, 3·4% yellow.
Eckendorffer Yellow	General Swedish Seed Co	35	164	3	1,758	112·98	Tankard yellow	
Giant Sugar Beet Half Sugar White	Dupuy & Ferguson	32	1,312	3	1,716	112,36	Half long white	5·1% long, 4·4% intermediate, 7% ovoid, 0·7% rose
Red Globe	Wm. Ewing Co	33	605	3	1,615	110·89	Globe red	8% ovoid, 4·4% tankard.
Barres Stryno	Trifolium	35	1,630	3	1,596	110·62	Intermediate yellow (orange)	9·2% ovoid, 2·3% long, 0·8% globe.
Ideal	Wm. Rennie Co	31	894	3	1,590	110·53	Tankard yellow	
Yellow Intermediate	A. E. McKenzie Co	27	1,929	3	1,580	110·38	Intermediate yellow (orange)	8·9% ovoid, 2·1% long, 1·4% red.
Taaroje Barres	Hjalmar Hartmann Co	38	798	3	1,576	110·32	Intermediate yellow (orange)	1% ovoid, 1·8% globe.
Barres Ovsl	General Swedish Seed Co	36	350	3	1,563	110·14	Intermediate yellow (orange)	4·6% ovoid, 1·5% globe, 0·8% tankard, 0·8% long.
Sludstrup Barres	Hjalmar Hartmann Co	33	460	3	1,532	109·68	Intermediate yellow (orange)	4·7% ovoid, 0·8% long.
Barres Sludstrup	Trifolium	40	1,270	3	1,489	109·06	Intermediate yellow (orange)	5·0% ovoid, 0·7% globe.
Mammoth Red Intermediate	John A. Bruce	36	887	3	1,487	109·03	Intermediate red	7·4% long, 5·7% ovoid, 2·5% tankard, 0·8% globe.

Golden Giant Intermediate	Dupuy & Ferguson	34	874	3	1,484	108·99	Intermediate yellow (orange)	9·2% long.
Red Top Half Sugar	Wm. Ewing Co	27	134	3	1,476	108·87	Half long rose	5·6% Intermediate, 7·42% long, 2·8% long red, 1·9% intermediate yellow, 3·7% long white.
Rose Top Sugar	Halifax Seed Co	26	821	3	1,427	108·15	Half long rose	10·3% long, 7·1% white, 0·6% long red.
Long Red Mammoth	Graham Bros	32	420	3	1,424	108·11	Long red	10·7% intermediate.
White Knight	Gartons Ltd	38	392	3	1,319	106·58		
Danish Sludstrup	Kenneth McDonald	29	1,902	3	1,318	106·57	Intermediate yellow (orange)	4·2% long, 2·5% ovoid.
Improved Long Yellow	John A. Bruce	39	40	3	1,306	106·39	Globe yellow	7·7% ovoid, 2·6% intermediate, 1·7% long.
Barres Taaroje	D. L. F.	35	1,370	3	1,270	105·87	Intermediate yellow (orange)	3·5% ovoid, 0·7% long, 0·7% tankard.
Giant Yellow Oval	Steele Briggs	36	615	3	1,267	105·82	Intermediate yellow	13·2% ovoid, 1·8% tankard, 0·9% long.
Yellow Leviathan	Wm. Rennie Co	34	700	3	1,259	105·71	Intermediate yellow (orange)	5·8% long, 2·6% ovoid.
Giant Yellow Intermediate	John A. Bruce	34	552	3	1,249	105·56	Intermediate yellow (orange)	4·6% long, 7% ovoid.
Improved Tankard Cream	Wm. Rennie Co	31	1,484	3	1,234	105·34	Half long white	4·5% ovoid, 3% long.
Champion Yellow Globe	Graham Bros	31	941	3	1,183	104·60	Globe yellow (orange)	8·2% ovoid, 3·1% red.
Giant White Sugar	Wm. Rennie Co	32	1,739	3	1,178	104·53	Half long white	4·7% intermediate 3·5% ovoid, 2·1% globe, 2·1% long.
Danish Sludstrup	Dupuy & Ferguson	36	1,678	3	1,144	104·03	Intermediate yellow (orange)	4·8% ovoid, 4·8% long.
Yellow Leviathan	Steele Briggs	34	232	3	1,138	103·95	Intermediate yellow (orange)	5·7% ovoid, 2·6% long.
Ferritslev Barres	Hjalmar Hartmann Co	33	1,015	3	1,123	103·73	Intermediate yellow (light orange).	3·3% ovoid, 2·8% tankard, 2·1% long.
Giant White Sugar	Steele Briggs Co	31	1,835	3	1,103	103.44		
Prisetaker Yellow Globe	A. E. McKenzie Co	40	809	3	1,068	102·93	Globe yellow (orange)	3·8% ovoid, 5·1% tankard.
Green Top Half Sugar	Hjalmar Hartmann Co	29	939	3	1,042	102·55	Half long white	3·5% long, 3·5% ovoid, 1·4% intermediate 1·4% rose.
Red Globe	John A. Bruce	29	1,332	3	1,029	102·36	Globe red	7·3% ovoid, 0·8% intermediate.
Long Yellow	Wm. Ewing Co	25	859	3	999	101·92	Long yellow	3·1% intermediate 3·2% yellow (orange), 3·2% intermediate yellow (lemon).
Barres Strymo	Danske Landboforeningers Froforsyning, Roskilde, Denmark (D.L.F.)	35	1,070	3	948	101·18	Intermediate yellow (varied)	2·9% ovoid.
Giant Half Sugar	Kenneth McDonald & Sons	31	280	3	942	101·09	Half long rose	3·7% long, 2% ovoid, 4·7% white, 0·7% long white.
Gatepost	J. A. Bruce	29	886	3	928	101·00	Long red	6·5% half long, 5·6% intermediate, 1·6% ovoid.
Danish Sludstrup	Wm. Ewing Company	30	346	3	892	100·36	Intermediate yellow (orange)	4·8% ovoid, 4·0% long.
Red Globe	Dupuy & Ferguson	31	1,658	3	889	100·32	Globe red	5·8% ovoid.
Yellow Intermediate	Sutton & Son	31	400	3	888	100·31	Intermediate yellow (lemon)	10% ovoid, 5% long, 2·2% tankard.
Yellow Intermediate	Central Exp. Farm, Ottawa	29	936	3	887	100·29	Intermediate yellow (orange)	1·4% long.
Svalof Original Alfa	General Swedish Seed Co	26	1,544	3	873	100·09	Half long rose	5·1% intermediate, 3·4% long, 0·7% half long white.
Golden Tankard	John A. Bruce	32	1,660	3	871	100·06	Intermediate yellow (orange)	7·3% ovoid, 4% tankard, 2·4% globe.
Giant Rose	A. E. McKenzie Co	25	1,807	3	852	99·78	Half long rose	5% long, 1·7% intermediate, 5% half long white, 2·5% long white, 5·8% intermediate white, 0·8% intermediate red
Elvetham Long Red	Sutton & Son	31	138	3	842	99·64	Long red	2·4 % intermediate, 1·6% half long.
Long Red	Halifax Seed Co	26	1,559	3	834	99·52	Long red	4·8% intermediate, 2·4% ovoid, 0·8% long white
Special Yellow Globe	Sutton & Son	31	1,555	2	1,837	99·49	Globe yellow	4·3% ovoid, 4·4% tankard.
Giant Half Rose	Dupuy & Ferguson	25	1,212	3	831	99·48	Half long rose	12·2% long, 4·9% intermediate, 4·1% long white, 0·8% intermediate white.
Giant Sugar	Wm. Rennie Co	26	166	3	822	99·34	Half long rose	11·3% long, 4·8% intermediate, 2·4% ovoid.
Large Yellow Globe	Gartons Ltd	34	1,824	3	805	99·10	Globe yellow	8·9% ovoid, 2% tankard.
Barres Sludstrup	General Swedish Seed Co	32	1,710	3	802	99·05	Intermediate yellow (orange)	2·9% ovoid, 0·7% long.
Leviathan Half Sugar Rose	Wm. Rennie Co	29	279	3	769	98·57	Intermediate red	3·1% ovoid, 1·6% long, 4·7% intermediate rose, 10·1% intermediate white, 2·3% long white.
Giant Red Sugar	John A. Bruce	26	1,932	3	766	98·53	Long red	6% intermediate, 2·6% intermediate, 0·9% ovoid, 1·7% long rose, 10·3% intermediate rose, 3·4% intermediate white, 1·7% long white.
Red Tankard	Kenneth McDonald & Sons	32	634	3	757	98·40	Tankard red	4·1% ovoid.
Barres Tystofte	Danske Landboforeningers froforsyning, Roskilde (D.L.F.)	31	515	3	744	98·21	Intermediate yellow (orange)	4·7% ovoid, 2·4% long.

TABLE 6—VARIETY TEST OF MANGELS FOR 1927—*Concluded*

Variety	Source	Green yield		Dry matter		Relative yield	General type	Off types present
		tons	lb.	tons	lb.			
Yellow Globe	Sutton & Sons	34	1,130	3	728	97·98	Globe yellow	6·2% ovoid, 2·7% tankard.
Danish White Giant	Halifax Seed Co	30	207	3	724	97·92	Half long white	3·8% long, 3·8% ovoid, 2·9% intermediate, 6·7% half long rose, 1% long rose.
Long White	Dupuy & Ferguson	30	1,809	3	710	97·71	Long white	4·5% half long, 1·5% intermediate, 6 % long rose
Yellow Fleshed Golden Tankard	Edward Webb & Son	27	550	3	703	97·61	Intermediate yellow (orange)	10·6% ovoid, 3·5% tankard.
Giant Yellow Globe	Steele Briggs	31	1,907	3	700	97·57	Globe yellow	5·6% ovoid, 2·1% tankard, ·7% rose.
Golden Tankard	Dupuy & Ferguson	29	492	3	662	97·01	Intermediate yellow (orange)	2·9% ovoid, 2·2% globe, 1·4% tankard, 0·7% long
Red Half Sugar	Harris McFayden	24	1,602	3	658	96·96	Half long rose	3·9% long, 3·9% intermediate, 5·9% white, 2·6% long white, 1·3% intermediate red.
Sugar Mangold	Sutton & Sons	25	1,688	3	628	96·52	Half long white	5·8% long, 5·8% intermediate 2·2% ovoid, 1·4% intermediate rose.
Giant Yellow Globe	Halifax Seed Co	28	1,150	3	626	96·49	None	Mixture globes to half long. Colour yellow to red..
Giant White Feeding Sugar	Steele Briggs Co	28	1,916	3	615	96·33	Half long white	6% long, 4·7% intermediate.
Long Yellow	Dupuy & Ferguson	27	909	3	611	96·27	Long yellow (lemon)	8·7% long yellow (orange), 2·9% intermediate, 1% long white.
Svalof Original Alfa	General Swedish Seed Co	24	1,766	3	593	96·01	Half long white	8·7% long, 5·5% intermediate, 3·1% ovoid.
Giant Sugar Rose	Graham Bros	25	1,814	3	569	95·66	Half long rose	8·7% long, 3·4% intermediate, 1·3% half long white. 6% intermediate white.
Eclipse	A. E. McKenzie Co	34	225	3	568	95·65	Tankard yellow	
Yellow Ovoid	University of British Columbia.	37	546	3	556	95·47	Ovoid yellow (orange)	9·5% intermediate, 2·5% tankard, 2·5% globe.
Jumbo	Wm. Rennie Co	32	1,670	3	506	94·74	Half long white	7·2% long, 3·9% intermediate, 1% ovoid.
Yellow Leviathan	John A. Bruce	29	356	3	475	94·29	Intermediate yellow (lemon)	5·5% long, 3·1% ovoid, 1·6% tankard.
Eckendorffer Red Tankard	Hjalmar Hartmann Co	32	1,799	3	471	94·23	Tankard red	2·5% ovoid.
Gatepost Intermediate	Sutton & Sons	30	98	3	444	93·84	Intermediate yellow (lemon)	13·2% ovoid, 1·8% tankard, 0·9% long.
Royal Giant	Steele Briggs	26	510	3	386	93·00	Long rose	7·7% half long, 7·7% intermediate.
Sunrise	Gartons, Ltd	30	470	3	361	92·63	Intermediate yellow (orange)	6% ovoid, 2·2% long.
Perfection Mammoth Long Red	Wm. Rennie Co	27	1,569	3	313	91·93	Long red	8·3% intermediate.
Golden Tankard	Sutton & Son	28	250	3	311	91·90	Intermediate yellow (orange)	3·4% ovoid, 2% tankard, 1·4% globe.
Mammoth Long Red	Harris McFayden Co	23	1,451	3	310	91·89	Long red	10·6% half long, 6·2% intermediate.
Fodersuskerrve	D. L. F.	26	778	3	308	91·86	Half long rose	4·2% ovoid, 1·4% long.
Giant Half Sugar White	J. A. Steves	28	360	3	280	91·45	Half long white	5·5% long, 7·8% intermediate, 6·3% ovoid.
Giant Yellow Globe	A. E. McKenzie Co	31	104	3	278	91·42	Globe yellow	4·4% ovoid, 4·4% tankard.
Giant Yellow Globe	Wm. Rennie Co	31	798	3	275	91·38	Globe yellow	7·5% ovoid, 5% tankard.
Prizewinner Yellow Globe	Sutton & Son	32	55	3	270	91·31	Globe yellow	5·6% ovoid, 3·5% tankard.
Mammoth Prize Long Red	K. McDonald & Sons	28	132	3	259	91·15	Long red	10% intermediate, 40% intermediate yellow.
New Ideal	Steele Briggs	29	961	3	199	90·27	Tankard yellow	3·1% ovoid.
Giant Long Red	A. E. McKenzie	25	277	3	114	89·03	Long red	5·8% intermediate.
Golden Globe	Sutton & Sons	25	94	3	91	88·70	Globe yellow (orange)	7·3% ovoid.
Improved Giant Sugar	Wm. Rennie Co	23	1,090	3	79	88·52	Half long rose	5·5% long, 0·7% intermediate white.
Golden Tankard	Halifax Seed Company	26	550	3	70	88·39	Intermediate yellow (orange)	8·7% ovoid, 6·5% tankard, 6·5% long.
Superlative	Sutton & Sons	32	22	3	69	88·38	Globe yellow	6·7% ovoid.
Devon Yellow Globe	Sutton & Sons	30	1,071	3	54	88·16	Globe yellow	7% ovoid, 1·6% tankard.
Devon Champion Yellow Globe	Gartons, Limited	29	1,824	3	49	88·09	Globe yellow	6·3% ovoid, 0·8% tankard.
Yellow Globe	Dupuy & Ferguson	24	1,907	3	36	87·90	Globe yellow	3·6% ovoid, 0·7% tankard.
Yellow Oval	Steele Briggs Co	30	436	3	35	87·88	Globe yellow	9·8% ovoid, 1·6% tankard.
Half Sugar Rose	Dupuy & Ferguson	22	1,735	3	14	87·58	Half long rose	6·4% long, 1·3% intermediate, 3·2% intermediate white, 0·6% long white.
Mammoth Long Red	Steele Briggs	28	313	2	1,981	87·10	Long red	7·4% half long, 6·5% intermediate, 0·9% ovoid.

Mammoth Long Red	Sutton & Son	28	920	2	1,958	86·76	Long red	2·3% intermediate.
Mammoth Long Red	Dupuy & Ferguson	24	923	2	1,955	86·72	Long red	7·1% intermediate.
Devon Yellow Intermediate	Sutton & Sons	29	561	2	1,951	86·66	Intermediate yellow (lemon)	10·3% ovoid, 3·4%tankard, 1·4% long, 1·4% globe.
Yellow Leviathan	Ralph Moore	26	1,225	2	1,951	86·66	Intermediate yellow (orange)	5·3% ovoid, 3·1% long.
Red Top Half Sugar	Hjalmar Hartmann Co	23	368	2	1,915	86·14	Half long rose	10·2% intermediate, 3·9% long, 2·4% long white.
Long Red Mammoth	Wm. Ewing Co	28	1,537	2	1,894	85·83	Long red	8·8% intermediate, 0·7% ovoid.
Giant Rose	John A. Bruce	24	645	2	1,880	85·63	Half long rose	12% long, 5·1% intermediate, 0·8% white.
Golden Tankard	Wm. Ewing Company	25	965	2	1,870	85·48	Intermediate yellow (orange)	11·7% long, 5·3% ovoid, 3·1% tankard, 1·6% long yellow (lemon).
Perfection	Edward Webb & Son	28	1,476	2	1,803	84·51	Globe yellow (orange)	5·9% ovoid, 8% intermediate, 8% tankard.
Giant Yellow Intermediate	Wm. Ewing Co	24	1,996	2	1,799	84·45	Intermediate yellow (lemon)	5·6% ovoid, 3·5% long, 0·7% red.
New Lion Intermediate	Edward Webb & Sons	30	1,955	2	1,769	84·01	Intermediate yellow (orange)	4% long, 0·8% ovoid, 0·8% intermediate yellow—(lemon).
Improved Half Sugar	Gartons Limited	21	624	2	1,743	83·63	Half long rose	4·8% long, 3·4% intermediate, 1·4% ovoid, 0·7% long white.
Giant Yellow Intermediate	Halifax Seed Company	25	89	2	1,734	83·50	Intermediate yellow (lemon)	7·3% ovoid, 2·4% long, 0·8% globe.
Yellow Globe	Kenneth McDonald & Sons	28	243	2	1,622	81·87	Globe yellow	4·7% ovoid, 4·2% tankard.
Selected Golden Tankard	A. E. McKenzie Co	22	1,952	2	1,604	81·67	Intermediate yellow (orange)	8·2% ovoid, 2·7% long, 1·4% globe, 0·7% tankard.
Prize Mammoth Long Red	Steele Briggs Co	24	1,735	2	1,506	80·18	Long red	2·7% intermediate.
Mammoth Long Red	Edward Webb & Sons	24	785	2	1,501	80·11	Long red	9·6% half long, 5·9% intermediate.
New Smithfield Yellow Globe	Edward Webb & Son	32	467	2	1,464	79·57	Globe yellow	4·4% ovoid, 4·4% tankard.
Elevetham Mammoth	Hjalmar Hartmann Co	25	513	2	1,353	77·95	Long red	Exceptionally uniform in type and colour.
Long Yellow	John A. Bruce	21	709	2	1,332	77·65	Long yellow (orange)	10·1% intermediate, 6·4% long, 3·7% intermediate yellow (lemon).
Best of All	Dupuy & Ferguson	27	1,948	2	1,295	77·11	Intermediate yellow	6·6% ovoid, 2·9% long.
Giant Yellow Globe	Wm. Ewing Company	26	1,933	2,	1,252	76·48	Globe yellow	4·6% ovoid, 4·3% tankard.
Golden Fleshed Tankard	Steele Briggs Co	23	899	2	1,210	75·87	Intermediate yellow (orange)	4·8% ovoid, 4% long, 1·6% globe.
Golden Tankard	Wm. Rennie Co	22	1,404	2	1,209	75·86	Intermediate yellow (orange)	6·1% tankard, 5·3% long, 2·3% ovoid.
Mammoth Long Red	Gartons Limited	25	378	2	1,159	75·13	Long red	1·9% intermediate.
New Combination	Gartons Limited	23	1,105	2	1,058	73·66	Intermediate red (varies)	9% tankard, 7·4% ovoid, 10·7% long, 2·5% intermediate yellow, 8% long yellow.

As differences in yield of less than 12 per cent may not be significant, it would seem that quite a number of types yield approximately the same. As in previous years the Half Long and the Intermediate types have been on the whole the best yielders, because of their adaptability to a greater range of soils.

In considering the per cent of off-types present, it is well to keep in mind that a mixture of extreme types, as Long with Ovoid or Globe is more likely to be accompanied by a lowering of yield, than is a mixture of the Intermediate, Half Long and Ovoid types.

With the information available in the accompanying table it should be possible for any grower to select a type suitable to his soil, and which was among the highest yielding lots.

Mangel Breeding.—Seed was raised and further selections made of the Central Experimental Farm selection of Yellow Intermediate mangel. This selection has continued to be one of the highest yielding lots tested, and should prove of considerable value to growers of field roots.

SWEDES

Variety Test.—Twenty lots of swedes were tested in the summer of 1927 for yield and suitability. The following table presents in tabular form the results secured.

TABLE 7—VARIETY TEST OF SWEDES, 1927

Variety	Source	Green yield		Yield dry matter		Relative yield
		tons	lb.	tons	lb.	
White swede	John A. Bruce	44	1,971	4	511	113·09
Bangholm	Experimental Farm, Charlottetown, P.E.I.	35	910	4	449	112·26
Hall's Westbury	Wm. Ewing Co.	39	836	4	420	111·88
Sutton's Champion Purple top	Wm. Ewing Co.	42	792	4	398	111·59
Elephant or Monarch	John A. Bruce	38	793	4	47	106·92
Derby green top	John A. Bruce	40	9	3	1,904	105·02
Kangaroo	John A. Bruce	37	1,808	3	1,771	103·26
Ditmars	H. H. McNutt	39	1,246	3	1,744	102·90
Invicta bronze top	Wm. Ewing Co.	36	465	3	1,514	99·84
Garton's Superlative	Wm. Ewing Co.	39	360	3	1,470	99·26
Bangholm	Exp. Farm, Nappan, N.S.	32	1,714	3	1,436	98·80
Elephant or Monarch	Wm. Ewing Co.	35	993	3	1,374	97·98
Cornings	Yarmouth Fruit Producers	35	1,346	3	1,333	97·44
Magnum Bonum	John A. Bruce	35	148	3	1,314	97·18
Bangholm Purple top	John A. Bruce	35	1,719	3	1,209	95·79
Hall's Westbury	John A. Bruce	34	268	3	883	91·46
Bangholm	Exp. Station, Kentville	24	1,510	3	849	91·00
Cylindrical	Univ. of British Columbia	33	1,929	3	837	90·85
Canadian Gem	John A. Bruce	34	1,233	3	553	87·07
Kangaroo	Wm. Ewing Co.	33	770	3	510	86·50

The most outstanding feature of the data presented is the lack of correlation between the harvested yields and these yields when reduced to a dry matter basis.

As differences in yield of less than around fifteen per cent are probably not to be relied on, the first six varieties may be considered as being equally desirable so far as yield is concerned.

Breeding Swedes.—A sufficient quantity of seed to meet our present requirements was raised off the Central Experimental Farm selection of Purple Top Swede. Stecklings were also grown to produce a seed crop in 1928.

FALL TURNIPS

Variety Test.—Twenty-six lots of fall turnips comprised the variety test conducted at the Central Farm in 1927 with the crop in question. Due to more favourable growing conditions both the yield and quality of most varieties was somewhat more satisfactory than in the previous year.

As the relative values of the different varieties is not much changed from that reported for 1926 the table of yields will be omitted for 1927.

CARROTS

Variety Test.—Forty-eight lots of field carrots were included in the 1927 variety test.

Probably the most outstanding feature in the current season's results is the evidence of the continued lack of uniformity in the majority of varieties offered for sale to Canadian growers.

The highest yielding lots were again to be found among the varieties belonging to the intermediate type.

Carrot Breeding.—A satisfactory seed crop of the Central Experimental Farm selection of Danish Champion carrot was produced. Sufficient roots for the production of seed in 1928 were also grown.

SUGAR BEETS

Variety Test.—Four lots of sugar beets were planted in comparative test plots in connection with the trials being carried on in co-operation with the Chemistry Division. These were seeded and harvested at the same time as the mangel crop.

The yields secured were from eighteen and one-half to eighteen and three-quarter tons to the acre of material as harvested.

FLESHY ANNUALS

VARIETY TEST

Twelve lots of fleshy annual pasture crops were tested in the summer of 1927. These were seeded on May 13 and harvested on October 19 and 20. Table No. 8 records the yields of both green and dry matter obtained and also the relative yielding capacity of the different lots tested.

TABLE 8—VARIETY TEST OF RAPE AND KALE, 1927

Variety	Source	Green yield		Dry Matter		Relative yield
		tons	lb.	tons	lb.	
Giant rape	Sutton & Sons	27	1,900	4	622	118·96
Large seeded Winter Umbrella	Vilmorin & Son	29	1,300	4	488	117·11
Large seeded Winter Common	Vilmorin & Son	27	900	4	415	116·10
Green stem marrow kale	Sutton & Son	30	1,467	4	348	115·18
Purple stem marrow kale	Edward Webb & Son	29	1,467	3	1,968	109·93
1,000 headed kale	Sutton & Son	24	1,633	3	1,800	107·62
Purple stem marrow kale	Sutton & Son	26	1,033	3	1,522	103·78
Marrow stem kale	Sutton & Son	27	1,867	3	1,477	103·16
Improved 1,000 headed kale	Sutton & Son	25	1,100	3	1,401	102·11
Improved dwarf Essex	McDonald & Son	17	167	2	1,389	74·35
Sheep kale	Sutton & Son	15	1,300	2	807	66·32
Rape	Sutton & Sons	15	933	2	735	65·33

The yields secured from the fleshy annuals as a whole were considerably higher than those obtained in 1926. Satisfactory crops of these plants can be

produced in many parts of Canada and it would appear as if they could be used to good advantage much more extensively than they are at present.

BIENNIAL AND PERENNIAL CROPS

HAY AND PASTURE MIXTURES

Compartive Test.—The tests of various combinations of grasses and legumes were continued in 1927. Thirty-eight lots were harvested in this connection. The findings were in accordance with those reported quite extensively in the annual report of 1926.

A fair proportion of the combinations again produced yields approximately the same in as far as total dry matter and cost of production is concerned. The ultimate determination of the relative value of these lots is a matter of chemical analyses and feeding trials.

ALFALFA

Variety Tests.—Nine different lots of alfalfa were harvested in connection with the 1927 variety tests of the crop in question. These lots had been seeded in 1926 with a nurse crop of oats.

Three of the lots tested were of the Grimm type, two of the Canadian Variegated, two Cossack, one Falcata and one lot from seed claimed to be grown in France.

Two cuts were taken from all but the Falcata which produced only a single crop.

Under the climatic conditions prevailing at the Experimental Farm in the growing season of 1927 no significant difference was obtained in the yields of the various lots of Grimm and Cossack alfalfas tested. The yield secured from French grown seed and one lot of Canadian Variegated gave slightly lower yields than either the Grimm or Cossack types. The yield of the Falcata alfalfa was considerably lower than any of the other lots.

Breeding.—Seed from about forty lots of inbred alfalfa was started in the cold frames and the resulting young plants transplanted to the field for further tests. Several of the most promising of the parent strains of the inbred lots were retained for comparison with their progeny.

SWEET CLOVER

Variety Test.—Sweet Clover was represented in the variety test plots in 1927 by six different lots. These were seeded in 1926, with a nurse crop of oats at the rate of twenty pounds to the acre.

Among the different lots tested were the common biennial white blossom and the following four varieties of the same general type but having particular qualifications: Dwarf sweet, Arctic, Grundy County and Maccor. Along with these were included the common yellow blossom sweet clover.

In common with previous years the highest yields were secured from the white blossom types. None of the four special selections mentioned gave significantly higher yields in 1927 than the common white blossom biennial from commercial seed. For conditions prevailing in the Ottawa district it would appear as if this type were about as satisfactory as anything available at the present time.

WHITE DUTCH CLOVER

Variety Tests.—Six different lots of White Dutch Clover were included in the variety tests in 1927. Due to the difficulty of harvesting this crop, particularly with regard to the second cutting, it is hard to arrive at a proper basis of comparison between the different types. Four of the lots tested were of the

common white type, while two were of the Mammoth type. On the whole the Mammoth lots yielded slightly more than the common. Our experience in previous years however, has indicated that the Mammoth types have not been quite as hardy as the common lots. Of the common types the Morso and Stryno strains imported from Denmark have been the most promising through a period of years.

TIMOTHY

Variety Test.—In the variety test with timothy, ten different lots were included in 1927. These had been seeded in 1926 with a nurse crop of oats. The lots included commercial seed and strains some of which had been produced in Sweden, some at the Central Farm, Ottawa, and some by the United States Department of Agriculture. The 1927 yield figures do not indicate any significant difference between the lots tested. All of the lots produced a fairly satisfactory yield.

Breeding.—The best inbred individuals in the breeding block in 1926 had been caged and seed obtained. This seed was planted in sterile soil in cold frames in the spring of 1927, and as soon as the young plants were well established they were transplanted to the field. A large breeding block of these was thus established for a continued selection in 1928.

MISCELLANEOUS GRASSES

Variety Test.—Nine lots of miscellaneous grasses were planted in comparative test plots in 1926, with a nurse crop of oats. The yields obtained from these in 1927 are reported in the following table.

RESULTS OF VARIETY TEST OF MISCELLANEOUS GRASSES

Variety	Green yield		Yield of cured hay 15 per cent moisture	
	tons	lb.	tons	lb.
Meadow Fescue	3	1,100	1	553
Italian Rye Grass	4	1,600	1	1,993
Western Rye Grass Grazer	2	500	1	187
Western Rye Grass Fyra	1	1,900	..	1,908
Red Top	2	900	1	49
Perennial Rye Grass	2	1,100	1	238
Tall Oat Grass	4	1,600	2	80
Golden Oat Grass	2	600	1	35
Field Brome	4	1,200	1	1,482

Under the seasonal conditions which obtained in 1927 there was not very much to choose between the different lots tested, in as far as yield of cured hay was concerned. The Tall Oat grass, Italian Rye grass and Field Brome produced the largest amount of cured hay.

The Field Brome acts as a winter annual, while the Tall Oat grass and the Italian Rye grasses are not always hardy under conditions prevailing at Ottawa.

Breeding.—Extensive lots of breeding material of Orchard Grass, Meadow Fescue, Kentucky Blue grass, Red Top and Western Rye were set out. The most promising lots will be re-selected in 1928 for further improvement.

RED CLOVER

Variety Tests.—Twenty-four lots of red clover comprised the variety test of that crop for the 1927 season. These varieties represented lots from both home grown and imported seed. In the case of both the home grown and lots both single cut and two cut types were included.

In common with the results of other years the crop from home grown seed has been a much more profitable one than that secured from imported seed. The difference in favour of home grown has in most cases been represented by increased yields of over one ton of cured hay.

On the whole the two cut types have outyielded the types which produce only a single cut. A few of the single cut types from Canadian grown and Swedish seed however have yielded within a few hundred pounds as much hay as the average of the two cut types. The highest yield was secured from a two cut strain developed at the Central Experimental Farm.

Breeding.—Further selections have been made with the two cut strain of red clover being developed at the Central Farm. An attempt will be made in 1928 to put in as much as possible of the seed of this type for increase purposes.

THE RELATIONSHIP OF ORIGIN TO HARDINESS IN RED CLOVER

In June, 1921, at a conference in Copenhagen, experimental evidence was produced which proved that red clover seed from southern climates was undesirable in Northern Europe, due to lack of winter hardiness. As a consequence the countries concerned restricted the importation of non-hardy red clover seed. The result of these restrictions was, that markets had to be found elsewhere for the red clover seed from southern sources.

The United States Government in anticipation of larger importations of non-hardy red clover seed took action to restrict such importations from Italy and other southern sources. It became evident that unless Canada could enforce similar restrictions to those adopted by the United States this country would become a dumping ground for the increased amount of non-hardy red clover seed.

In order to enforce restrictions it was necessary to obtain definite evidence of non-hardiness of imported seed from the areas against which restrictions were desired. Beginning with 1922 comprehensive tests were undertaken paralleling those of the United States Department to obtain definite information concerning the suitability for Canadian conditions of clover seed grown in all of the red clover exporting countries of the world.

For the last five years a uniform procedure has been followed in conducting the tests for hardiness. In all cases seed was planted in sterilized soil in small pots. The pots were first placed in cold frames, until the young plants were sufficiently advanced to be transplanted to the field where they were placed in rows at definite distances apart, so that a study of individual plants could be made. In the fall of the year of planting, the number of plants in each row was recorded. After growth had commenced the following spring, the number of living plants remaining was ascertained and the difference between the number of plants going into the winter and those surviving in the spring was calculated on a percentage basis, and listed as per cent winter killed.

It is realized that row planting does not approximate exactly the conditions obtaining under field culture. However, all lots were treated alike, and the conditions to which they were subjected to were at least as severe as those obtaining under commercial plantings.

In 1922 thirty lots of red clover were set out as individual plants. In 1923 records were compiled in these lots. Nine Canadian lots gave an average of 3·26 per cent winter killed, whilst the average of twelve Italian lots killed out 55·17 per cent.

During the winter of 1922-23 it was deemed advisable to increase the number of lots to be tested and accordingly additional seed samples were obtained. Through the courtesy of Dr. Pieters of the United States Department of Agriculture a large number of samples of foreign red clover seed were placed at our

disposal and in the following years the United States Department continued to place at our disposal material for this test. In 1923, thirty lots, in 1924-25 one hundred and ten lots, in 1926 one hundred and forty lots and in 1927 one hundred and seventy-four different lots were tested in individual plant plots for comparing winter hardiness. The table following summarizes the results of these tests to date.

TABLE 9—HARDINESS OF RED CLOVERS FROM DIFFERENT SOURCES

Source	1923		1924-25		1926		1927		Average	
	Lots tested	Average per cent winter killed	Lots tested	Average per cent winter killed	Lots tested	Average per cent winter killed	Lots tested	Average per cent winter killed	No. of lots	Average per cent winter killed
Canada	9	3·26	21	13·9	10	16·32	18	14·66	58	12·81
Sweden	3	5·15	8	23·3	11	28·10	9	12·39	31	20·08
Great Britain	2	19·39	9	58·9	26	37·05	33	30·93	70	36·47
France	4	31·72	10	68·5	12	45·01	16	35·42	42	45·63
Italy	12	55·71	25	74·7	29	49·47	28	54·66	94	58·52
Germany	.....	.....	3	24·7	4	38·88	3	29·39	10	31·78
Finland	.....	.....	2	29·9	2	32·07	2	18·55	6	26·89
Poland	.....	.....	2	37·6	3	25·74	3	27·09	8	29·21
Roumania	.....	.....	4	39·2	6	25·18	6	25·71	16	26·63
Silesia	.....	.....	1	40·3	2	26·67	2	21·38	5	27·28
Holland	.....	.....	1	46·0	3	35·66	3	34·26	7	36·54
Denmark	.....	.....	7	46·7	8	33·01	10	20·86	25	31·98
Latvia	.....	.....	1	49·0	1	12·82	1	7·41	3	23·08
Switzerland	.....	.....	2	51·3	3	24·24	3	29·97	8	31·90
Hungary	.....	.....	3	67·7	5	25·79	5	27·70	13	36·20
Chili	.....	.....	6	70·6	12	24·19	13	34·61	31	38·30
New Zealand	.....	.....	2	71·9	2	28·69	2	18·75	6	39·78
Sicily	.....	.....	3	95·8	.....	.....	3	45·35	6	70·58
Pomeranian	.....	.....	.....	.....	1	17·82	1	34·62	2	26·22
U. S. A.	.....	.....	.....	.....	5	24·73	5	18·77	10	20·75
Belgian	.....	.....	.....	.....	1	31·24	1	41·00	2	36·32
Russia	.....	.....	.....	.....	4	34·47	3	18·11	7	27·46
Egypt	.....	.....	.....	.....	1	98·68	.....	.....	1	98·68
Australia	.....	.....	.....	.....	1	100·00	.....	.....	1	100·00
Czecho-Slovak	.....	.....	.....	.....	2	26·07	2	17·43	4	21·25

While in some of the tests very few samples of a given source were available, and while results from these may not be considered conclusive, it is nevertheless a good indication of the suitability of any source for the supplying of seed to be sown under Canadian conditions. In most cases we believe that a sufficient number of lots have been tested from each country to show rather conclusively just what value may be placed on seed from that particular source. Thus it may be noted that a total of ninety-four tests have been made of Italian seed. The average winter killing over a period of five years has been 58·52 per cent. In addition to lack of winter hardiness, the Italian plants that lived through the winter come up very weak and were apparently unable to thrive under our summer conditions. This shows rather conclusively that Italian clover seed is not desirable for seeding in Canada.

Forty-two tests have been made with French red clover seed. The average winter killing was 45·63 per cent. Comparing seed from Italy and France it will be noted that the chances are slightly better of obtaining a crop with seed of French origin. Some few lots from France did winter fairly well, producing plants that also came through the summer in good condition but the majority of seed of French origin is undesirable. Seed from Great Britain of which seventy tests were made, averaged 36·47 per cent non-hardy. A number of the lots from Great Britain were well suited to Canadian conditions both as to hardiness and ability to live and produce a crop in the summer. On the whole, however, Canadian grown seed produced much better results

FIG. 1.—A typical Canadian clover.

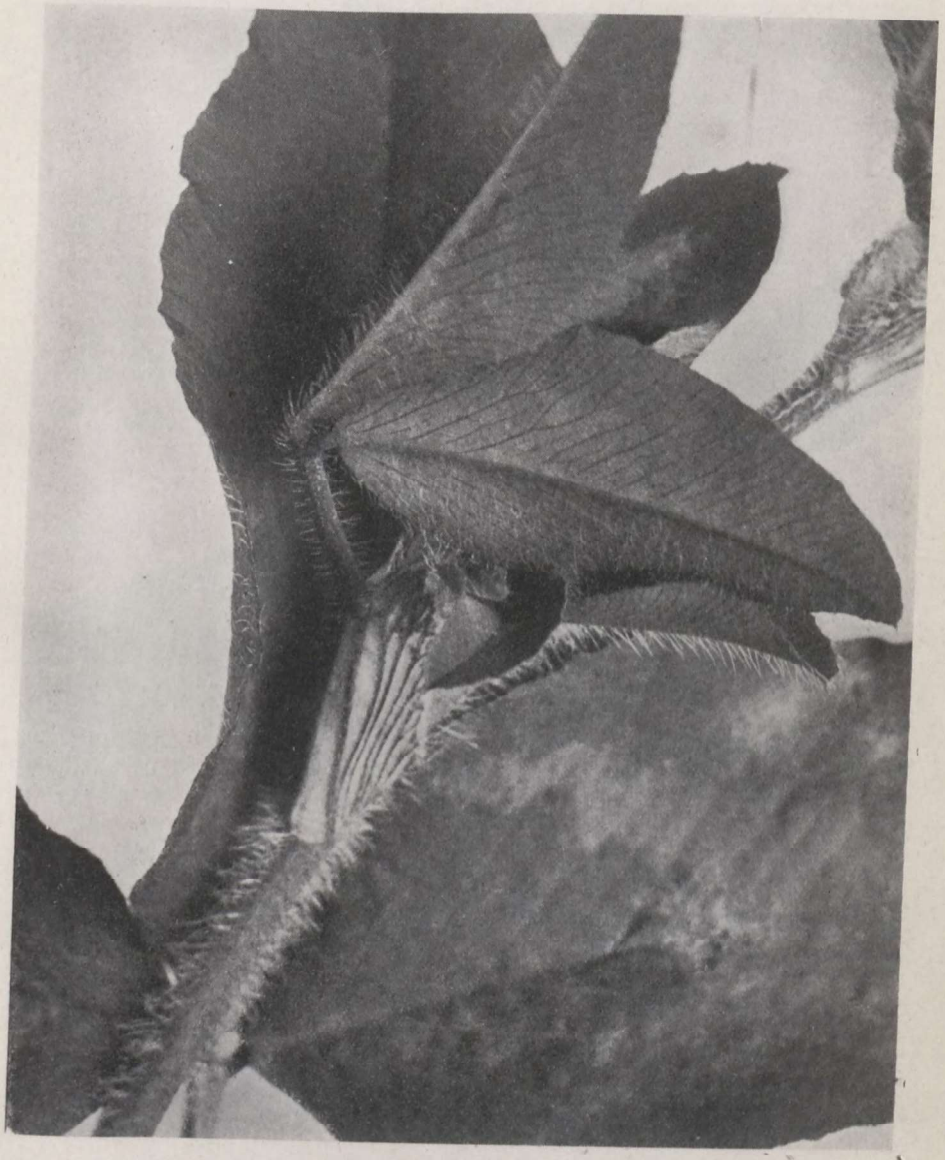


FIG. 2.—A "close up" showing the hairiness, characteristic of the typical Canadian clover.

FIG. 3.—A typical European clover.

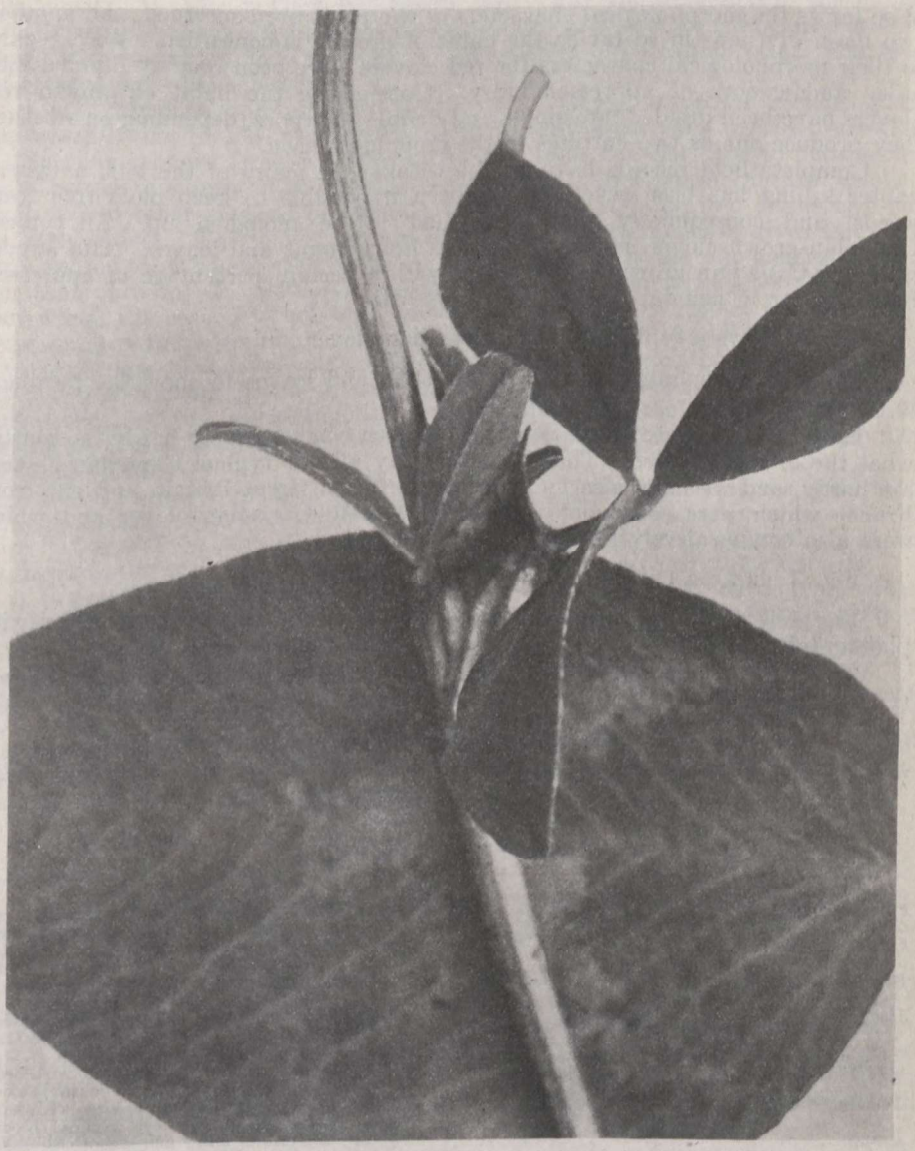


FIG. 4.—A "close up" showing the lack of hairiness in the typical European clover.

Swedish seed has on the whole proven satisfactory in so far as hardiness is concerned. Late Swedish red clover imported in 1910 by the Seed Branch has been multiplied and has produced fair crops in some parts of Western Canada under the name of Alta swede.

Two main divisions have been made in classifying the types of red clover in so far as the morphological characters of the plant are concerned, and another two main divisions in so far as the habit of growth is concerned. With regard to their morphological characters the red clovers have been roughly divided into hairy and smooth or appressed hairy. Considering the habit of growth red clovers have been divided into single and double cut types, depending on whether they produce one or two cuttings in the cropping season.

Complete field records have not been taken on many of the lots, as where winter killing has been severe it has been impossible to keep plots free from weeds, and consequently they have had to be ploughed up. All typical Canadian-grown clover, however, has had hairy stems and leaves. Alta swede, although Canadian grown, is smooth or with a certain percentage of appressed hairs similar in general type to Late Swedish.

Fig. 1 shows a typical plant of Canadian clover.

Fig. 2 is an enlarged section of the stem and leaves to show the hairiness in greater detail.

In the tests to date hairy clovers have been comparatively hardy, no matter what the original source. That is, practically all our typical Canadian clovers are hardy, and we have also had several lots from Great Britain and one from France which were somewhat similar in type to Canadian clover and which were also comparatively hardy.

Fig. 3 shows a cut of typical European clover.

Fig. 4 is an enlargement of a section of stem and leaf for comparison with photographs 1 and 2.

The following remarks taken 1927 for the field notes indicates the general type of the lots tested:—

RESULTS OF TESTS OF LOTS OF CLOVER SEED FROM VARIOUS SOURCES

Source	Per cent winter killed in 1927	Remarks
Chateauguay, Que	8·71	Hairy, vigorous plants large with heavy foliage. Large deep coloured bloom.
Central Italy	49·89	Smooth, weak plants, fine with light foliage. Light coloured small blooms.
St. Clet, Que	13·76	Hairy, vigorous, plants large, medium, large deep coloured blooms.
Italy	19·35	Smooth, some hairy, fairly vigorous, plants fine, foliage light, bloom light to medium in colour and size.
Ottawa, Ont	10·00	Hairy, vigorous, plants large with heavy foliage. Large deep coloured blooms.
Kenora, Ont	20·00	Hairy, vigorous, plants large with heavy foliage. Large deep coloured blooms.
France	34·28	Mixture of hairy and smooth types, fair vigor. Plants a mixture of large and small, with various sized and coloured blossoms.
Ontario	19·51	Mostly hairy, but smooth types present. Not uniform in type.
Ontario	19·47	Some hairy, appressed hairy and smooth. No uniform general type.
Ontario	36·46	Smooth, a few hairy, not uniform.

It will be noted that of the Canadian lots tested in 1927 two showed a mixture of hairy and smooth types, while one was practically all smooth. Apparently during the past few years some growers have raised seed from crops resulting from imported seed. As the value of Canadian-grown seed is more realized it may be expected that more of this non-hardy material may be propagated in this country for sale as Canadian-grown seed. For the protection of the industry growers of clover seed should make certain that any seed they use to seed down where a seed crop is expected to be taken is of Canadian origin and seed of the common Canadian type.

Not only has the average hardiness of Canadian-grown seed slightly decreased owing to the introduction of non-hardy stock, but one seed-growing section has changed from a producer of seed of the two-cut type to become the chief source of supply of the late or one-cut type. In Eastern Ontario, Quebec, and several other sections of Canada the clover that is desired is the two-cut or early clover. This clover, where the season is long enough, gives two cuts in a season, and where seed is raised the second cut is the one generally used for that purpose. In sections of Canada where red clover is a valuable crop, but where the season is not long enough to allow for two cuts, the single-cut type appears to be the most suitable. As it is impossible to tell the seed of the two types apart, and difficult to determine which is which in the field, except by the fact that one produces a second crop and one does not, it would appear advisable, now that such emphasis is being placed on the value of Canadian-grown seed, that a clear distinction should be made in the naming and selling of these clovers.

For the grower in Quebec who purchases Canadian red clover seed with the expectation of getting the common or early type it is a very serious loss to him if the seed he obtains happens to be the two-cut type, particularly if he desires to raise seed and depends on the second cut to produce the seed crop.

Legislation has been enacted whereby all Italian seed or seed of other southern origin must contain a percentage of seeds stained red, seed from other parts of Europe must contain seed stained green, seed from the United States has a percentage of each lot stained orange, while Canadian seed goes on the market unstained. Canadian farmers buying red clover seed for use in Canada to produce a seed crop are strongly recommended to buy unstained seed. If unstained seed is not available a chance may be taken with the seed stained orange or green, but under no circumstances is the seeding of red clover containing seed stained red recommended.

GENERAL ACTIVITIES

In addition to the regular activities incident to the carrying out of the breeding and variety tests with the various forage crops, several other phases of work were undertaken.

The investigations of the effects of various methods of harvesting experimental plots on the results obtained were continued. Final figures were secured on the influence of including the border foot of plots in the yields used for calculating the comparative value of the test plots. In addition a large number of determinations were made to gain further information concerning the influence of the immediate drying of shrinkage samples on the ultimate dry matter which they contained.

A small folder describing the essentials of alfalfa growing was revised. In addition the results to date of our projects with field roots were summarized in Bulletin No. 84, "Field Roots in Canada", which appeared in the summer of 1927.

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

RANGE INVESTIGATIONS

A reconnaissance of the range lands of southern Saskatchewan and Alberta was made during the summer of 1926. Over one hundred ranches were visited and much useful information was obtained. During this survey it was found that the vegetative cover of the range lands had become seriously depleted. This condition was found to be most acute on the short grass plains of southwestern Saskatchewan and southeastern Alberta. Many of the ranchers were forced to reduce their herds. The shortage of feed was felt most during the winter months and over 90 per cent of the ranchers were found to be cultivating some of their land and growing forage crops with varying degrees of success, in order to supplement the native forage.

The shortage of feed together with low prices of cattle had placed the ranching industry in a most precarious condition. An unusually hard winter in 1926-27 would have resulted in tremendous losses. A year or two of increased precipitation would improve the stand of native vegetation, but such a period is invariably followed by a succession of dry years during which conditions would become more serious than ever.

It was quite apparent that, in the interests of the ranchers themselves and of the country at large something should be done to place the ranching industry on a more permanent and secure basis. With this end in view the Forage Crops and Field Husbandry Divisions of the Dominion Experimental Farms have instituted a program of research work that promises to be both extensive in its scope and intensive in its application.

A Dominion Range Experiment Station has been established in southeastern Alberta on a tract of land which comprises sections 13 to 36 inclusive in township 2, range 4, west of the 4th meridian. This land, the northwest corner of which lies about 15 miles south and seven miles east of the town of Manyberries, has been sub-leased from the Gilchrist Bros. for an indefinite length of time. It is fairly representative of a large range area as it consists of undulating prairie cut by many coulees. In many places the banks of these coulees, as well as certain other areas, have been eroded to such an extent that they are almost devoid of vegetation. There are low lying flats and a number of sloughs all of which usually dry up during the summer months. While there are several springs on this area, only one of them can be depended upon to supply water throughout the entire summer. The vegetative cover is quite typical of the short grass plains area. The chief grass species are: June grass (*Koleria gracilis*) Spear grass (*Stipa comata*) Grama grass (*Bouteloua gracilis*) Meadow grass (*Poa laevigata*) and Blue Joint grass (*Agropyron Smithii*) Less common species include Tickle grass (*Agrostis hyemalis*) Sand grass (*Calamovilfa longifolia*) Needle grass (*Stipa viridula*) Oat grass (*Avena Hookeri*) Beard grass (*Schizachyrium scoparium*) Bearded Wheat grass (*Agropyron Richardsonii*) Wild Rye (*Elymus robustus*) Slough grass (*Beckmannia erucaeformis*) Finger grass (*Schedonnardus paniculatus*) Meadow grass (*Poa crocata*) Sheep Fescue (*Festuca ovina*) *Poa rupicola, Poa triflora,* Reed grass (*Calamagrostis montanensis*) Salt grass (*Distichlis stricata*) Sweet grass (*Torresia odorata*) Alkali grass (*Spartina gracilis*) Indian millet (*Eriocoma hymenoides*) Drop Seed grass (*Sporobolus cryptandrus*) Wild Barley (*Hordeum jubatum*) and Nigger Wool (*Carex filifolia*). On certain areas broad leaved plants constitute a large part of the vegetative cover. On the dry stony ridges the following are quite common: Umbrella plant (*Eriogonum flavum*) Colorado rubber plant (*Hymenoxys Richardsonia*) *Antennaria* sp., Little Club Moss (*Selaginella densa*) Chick Weed, Iron Plant (*Sideranthus spinulosus*) Sand Vetch (*Psoralea lanceolata*) Winter Fat (*Eurotia lanata*) and several Astragalus species. Prairie Sage (*Artemisia frigida*) is rather prevalent on most parts of the Station lands

and is an indication of over-grazing. Sage Brush (*Artemisia gnaphaloides*) is found mostly on certain small areas on the flats. The Cacti species (*Opuntia polyacantha*) and *Coryphantha vivipara* are very prevalent, the latter often occurring in large dense patches especially on or near burn-out areas.

The work done on this area during the summer of 1927 was chiefly preparatory to the inception of the various projects that have been outlined. The whole area has been fenced and cross fenced both from north to south and from east to west, thus dividing it into four fields of approximately the same size. One section comprising the west half of section 15 and the east half of section 16 has been set aside as land for a building site, for horse pastures and for certain experimental work. For information regarding the building of the fences, the construction of reservoirs and the handling of the stock, reference is made to the report of the Field Husbandry Division.

It is intended to put into practice different grazing methods, including that known as "deferred and rotation grazing". The grazing practices most desirable are those that combine maximum utilization with the maintenance of a vigorous vegetative cover of the climax types, and any system of grazing must be judged largely by its effects on the vegetative cover. A great number of research projects have already been outlined with a view to an intensive study of the native vegetation, including the reaction of the various species to different systems of grazing.

This study will necessitate the use of a large number of plots, located on representative areas in all of the fields used as well as on other outside areas. These plots are of four kinds as follows:—

(1) Permanently enclosed plots.
(2) Temporarily enclosed plots, by use of hurdles.
(3) Large open plots—major quadrats.
(4) Small open plots—minor quadrats.

A careful reconnaissance has been made of each quarter section of the Station lands. Maps have been drawn showing the general topography, the density of the vegetative cover and the distribution of the predominant species. A large number of representative areas were selected for plot work and twenty-three plots of 4 square rods each have been permanently fenced. The work of establishing plots will be continued in the spring of 1928, as it is estimated that well over one hundred plots will be required in this study.

Owing to the unusually heavy rainfall during the summer of 1927, all of the grasses produced an abundance of seed. Large amounts of seed were harvested from the predominant grass species and this will be used in reseeding experiments on range lands and on abandoned fields. Some of this seed will be used also for the establishment of seed production plots at the Dominion Experimental Stations.

Samples of the more common native forage plants have been collected and turned over to the Chemistry Division for chemical analysis, in order to determine the nutritive value of the different species. In many cases the samples were collected at three different growth stages such as: (1) early flowering stage, (2) early dough stage, (3) cured stage, after being subjected to snow and sub-zero temperatures.

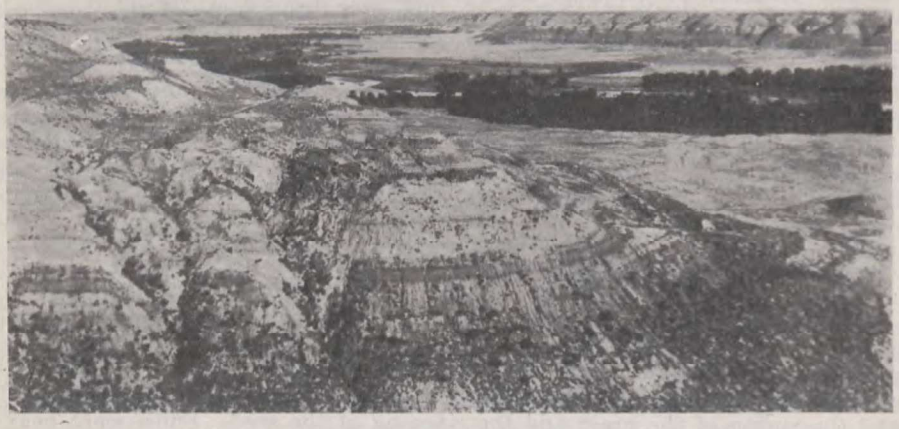
ECOLOGICAL STUDIES

During the summer of 1927, climatic conditions closely approached the optimum for the development of native grasses. The cool, moist months of spring and early summer were followed by a hot period of less precipitation during the latter part of July and the first part of August. This greatly facilitated the curing of the grass and the ripening of the seed. Subsequent heavy

rains helped to cover the seeds and many seedlings were observed during the months of September and October. A marked increase in the density of the vegetative cover, therefore, may be expected during the coming season.

A study is being made of the response of the various species to the unusually favourable climatic conditions which prevailed throughout the past season. All of the grasses grew to an unusual height and produced much seed. Spear grass (*Stipa comata*) appeared to make the most marked response; large, vigorous tufts were produced which grew to a height of from 1½ to 3 feet. The seed of this grass was produced in such great quantities as to occasion rather severe losses to the sheep men. Blue grama grass (*Bouteloua gracilis*) was observed to greatly increase in density, and grew to a height of from 8 to 16 inches while during the previous summer it grew to only 3 or 4 inches in height. Stoloniferous species such as Blue Joint (*Agropyron Smithii*) Reed grass (*Calamagrostis montanensis*) and Salt grass (*Distichlis stricta*) sent up so many shoots that the stand of these grasses was greatly thickened. Both Spear grass and June grass produced a much greater amount of secondary growth than did any of the Poas or Fescues. Any increase in the density of the vegetative cover due to seedling growth should be noticeable during the coming season.

The response of the various species to the increased amount of moisture was very noticeable on abandoned fields and on burn-outs and badly eroded areas. The history of a number of abandoned fields has been obtained. Previous to the summer of 1927, several of these fields were observed to be returning to grass very slowly, only a few scattered patches or bunches of grass being found. During the past season, however, there has been a marked increase in the size and number of the grass covered areas. One or more years of increased precipitation may result in a marked restoration of grass on these weed infested areas, especially so, if the grass already there is allowed to go to seed. Burn-outs are very common both on the Station lands and on adjacent areas. The soil in these depressions is in the form of a hard-pan which water will not readily penetrate. During the past summer many of these depressions were flooded a good deal of the time, and several plant species, chiefly Blue Joint (*Agropyron Smithii*) were observed to be spreading on to these denuded areas. To what extent they will persist during subsequent dry seasons remains to be seen. Quite an increase was noticed also in the amount of vegetation on the badly eroded areas or bad lands. Here the principal species are broad leaved plants such as



Eroded clay banks. A non-productive type of range land.

"Blow-outs." A non-productive type of range land.

Salt Sage (*Atriplex Nuttallii*) Winter Fat (*Eurotia lanata*) *Endolepis Suckleyi* and Sea Blite (*Dondia depressa*).

Permanently enclosed plots have been established on these eroded areas in order to determine to what extent they will become revegetated, when protected from grazing.

Poisonous plants are not very prevalent on the Station lands. Death camas (*Zygadenus venenosus*) and Yellow Loco (*Oxytropis lamberti*) have been found but these occur on a few small patches only. On certain range areas however, poisonous plants are rather prevalent and often cause serious loss. Several cases have been investigated including one near Piapot, Sask., where a rancher lost 30 sheep in two or three days and apparently death was due to poisoning by Death camas.

TAXONOMIC STUDIES

Much time was spent on the collection and identification of the native plants, as found both on the Station lands and on other range areas. Many grasses and broad-leaved plants have been collected and most of these have been identified and placed in the herbarium. A beginning was made in the study of the root, culm and leaf characters of the native grass species. It will be necessary to make a careful morphological study of such characters in order to be able to identify the various species in their early growth stages, and without the use of the inflorescence.

FORAGE CROPS

Practically all of the ranchers now grow forage crops for winter feed, and an effort is being made to determine what varieties will best meet the stockmen's needs in different localities. Co-operative experiments in the growing of alfalfa, sweet clover, corn and crested wheat grass have been carried on with forty ranchers throughout Saskatchewan and Alberta. In most cases five-acre plots were grown and these plots were inspected during the summer months. In nearly every case a good stand was secured and it is quite evident that such experiments will result in a great increase in the acreage devoted to these crops. This work is very promising, as the successful production of a forage crop overcomes the shortage of winter feed and gives immediate relief in many cases.

In the growing of these crops it is best to use northern grown seed. In the case of alfalfa and sweet clover a good supply of seed of the better strains is produced within the borders of Saskatchewan and Alberta. Plots of the more promising grasses are being established at the Dominion Experimental Stations for seed production purposes. In the case of corn, the supply of northern grown seed of the most suitable strains is altogether inadequate. A tremendous loss each year is occasioned by the use of unsuitable seed, and by the growing of strains that are not adapted to local conditions. This year co-operative experiments in corn growing were conducted in the Maple Creek and Comrey districts. Sixty-five strains representing 30 different varieties were grown. The chief purpose of the work was to test the earliness of maturity of the various strains, although data was taken also on uniformity, vigor of plant, amount of stooling, height of ear on the stem and other characters of economic importance. Some of the more desirable appearing plants in each of the more promising strains were self-fertilized and a number of crosses were made. Forty of the sixty-five strains grown, produced mature ears. Ears and sheaves of nearly all of the strains were placed on exhibit at the corn shows held at Maple Creek and at Calgary. Arrangements have been made with a number of farmers in the Maple Creek district to grow about five acres of corn each, for seed production purposes, and it is hoped that corn drying facilities may be established in the town of Maple Creek. With an adequate supply of locally grown seed of suitable strains available it is probable that corn would soon become an important forage crop on certain range areas.

RANGE INVESTIGATIONS IN BRITISH COLUMBIA

An investigation of range conditions in the Nicola Valley of British Columbia was conducted during the latter part of September. Here conditions are quite different from those that prevail on the prairies. On the valley bottoms thousands of acres are under irrigation. Alfalfa is one of the principal forage crops, while grasses, both native and introduced, clover and corn, also furnish large quantities of winter feed. Three of the largest ranches in the district were visited and on these the buildings were found to be much more extensive than those of the prairie ranches.

During the year vegetative cover on the upland pastures has been seriously depleted. This condition has been brought about by over-grazing during the long succession of very dry years preceding 1927. The principal grass on the uplands is a tufted wheat grass (*Agropyron spicatum*). Under favourable conditions this grass produces large compact tufts of palatable and highly nutritious forage. Unfortunately this species has been largely killed out and the ground left either devoid of vegetation or occupied by very inferior species such as annual brome grass (*Bromus tectorum*) and wormwood (*Artemisia frigida*). This brome grass apparently has the ability to take root, produce a small amount of leafage, and go to seed in a very short length of time, and it is largely taking the place of the more desirable wheat grass. The wormwood although relatively an inferior species, furnishes very fair winter forage, as it is relished by the stock to a much greater extent than is the same species found on the prairies.

It is imperative that something be done to increase the carrying capacity of the upland pastures of this district. On these ranches the overhead expenses are heavy and, due to the scarcity of forage in many cases the herds have been reduced to such an extent that the business is no longer on a paying basis.

The investigation will be continued during the summer of 1928 and co-operative experiments with the ranchers of the district are being planned with a view to an improvment in the conditions on this important range area.

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