DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION

HARROW, ONTARIO

REPORT OF THE SUPERINTENDENT

H. A. FREEMAN, B.S.A., M. Sc.

FOR THE YEAR 1927

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DOMINION EXPERIMENTAL STATION, HARROW, ONTARIO

REPORT OF THE SUPERINTENDENT, H. A. FREEMAN, B.S.A., M.Sc.

SEASONAL NOTES

The months of March and April were for the most part fine and mild so that it was possible to prepare and sow tobacco seed beds at a comparatively early date. Some beds were sown the last week in March. Oats were also sown in March. Weather conditions during April were bright and sunny and tobacco seedlings made an excellent start. Rain and cool weather during May retarded seedling growth somewhat, but due to the early seeding date, an abundance of early plants was available throughout Ontario.

Fall wheat came through the winter and spring with very little killing.

Corn was planted later than usual but growth was very slow with poor stands. While towards the latter end of the season the corn crop looked fairly good the yields and quality of the corn was very poor as a whole. Damage by corn borers was much worse than it appeared to be.

Tobacco planting commenced about May 20 and finished much earlier than usual. Due to cool rainy weather in June excellent stands were obtained.

The yields of hay were very good throughout the entire district. Excellent yields of oats were also secured.

The fall was bright and dry, making tobacco harvesting and curing ideal.

The canning tomato crops were good.

The following table gives the 1927 meteorological records for this Station, also averages for the past six years:—

1927 METEOROLOGICAL RECORDS AT HARROW, ONT.

Month	Temperature (F.)						Precipitation (Inches)				Sunshine (Hrs.)	
	Mean		Maximum		Minimum		Rain	Snow	Total Precipitation			
	1927	Average 6 years	1927 Highest	1927 Mean Max.	1927 Lowest	1927 Mean Min.	1927	1927	1927	Average 6 years	1927	Average 6 years
January	26·9	23·61	39·0	29·2	−14·0	14·6	0·43	15½	1·95	2·20	80·4	84·7
February	31·96	26·27	54·5	39·03	24·9	24·9	0·63	8½	1·48	1·84	78·5	84·4
March	38·35	33·92	62	46·1	16	30·6	1·33	.....	1·33	2·39	137·9	129·8
April	45·05	45·82	76	55·7	25·5	34·4	1·27	½	1·27	2·45	194·7	184·5
May	55·25	55·25	84	64·8	34	45·7	2·34	.....	2·34	2·01	205·9	244·8
June	63·15	55·98	98	74·4	41	51·9	1·66	.....	1·66	2·68	276·9	275·5
July	71·0	70·9	96	82·3	44	59·7	2·42	.....	2·42	1·89	293·2	296·7
August	62·55	68·34	86·0	72·5	44·0	52·6	1·05	.....	1·05	1·84	265·2	254·8
September	65·6	62·1	95·0	76·0	41·0	55·2	1·91	.....	1·91	3·32	190·4	158·8
October	54·85	51·22	81·0	66·1	36·0	43·6	0·55	.....	0·55	1·68	176·0	154·8
November	43·6	40·36	67·0	50·97	16·0	36·2	1·45	2	1·65	1·65	67·6	93·4
December	29·1	28·8	55·0	36·3	08·0	21·9	2·24	4½	2·67	1·58	64·9	65·7

Total Precipitation

1922	19·94 inches	1925	26·70 inches
1923	24·98 "	1926	37·82 "
1924	23·28 "	1927	20·28 "

TOBACCO

TOBACCO SEED BEDS

The mild sunny weather during the latter part of March and April was very favourable for the making and seeding of plant beds in 1927. The cool nights during the latter part of April and part of May somewhat retarded the growth of the early seedlings, more especially under cotton. The glass covered beds proved much more satisfactory.

Failures in the district were not nearly so marked as they were the previous year, while in some sections there was a scarcity of plants and a keen demand for plants, especially for Burley and Green River varieties for early planting.

Besides producing sufficient plants of all varieties to meet the requirements of the Station, 100,275 plants were sold to the tobacco growers, which gave a return of $243.

Three thousand five hundred and eighty square feet of glass covered beds, 78 feet of celo-glass covered beds, and 1,240 square feet of cotton covered beds of the following types were seeded:—

(1)	Cold-bed	Glass-covered	Spring-steamed
(2)	Cold-bed	Glass-covered	Fall-steamed
(3)	Semi-hot bed	Glass-covered	Spring-steamed
(4)	Semi-hot bed	Glass-covered	Fall-steamed
(5)	Semi-hot bed	Cotton-covered	Spring-steamed
(6)	Cold-bed	Cotton-covered	Spring-steamed
(7)	Semi-hot bed	Celo-glass-covered	Spring-steamed

A top dressing of 2 inches of well rotted compost was put on all beds.

While small sections of one bed were given an application of root rot diseased soil which was sterilized at different pressures and lengths of time, all other beds were sterilized by being subjected to steam at 100 pounds pressure for 30 minutes. Small sections were steamed for 60 minutes while other sections were left unsteamed.

The growth and vigour of the plants in bed sections steamed for different periods and pressures was very similar, but growth from the steamed sections was much more rapid and vigorous than from the unsteamed sections. Plants were obtained eight days earlier from steamed than from unsteamed sections of the bed.

Weak solutions of nitrate of soda were applied to sections of the beds after the plants had reached the size of a ten-cent piece, or had about shaded the ground.

Straw was used in making the fall prepared semi-hot beds. Under some of the spring made semi-hot beds straw was used while under others cornstalks were used. Both of these materials proved equally satisfactory.

The beds were sown with dry seed on April 5 and 8 at the rate of one-eighth ounce per 100 square feet of bed for flue-cured and Green River varieties and one-seventh ounce for the Burley.

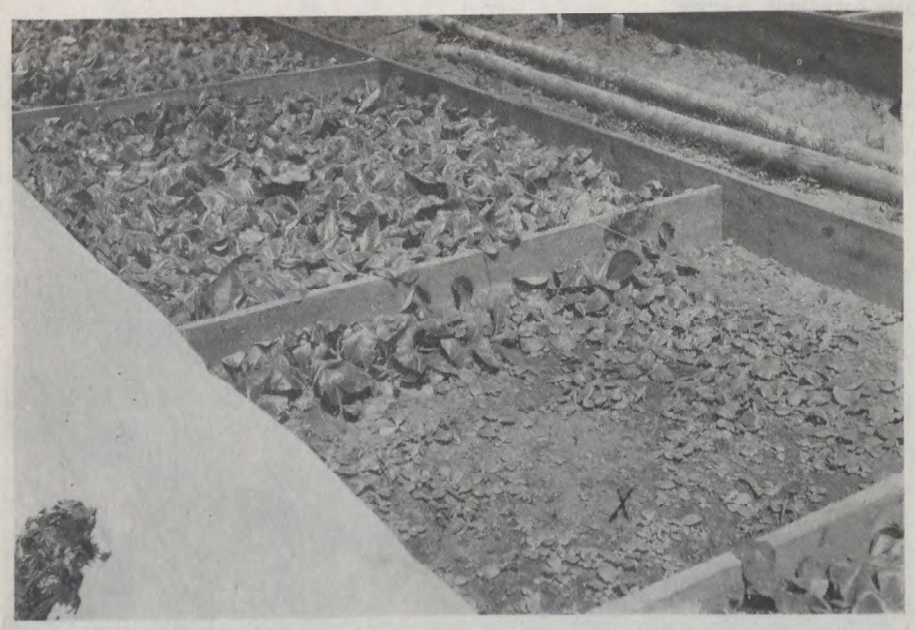
For the eleventh season the semi-hot beds produced plants ready for transplanting earlier than the cold beds.

Glass covered semi-hot beds produced plants fourteen days earlier than semi-hot cotton covered beds, and seven days earlier than glass covered cold beds. The glass covered semi-hot beds gave a much larger total number of plants per 100 square feet of bed.

Beds made and steamed in the fall produced plants just as early and produced as many plants per 100 square feet of bed as similar beds made and steamed in the spring.

Celo-glass produced plants which appeared to have been rather shaded. The beds covered with this material did not require as much attention and held moisture much better than glass covered beds. The celo-glass covered beds produced plants 3 days later than similar beds glass covered. From one year's results it would indicate that celo-glass could be used on a part of the seed beds with fair results so far as plant production is concerned.

Beds top dressed with well rotted black muck required less watering and produced earlier plants than those receiving no compost.



Showing difference in growth on diseased and healthy soil; section X diseased.

OBSERVATIONS AND CONCLUSIONS

1. For the eleventh season the semi-hot bed has proven to be the most efficient type of bed tested.

2. Eight years results indicate that by using straw under the bed and covering it completely after steaming to keep out wind blown material, weed seeds, etc., the semi-hot bed can be made and sterilized in the fall without lessening its effectiveness.

3. Diseases and weeds are well controlled by steaming for 30 minutes at 100 pounds pressure provided the soil is in a good loose condition and not too wet.

4. A weak solution of nitrate of soda applied at six-day intervals seemed sufficient for the production of early thrifty plants on the fairly fertile black muck soil used.

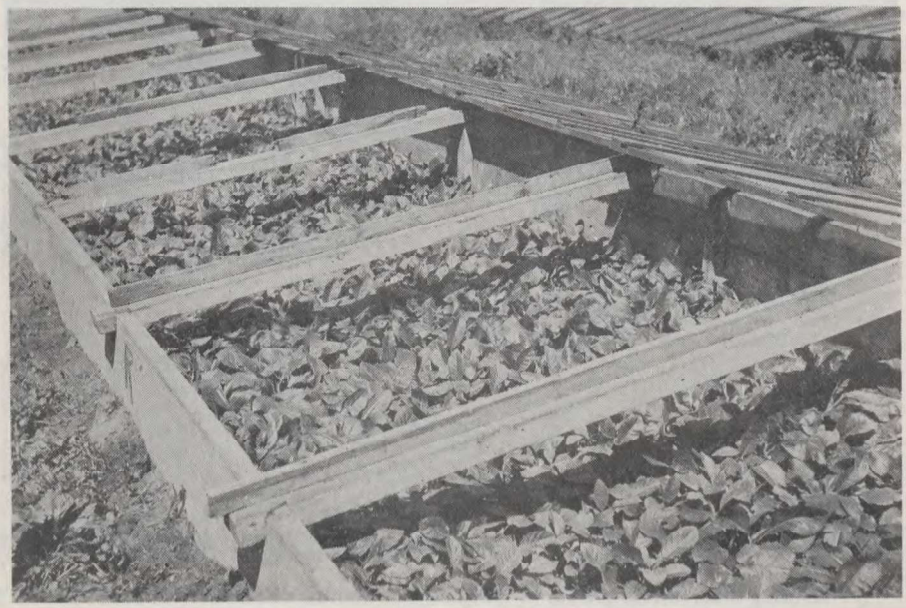
5. Apparently cornstalks which had been used for bedding, and corn fodder, or straw from the stack, were again equally effective under the semi-hot bed.

6. Steaming hastens the growth of plants as well as controlling diseases and weeds.

7. The rate of seeding should be governed by the percentage germination of the seed. By count it has been found that one-seventh of an ounce of tobacco seed contains about 49,000 seeds. One hundred square feet of plant bed con-

tains 14,400 square inches. With seed germinating 80 per cent or better, sow one-eighth ounce of flue-cured or Green River seed and one-seventh of an ounce of Burley seed per 100 square feet of plant bed. On account of the tendency of the flue-cured and Green River varieties to grow spindly they should be sown more thinly than Burley. At the above rates more than three seed to the square inch are sown, and if only one plant is produced per square inch, 100 square feet of bed would be sufficient for planting approximately two acres of tobacco.

9. A top dressing of 2 inches of well rotted black muck on the plant beds gave excellent results.



Full ventilation and hardening off of plants.

TRANSPLANTING TOBACCO

Transplanting was begun on the Station on the 28th of May and completed on the 10th of June. The transplanting was done by machine and usually in the afternoon.

For two successive evenings, after six o'clock, or before if cool and cloudy, preceding the planting of the area to tobacco, a poison bran mixture was applied broadcast. Good stands of tobacco were obtained and cut worms were effectively controlled.

Twenty-four plots of flue-cured tobacco, twelve Warne and twelve Hickory Pryor, were planted at different distances with the object of determining the effect of distance of planting on both the yield and quality of tobacco. The plots were also used to compare Warne and Hickory Pryor as to yield and colour. All plots were planted the same day, cultivated and handled exactly alike throughout. All rows were 36 inches apart.

The results in all cases are the average of four plots for each distance and are as follows:—

Distance of planting in row	Distance between row	Yield per acre	Percentage bright	Variety
Inch	Inch	Lb.		
18	36	1,266	90·0	Warne
21	36	1,356	82·5	"
24	36	1,188	80·0	"
18	36	1,398	85·0	Hickory Pryor
21	36	1,704	68·0	"
24	36	1,044	43·0	"

The tobacco on all of these plots made a very good thrifty growth as will be noted from the above yield. A high percentage of bright leaf was obtained from both varieties.

The proper size of plants for transplanting.

Again Hickory Pryor gave a higher yield per acre when planted at 18 and 21 inches than did Warne planted at the same distance apart. Warne was superior to Hickory Pryor in yield and colour when planted at 24 inches apart. Warne gave the highest total percentage of bright leaf in all cases.

It seems from the above experiment that good results should be obtained by planting Hickory Pryor and Warne in rows 36 inches apart and 21 inches in the row.

TOBACCO INSECT PESTS

Cutworms were very numerous again in spring ploughed fields. The worms cut practically all of the plants on many fields throughout the district where control measures were not used. On fall ploughed land they were not so numerous.

Cutworms were almost completely controlled on the Station by the use of the following mixtures:—

50 lb. bran 1 lb. Paris green	Mix thoroughly dry.
1 gal. cheap molasses 2 gals. water	Mix thoroughly.

Bring the above mixtures together and add sufficient water to make the whole mass into a good doughy or pasty condition.

Transplanting tobacco.

Hornworms were fairly numerous and were completely controlled by spraying with 4 to 5 pounds of arsenate of lead per acre. The dry powdered arsenate of lead was used after the tobacco had reached too large a size to go through with the spray cart. When used as a dust, equal quantities of sifted wood ashes were mixed with the lead and dusted on with the hand dust gun while the dew was on the tobacco. Dusting is rather wasteful of material and does not stick as well as the spray.

Grasshoppers gave very little trouble.

HARVESTING TOBACCO

Harvesting was begun on September 2. Practically all of the tobacco was harvested by the split stalk method and as soon as the tobacco had wilted sufficiently to handle without breaking it was hauled to the curing barns.

One curing of flue tobacco was primed from the stalk, strung on laths in bunches of three leaves with an average of 26 bunches to the lath, taken to the curing barn the same day and hung 7 inches apart on the runs. The procedure of curing then followed was the same as with stalk harvested tobacco.

It required ten inexperienced men 9½ hours to fill this kiln which was a five-room curing barn.

The tobacco cured just as bright and satisfactory as did stalk cut tobacco and in four days time.

It would seem with more experienced labour that flue tobacco can be harvested about as cheaply by priming and stringing as by cutting the stalk, with the possibility of a better colour of cured leaf being obtained and a saving of from 18 to 24 hours in the time of curing.

Filling the flue-curing barn.

In a comparison of curing split stalk and spudded or needled tobacco, it was again proven that splitting the stalk gave a brighter coloured leaf and also hastened the time of curing.

FLUE-CURING TOBACCO WITH STEAM HEAT

The equipment used for this experiment is the same as was used in 1923, 1924, 1925 and 1926. It consists of a 30 horse-power boiler and three five room kilns. Each kiln is equipped with thirteen 1¼-inch pipe radiators, each 18 feet long.

During this eason two kilns were filled the first day, the third was filled on the second day and it was possible to have three kilns curing simultaneously during one-third of the curing season while there was one period of 24 hours during which the steam was allowed to die down entirely. Through the yellowing period the boiler could have handled more kilns easily, while high temperatures were run on three kilns on two different occasions. It handled these three kilns this season under more favourable weather conditions, much more

satisfactorily than it did during 1926 under adverse weather conditions. The boiler could have handled five or six kilns on low temperatures with perhaps four kilns on high temperature during a season like 1927. However, on cool days and nights more than three kilns on high temperatures would no doubt cause forced firing of the boiler.

The boiler was fired continuously from September 2 to September 24 with the exception of one day. During this period 23,200 pounds of soft coal was burned and eight curings of tobacco were made.

The average amount of fuel used per curing was 2,900 pounds of soft coal, as compared with 3,347 pounds in 1926, 3,207 pounds in 1925, 3,347 pounds in 1924, and 3,830 pounds in 1923.

Fewer single curings were made in 1927 than previous years.

No curings were steamed into case during the season of 1927.

The time required in curing varied from four to five days, the average time being four days thirteen hours for the eight kilns cured with steam.

When three kilns were running on high heat drying out the leaf and stalk, the temperatures in the kilns varying from 170 to 198 degrees F. it required a pressure of 60 to 80 pounds of steam on the boiler with slightly higher pressure on very cool windy nights.

The average cost for coal per curing with steam was $11.60, as compared with an estimated cost of $20.25 per curing with wood.

OBSERVATIONS AND CONCLUSIONS

1. Until the equipment consists of as many kilns as the boiler will handle during the curing operations, and the tobacco acreage is sufficiently large to ensure ripe tobacco to fill these kilns, no definite conclusions can be reached as to the exact cost of curing with steam.

2. Tobacco cured just as bright and satisfactorily with steam heat as with the twin furnaces burning wood or coal.

3. A more uniform temperature was maintained in the steam kilns than in the kiln where the twin furnaces were used.

4. The 30 horse-power boiler handled three kilns satisfactorily by maintaining a pressure of 20 to 30 pounds on the boiler for yellowing, and 40 to 80 pounds pressure on the boiler when drying the leaf and stalk.

5. Six kilns with three and possibly four of them being on high temperature at one time might be satisfactorily handled with the boiler during a favourable season.

6. Curing with steam eliminates the fire risk, and can be used for steaming the dry tobacco into case.

7. It would be recommended to locate the boiler centrally, and build the kilns close around the steam plant on account of the economy in piping, rapidity of circulation, and less heat lost by radiation to and from the kilns.

EXPERIMENTS WITH THE BECKET-COVILL TWIN FURNACE

The kiln used for this experiment was used during 1925 and 1926 and is equipped with the Becket-Covill twin furnaces.

Four curings were made with the furnaces during the season of 1927. One curing was made with wood as the fuel, two with coal alone and one with a wood and coal combination.

When wood was used entirely as a fuel the furnaces required constant attention, the control of temperature was very difficult and frequent additions of fuel had to be made.

By burning soft coal in the furnace a more uniform temperature was maintained with less attention than was the case while burning wood.

With the exception of the heat being rather high just over the furnaces when burning coal and rather low when burning wood, which difficulties were largely overcome by using a combination of wood and coal, the furnaces proved fairly satisfactory.

It would have been more interesting to compare these furnaces in a kiln the same size as the steam equipped kilns.

The total cost of fuel for one curing made in the four-room kiln using a combination of wood and coal was $6.80; that of coal alone, $5.60; and with wood alone as a fuel the cost was $9. The cost of the combination of wood and coal in 1926 was $7.25.

The season of 1927 was more favourable for curing than the season of 1926.

THE RELATION OF THE RELATIVE HUMIDITY IN THE CURING BARN TO THE COLOUR OF THE CURED LEAF

During the past seven years records have been kept of the relative humidity in the flue-curing kilns and the changes in colour of the tobacco watched carefully throughout the curing process, with the object of determining, if possible, what the humidity in the kiln should be at the various stages of curing to produce the best colour in the cured leaf.

Due to the climatic conditions of each season and the variations in the character of crops, together with the slow changing process in the colouring of the leaf, the results have varied. However, the results obtained this year further show that the humidity in the curing barn should be lowered more rapidly near the end of the yellowing process with large heavy bodied tobacco than with medium or light bodied tobacco.

The results secured this year bear out the results of the past six years which show that with average tobacco the relative humidity should be about 78 per cent when the lugs begin to yellow, 69 per cent when the middles begin to yellow, 59 per cent when the tips begin to yellow, and 46 per cent when the tobacco is sufficiently yellow for fixing the colour.

EFFECT OF WEATHER CONDITIONS AND RIPENESS ON THE CURE

The best results were obtained with ripe tobacco which had yellowed nicely in the field before harvesting.

Tobacco rained on in the field during harvesting, cured darker in colour than that not rained on. When caught out in the rain it should be allowed to drip about five hours before starting the fires, or fire at a low temperature for five or six hours with considerable ventilation in both the top and bottom of the curing barn.

Better results were obtained with tobacco which had been nicely wilted in the field, than tobacco slightly or excessively wilted before hauling to the curing barn.

VARIETY TESTS OF FLUE-CURED TOBACCO

Warne and Hickory Pryor composed the bulk of the flue-cured crop again in 1927. Both are broadleaf varieties. While the Hickory Pryor has the broader leaf of the two, it is more brittle and does not hold in case as well, although usually curing a more flashy bright than the Warne.

Neither of these varieties showed any appreciable amounts of mosaic, or other diseases the past season. Comparing the results of all plots on Hickory Pryor and Warne, the Pryor gave the highest yield in three out of six test comparisons, while the Warne gave the highest average percentage of bright tobacco.

Other varieties tested were Lizard Tail, White Stem Orinoco, and Gold Leaf.

The Lizard Tail variety has long, narrow, fairly heavy bodied tapering leaves with large midribs, the internodes being of medium length.

White Stem Orinoco produced a fairly large coarse plant, with large, heavy bodied, fairly smooth leaves with medium ruffles and large veins and midribs.

Gold Leaf produced long, rather blunt, broad, medium bodied, fairly smooth leaves with medium sized midribs and ruffles.

Showing tobacco baled and waiting shipment.

White Stem Orinoco and Gold Leaf made a poor start and did not ripen in time to cure. However, a few laths of bottom leaves, primed from each variety were cured and developed a very bright colour.

The yields of the varieties were as follows:—

Variety	Yield per acre
Hickory Pryor	1,430 pounds
Warne	1,385 "
Lizard Tail	1,222 "

Of all of the varieties tested on the Station for a period of years, Warne appears to be the best in an average season with Hickory Pryor following a close second.

VARIETY TESTS OF BURLEY TOBACCO

The general crop of Burley consisted of four varieties, namely, Station Standup, Standup Resistant, Broadleaf, and Broadleaf Resistant.

Other Burley varieties tested were Judy's Pride, Moss Broadleaf, Resistant C.R.B., and Recessive.

The yields of the Burley varieties were as follows:—

Variety	Yield per acre
Broadleaf	1,960 pounds
Station Standup	1,840 "
Resistant C.R.B	1,760 "
Broadleaf Resistant	1,680 "
Standup Resistant	1,320 "
Recessive	1,440 "
Judy's Pride	1,120 "
Broadleaf (Moss)	800 "

The above varieties with the exception of the Broadleaf Burley (Moss) have been previously grown and described in previous reports. While Moss Broadleaf gave a rather light yield in this test the growth and appearance on a larger plot was similar to the Broadleaf grown on the Station but had a thinner leaf.

Of the varieties grown, very little difference in the colour of the cured leaf was noted. This was no doubt due to the unusually favourable season for air-cured varieties. The standup varieties produced the best colour and quality.

The resistant varieties are recommended for diseased or doubtful soils; Broadleaf for gravelly soils and soils particularly susceptible to drouth; the Station Standup Burley for heavy sandy loams and light clay loams.

TESTS OF RESISTANT BURLEY AND GREEN RIVER TOBACCO

The root-rot resistant varieties of Burley and three resistant strains of Pryor (Green River tobacco) were tested for root-rot resistance on a field which is thoroughly infested with the black root-rot disease.

The varieties of Burley included Johnson's Broadleaf Resistant, Johnson's Standup Resistant, and Resistant C.R.B.

The Standup Resistant grows well on badly diseased soil and has more resistance to root-rot than any of the other varieties tested.

Broadleaf Resistant also grows well on root-rot soil. Resistant C.R.B. also proved quite resistant and made fair growth.

The three strains of Resistant Pryor (Green River), were obtained from Dr. J. Johnson of the University of Wisconsin in the spring of 1925 and were grown again this season. They were number 11001, 11008, and 11009. Of these strains 11001 and 11009 proved to be the most resistant with 11008 following close. Strain 11008 looked the most promising again this season. It seems to be a well fixed strain and breeds true to type, producing long broad leaves of good body and colour.

Strains 11001 and 11009 are similar to 11008 in shape and size of leaf and showed a fewer number of off-type plants than in the previous year.

A number of non-resistant varieties of Burley and Green River tobacco were grown on this plot with the resistant varieties and strains. The non-resistant varieties were very poor and not worth harvesting.

The following table gives the yield per acre made by the various varieties on badly diseased soil:—

Variety	Yield per acre
Standup Resistant	638 pounds
Resistant C.R.B	638 "
Resistant Pryor 11001	506 "
Resistant Pryor, 11009	506 "
Resistant Pryor, 11008	448 "
Yellow Pryor	418 "
Little Hill	154 "
Greenwood	154 "
British Snuff	154 "

TESTS OF GREEN RIVER VARIETIES

A number of varieties of dark tobacco were grown. These included Little Hill, Greenwood, Yellow Pryor, Rudolph Improved, British Snuff, Broadleaf, One-Sucker, Smith, and three strains of Resistant Pryor number 11001, 11008 and 11009.

All of the varieties were grown the previous season with the exception of the British Snuff.

Little Hill was the heaviest yielder of the black varieties again this year. It had somewhat oval, medium length and medium breadth, corrugated leaves with small ruffles, short internodes, medium size midribs and standup type. It closely resembles Greenwood in the field and in the cured leaf.

Greenwood has long fairly broad, heavy bodied, smooth leaves with medium size midrib. This variety is a standup type and the most popular of the Green River varieties grown in Ontario at the present time.

Yellow Pryor had long, fairly smooth, broad, drooping leaves, fairly large midribs and veins, small ruffles, medium body, with fair red colour. This is a decidedly drooping type and on heavy soil the leaves often become very dirty, sometimes getting covered with mud in the field. This variety ripens ten days to two weeks later than Greenwood and Little Hill.

Rudolph Improved is a large plant, standup in type with large somewhat oval, corrugated leaves of a dark green colour. This variety matured in the same time as Yellow Pryor and was next to Little Hill this year in yield. It cured rather light brown in colour.

Smith is a standup type with heavy bodied, medium length, oval shaped leaves of a very dark green colour. The leaves are carried well up from the ground. The veins and midribs are of medium size, it matures about the same time as Greenwood.

Broadleaf One Sucker matured earlier than any of the dark tobaccos grown on the Station. It is a standup type with long narrow pointed leaves, very coarse midribs and veins. The cured leaf had a rich brown colour of fairly good body.

British Snuff is a fairly large plant, standup in type with large somewhat oval, fairly smooth leaves of a very dark green colour it matured in about the same time as Yellow Pryor. The cured leaf was rather coarse and of a brown colour.

The yields of the varieties and strains were as follows:—

Variety	Yield per acre
Little Hill	1,780 pounds
Resistant Pryor 11009	1,713 "
Rudolph Improved	1,560 "
Resistant Pryor 11008	1,471 "
Smith	1,440 "
Greenwood	1,400 "
Yellow Pryor	1,410 "
Resistant Pryor 11001	1,420 "
British Snuff	1,320 "
Broadleaf One Sucker	1,200 "

Since Little Hill and Greenwood are from seven to ten days earlier than Yellow Pryor and are decidedly standup types, and also produce equal to better yields and quality than any of the dark varieties tested, it is thought that for Canadian conditions Little Hill and Greenwood are the most desirable varieties of the dark types to grow.

FERTILIZER TESTS ON FLUE-CURED TOBACCO

Twenty-one one-twentieth acre fertilizer plots were run in duplicate on the Station. These plots were staked off on land as nearly uniform as possible. All of the plots with the exception of check plots and two plots on which ready mixed commercial fertilizer was used, had home mixed fertilizers of different formulae drilled in the rows. Each plot contained the same number of plants of tobacco, all were planted the same day, cultivated, harvested and cured under as like conditions as possible, and all possible precautions taken to make the fertilizer the only factor affecting the results.

These plots were all fall manured and fall ploughed. The regular rotation used on this field is (1) corn, (2) tobacco, (3) oats, (4) hay.

The yield obtained on these plots in duplicate are given in the following table under A and B.

Plot No.	Sulphate of ammonia lb. per acre	Acid phosphate lb. per acre	Sulphate of potash lb. per acre	Urea lb. per acre	Dried blood lb. per acre	Carbonate of Potash lb. per acre	Double manure salts of potash lb. per acre	Tankage lb. per acre	Cotton seed meal lb. per acre	Yield per acre, lb.		Percentage bright leaf		Increase in yield over average of check plots		Value of increase at $0.32 per lb.		Cost of fertiliser per acre
										A	B	A	B	A	B	A	B	
																$	$	$
1	100	600	200	....	.....	.....	.....	....	.....	980	1,290	77·5	79·0	.....	168	.....	53·76	13 52
2	.....	600	200	60	.....	.....	.....	....	.....	1,240	1,290	82·2	81·1	118	168	37 76	53 76	12 87
3	140	600	200	....	.....	.....	.....	....	.....	1,260	1,250	79·3	80·0	138	128	44 16	40·96	14 62
4	180	600	200	....	.....	.....	.....	....	.....	1,500	1,320	84·0	83·3	378	198	120 96	63 16	15 72
5	210	600	200	....	.....	.....	.....	....	.....	1,440	1,270	87·5	77·3	318	148	101 76	47 36	16 55
6	140	300	200	....	.....	.....	.....	....	.....	1,240	1,390	84·0	82·0	118	268	37·76	85·76	11 86
7	Check	.....	.....	....	.....	.....	.....	....	.....	1,160	1,140	83·0	82·4	.....	.....	.....	.....	.....
8	140	400	200	....	.....	.....	.....	....	.....	1,310	1,360	80·0	84·0	188	238	60 16	76 16	12 78
9	140	500	200	....	.....	.....	.....	....	.....	1,250	1,340	85·6	85·0	120	218	38 40	69·76	13 70
10	140	600	200	....	.....	.....	.....	....	.....	1,140	1,360	81·0	81·0	18	238	5 76	76 16	14 62
11	140	600	140	....	.....	.....	.....	....	.....	1,360	1,230	89·0	79·0	238	108	76·16	34 56	13 04
12	140	600	166	....	.....	.....	.....	....	.....	1,440	1,320	89·0	85·0	318	198	101 76	63 36	13 72
13	150	500	80	....	.....	.....	.....	....	.....	1,380	1,260	88·4	85·7	258	138	92·56	44·16	10·80
14	1,000	lbs.	Commercial 3-8-4							1,380	1,360	87·0	85·3	258	238	82·56	76·16	17·63
15	50	600	200	....	83	.....	.....	....	.....	1,400	1,430	85·7	86·1	278	308	88·96	98·56	14·85
16	70	600	200	....	116	.....	.....	....	.....	1,220	1,100	82·0	74·4	98	.....	31 36	.....	16·46
17	140	600	.....	....	.....	192	.....	....	.....	1,270	1,080	86·0	83·3	148	.....	47·36	.....	14·41
18	140	600	.....	....	.....	.....	370	....	.....	1,220	1,180	82·0	67·2	98	58	31 36	.....	16·69
19	70	570	192	....	.....	.....	.....	....	232	1,120	1,340	82·1	68·6	.....	218	.....	69·76	16·87
20	70	450	200	....	.....	.....	.....	170	.....	1,170	1,230	83·0	70·3	48	158	15·36	49·56	14·93
21	Check	.....	.....	....	.....	.....	.....	....	.....	1,010	1,180	84·0	74·6	.....	.....	.....	.....	.....

Judging from the closeness of the yield of tobacco on the duplicate plots in some cases, and the variation in the yield in other cases, it would appear that the field on which these plots were grown was not entirely uniform.

OBSERVATIONS AND CONCLUSIONS

1. All of the plots and their duplicates, with the exception of number 1A, 10A, 16B, 17B and 19A showed a substantial profit from the use of the fertilizer.

2. The best formula from the standpoints of yield, quality, colour, and economy consisted of:—

Sulphate of ammonia	50 pounds per acre
Dried blood	83 "
Acid phosphate	600 "
Sulphate of potash	200 "

3. Comparing plots number 1, 15, 19 and 20 and their duplicates, supplying the nitrogen from a mixture of dried blood and sulphate of ammonia proved slightly superior to obtaining the nitrogen from sulphate of ammonia alone. The nitrogen supplied from a mixture of tankage and sulphate of ammonia did not prove equal to sulphate of ammonia alone. Supplying the nitrogen from sulphate of ammonia and cotton seed meal was not quite equal to sulphate of ammonia alone.

4. A mixture of sulphate of ammonia and dried blood such as contained in plot 15 and its duplicate proved a better source of nitrogen than either tankage or cotton seed meal. This is contrary to the results of the past three seasons where tankage was the leader.

5. A comparison of home mixed and factory mixed fertilizers showed a slightly higher return from the former, while the factory mixed fertilizer stood fourth in order of yield and economy.

6. In a comparison of various sources of potash on plots number 3, 17 and 18 and their duplicates, the highest yields this year were obtained from sulphate of potash, double manure salts of potash being second and carbonate of potash third.

7. If all of the fertilizer plots had been fertilized and produced yields like plot 15 and its duplicate the net return due to the use of fertilizer would have been $93.76 per acre, or a net return of $6.31 for each dollar spent in fertilizer.

Plot 14 and its duplicate, on which was used commercial 3-8-4 factory mixed fertilizer, gave a return of $79.36 per acre or a net return of $4.50 for each dollar spent in fertilizer.

8. During the season of 1927 the general formula, home mixed and used on the Station for flue-cured tobacco consisted of:

70 pounds sulphate of ammonia per acre.
166⅔ " dried blood per acre.
600 " acid phosphate per acre.
200 " sulphate of potash per acre.

This mixture again proved fairly satisfactory from the standpoints of yield, maturity and quality.

FERTILIZER TESTS ON BURLEY

Twenty-four one-twentieth acre fertilizer plots were run in duplicate on Burley this season using the Station Standup variety. The field was a fairly heavy loam of rather low fertility. This field became a part of the Experimental Station four years ago. The rotation followed is (1) corn, (2) tobacco, (3) fall wheat, (4) hay. The hay stubble is manured at the rate of 12 tons of barnyard manure per acre in the fall and fall ploughed if possible. When not fall manured and ploughed the land is spring manured and ploughed.

For the 1927 crop the field was spring ploughed.

The same procedure was followed in the case of the Burley fertilizer plots as in the flue-cured tobacco experiments. The manure is applied on the hay sod followed by corn and the fertilizer applied on the tobacco.

The fertilizers used and the results obtained were as follows:—

Plot No.	Sulphate of ammonia lb. per acre	Acid phosphate lb. per acre	Sulphate of potash lb. per acre	Carbonate of potash lb. per acre	Dried blood lb. per acre	Cotton seed meal lb. per acre	Nitrate of soda lb. per acre	Tankage lb. per acre	Potash Salts lb. per acre	Yield per acre, lb.		Increase of yield over average of check plots (per acre)		Value of increase per acre at $0.22 per lb.		Cost of fertilizers per acre
										A	B	A	B	A	B	B
														$	$	$
1	240	400	200	.....	.....	.....	.....	.....	.....	1,100	1,200	30	130	6 60	28 60	15 53
2	320	400	200	.....	.....	.....	.....	.....	.....	1,040	1,760	.....	690	.....	151 80	17 73
3	400	400	200	.....	.....	.....	.....	.....	.....	1,640	1,640	570	570	125 40	125 40	19 93
4	480	400	200	.....	.....	.....	.....	.....	.....	1,540	1,800	470	730	103 40	160 60	22 13
5	Check	.....	.....	.....	.....	.....	.....	.....	.....	1,100	1,180	.....	.....	.....	.....	.....
6	400	200	200	.....	.....	.....	.....	.....	.....	1,600	1,640	530	570	116 60	125 40	18 09
7	400	300	200	.....	.....	.....	.....	.....	.....	1,520	1,920	450	850	99 00	187 00	19 01
8	400	500	200	.....	.....	.....	.....	.....	.....	1,480	1,840	410	770	90 20	169 40	20 85
9	400	400	100	.....	.....	.....	.....	.....	.....	1,520	1,900	450	830	99 00	182 60	17 31
10	400	400	130	.....	.....	.....	.....	.....	.....	1,380	1,860	310	790	68 20	173 80	18 09
11	400	400	170	.....	.....	.....	.....	.....	.....	1,700	1,860	630	790	138 60	173 80	19 14
12	Check	.....	.....	.....	.....	.....	.....	.....	.....	960	700	.....	.....	.....	.....	.....
13	150	500	80	.....	.....	.....	.....	.....	.....	1,420	1,740	350	670	77 00	147 40	10 82
14	1,000 lbs. Commercial 3-8-4									1,620	1,400	550	330	121 00	72 60	17 63
15	320	400	200	.....	.....	.....	.....	.....	.....	1,740	1,520	670	450	147 40	99 00	17 73
16	320	400	200	.....	.....	.....	.....	.....	.....	1,700	1,580	630	410	138 60	90 20	17 73
17	320	400	.....	190	.....	.....	.....	.....	.....	1,700	1,680	630	610	138 60	134 20	17 47
18	Check	.....	.....	.....	.....	.....	.....	.....	.....	1,200	1,200	.....	.....	.....	.....	.....
19	160	400	200	.....	270	.....	.....	.....	.....	1,580	1,700	510	630	112 20	138 60	22 11
20	160	350	180	.....	.....	450	.....	.....	.....	1,480	1,840	410	770	90 20	169 40	20 54
21	160	400	200	.....	.....	.....	210	.....	.....	1,580	1,840	510	770	112 20	169 40	20 15
22	160	100	200	.....	.....	.....	.....	400	.....	1,240	1,680	170	610	37 40	134 20	18 57
23	320	400	.....	.....	.....	.....	.....	.....	370	1,740	1,960	670	890	147 40	195 80	19 88
24	Check	.....	.....	.....	.....	.....	.....	.....	.....	900	1,320	.....	.....	.....	.....	.....

OBSERVATIONS AND CONCLUSIONS

1. All of the fertilizer mixtures on all plots with the exception of plot 2A were highly profitable.

2. Plot 2A was on a hard clay spot in the field which was low in fertility and in very poor physical condition. The variation in the yield of the check plots and their duplicate plots shows that the field is not as uniform in fertility as could be desired.

3. The best and most economical formula apparently consists of:—

320 pounds sulphate of ammonia per acre.
400 " acid phosphate per acre.
370 " double manure salts of potash per acre.

4. The best and most economical formula in 1926 consisted of:—

320 pounds sulphate of ammonia per acre.
400 " acid phosphate per acre.
200 " sulphate of potash per acre.

5. Comparing the results obtained on plots number 13 and 14 and duplicates, the home mixed fertilizer gave a higher yield and was much more economical than the factory mixed fertilizer.

6. The carbonate of potash again this year gave a higher yield than sulphate of potash on duplicate plots 16 and 17.

7. The average yields on the double manure salts of potash plots were higher than for either carbonate or sulphate of potash.

8. Supplying all of the nitrogen from sulphate of ammonia was superior to all other sources.

9. Cotton seed meal produced the highest yield of any organic source of nitrogen. Blood was the next best organic source of nitrogen.

10. Had all of the plots been fertilized like plots 23 and duplicate, the average return per acre would have been $176.60, or a net return of $8.58 for each dollar spent for fertilizer.

11. It is very evident from the results of this and other years that for yield and economy, double manure salts of potash are promising. However, as sulphate of potash has so consistently, over a period of years, given excellent results, it is thought best to recommend sulphate of potash over all other forms of potash until further tests have been completed.

FERTILIZER TESTS ON GREEN RIVER TOBACCO

Ten one-twentieth acre fertilizer plots in duplicate were conducted with the Green River type of tobacco using the same procedure as was followed with the fertilizer tests on Burley and flue-cured tobacco.

The fertilizers used and results obtained were as follows:—

Plot No.	Sulphate of ammonia, pounds per acre	Acid phosphate, pounds per acre	Sulphate of potash, pounds per acre	Yield per acre in pounds		Increase in yield over average of check plots, pounds		Value of increase at $0.22 per pound		Cost of fertilizer per acre
				A	B	A	B	A $ cts.	B $ cts.	$ cts.
1	240	400	200	1,380	1,100	385	105	84 70	23 10	15 53
2	Check			1,140	1,240	.....	.....	.....	.....	.....
3	320	400	200	1,340	1,100	345	105	75 90	23 10	17 73
4	400	400	200	1,320	1,190	325	195	42 90	64 90	19 93
5	320	300	200	1,140	1,200	145	205	31 90	45 10	16 81
6	320	500	200	1,460	1,200	465	205	102 30	45 10	18 60
7	Check			660	940					
8	320	400	200	1,460	1,320	465	325	102 30	71 50	17 73
9	320	400	100	940	1,390	.....	395	.....	86 90	15 10
10	320	400	150	1,340	1,300	345	305	75 90	67 10	16 41

These plots are grown on a section of the farm which is rather low in fertility. A four-year rotation of (1) corn, (2) tobacco, (3) wheat, (4) hay, clover and alfalfa, is being followed using 12 tons of manure per acre on the hay sod for corn and the fertilizer is applied to the tobacco.

Averaging the check plots, two of which were rather low in yield and two rather high, would show this field to be rather low and variable in natural fertility. However, all plots with the exception of 9A and duplicate gave a fair increase in yield for the use of fertilizer.

The best formula for yield and economy in 1927 on this soil appeared to be:

320 pounds sulphate of ammonia per acre.
400 pounds acid phosphate per acre.
200 pounds sulphate of potash per acre.

The above formula also proved best during 1926.

The best formula in 1925 from the standpoint of yield and economy consisted of:

240 pounds sulphate of ammonia per acre.
400 pounds acid phosphate per acre.
150 pounds sulphate of potash per acre.

DRILLING VS. BROADCASTING FERTILIZER

Twelve plots on the Station were staked off in a portion of the same field where the Green River and Burley fertilizer plots were grown. Four of the Burley plots were staked off on the west side of the field and three on the east side of the field. The same amount of fertilizer was drilled into the row on five plots and broadcast on five other plots. Two plots were staked out on which no fertilizer was applied. Five of the plots were devoted to the study of broadcasting vs. drilling for Green River tobacco, Greenwood variety being used for the test. Seven plots were used for the Burley test, Station Standup being used. The natural fertility of the soil on which these experiments were run was only fairly good as is evident from the yield of the check plots.

The fertilizer used in this test was composed of the following formula:—

400 pounds sulphate of ammonia per acre.
400 pounds acid phosphate per acre.
200 pounds sulphate of potash per acre.

The results obtained were as follows:—

GREEN RIVER TOBACCO

Plot No.	Method of applying the Fertilizer	Yield per acre	Increase in yield, average	Value of increase at 22c. per lb.
		lb.	lb.	$ cts.
20	Drilled	1,360	10	2 20
21	Check—no fertilizer	995		
22	Broadcast	1,320		
23	Drilled	1,380		
24	Broadcast	1,400		

By comparison of yields with the no-fertilizer plot it can be seen that both drilling and broadcasting were very profitable. While there was a small difference this season in favour of drilling, the difference is not so outstanding as is usually shown, or as was the case in 1926.

WHITE BURLEY TOBACCO

Plot No.	Method of applying the Fertilizer	Yield per acre	Increase in yield, average	Value of increase at 22c. per lb.
		lb.	lb.	$ cts.
1	Broadcast	1,740	67	14 74
2	Drilled	1,740		
3	Broadcast	1,640		
4	Drilled	1,520		
5	Broadcast	1,740		
6	Drilled	1,700		
7	Check—no fertilizers	1,070		

It can be seen that both drilling and broadcasting the fertilizer for White Burley was highly profitable, while broadcasting proved slightly more profitable than drilling this season.

OBSERVATION AND CONCLUSIONS

Since in seven out of ten years, drilling the fertilizer in the row has proven superior to broadcasting, it would seem safe to conclude that drilling is superior to broadcasting. This difference is seldom noticeable in the growing plants in the field but shows up in the quality and weight of the cured leaf.

MANURE TESTS ON BURLEY

With the object of determining as far as possible, the most profitable amount of manure to use in conjunction with fertilizer in producing Burley tobacco, four one-tenth acre plots were staked off and fertilizer of the same analysis, in equal quantities, was applied to each plot. The plots were manured at the rate of 8, 12, 16 and 20 tons per acre. The soil was rather light sandy loam. The fertilizer used was at the rate of 1,000 pounds of 3-8-4 ready mixed per acre.

The results will be found in the following table:—

Plot No.	Manure per acre	Yield per acre
	ton	lb
1	8	1,410
2	12	1,560
3	16	1,630
4	20	1,570

The above table would indicate that better results would be obtained from the use of 12 to 16 tons of manure per acre, in conjunction with fertilizer, than from smaller or larger applications of manure.

Last year's results showed 8 to 12 tons of manure, together with fertilizer, to be best.

While the results of the two years are somewhat contradictory, it is thought that from the standpoint of yield and economy, 12 tons of manure per acre supplemented with a good fertilizer, would be a satisfactory and economical rate of applying manure.

TESTS OF VARIOUS KINDS OF MANURE ON BURLEY

In a study to determine the effect of various kinds of manure on the yield and quality of Burley, fifteen one-fourtieth acre plots were staked out and manured with hen, horse, hog, cow and sheep manure respectively. These plots were run in triplicate.

The results were as follows:—

Plot No.	Kind of Manure used	Yield per acre			
		Block A	Block B	Block C	Average
		lb.	lb.	lb.	lb.
1	Hen	800	1,440	1,160	1,133
2	Hog	880	1,040	1,000	973
3	Horse	680	1,000	960	880
4	Cow	1,080	1,200	1,520	1,267
5	Sheep	440	400	450	430

The above manures were applied at the rate of 12 tons per acre. Each plot also received 1,000 pounds of 3-8-4 commercial ready mixed fertilizer per acre.

This is the third year that this experiment has been conducted and each year the manure has been applied at the above rate on the same plots in the order given. The relative order in which the yields indicated that the manures would be valued in 1925 was from first to last, hen, sheep, horse, cow and hog, while in the season of 1926 it was, hen, horse, cow, hog and sheep. This season the relative order on the same basis is, cow, hen, hog, horse and sheep.

It would seem from the results obtained this or the third year that some factor other than the manures have caused these plots to vary considerably in yield. While hen manure held first place for the first two years it fell to second place the third year. Sheep manure which held second place the first year fell to last place the second and third years.

These plots have been planted to Broadleaf Burley in the past, but in future will be planted to a resistant Burley.

The sheep manure was from a ground product which may vary, but is sold in considerable quantity throughout the district at much higher prices than the results on the Station would seem to indicate as economical.

CONTINUOUS PLANTING OF THE SAME FIELD TO BURLEY TOBACCO

A plot which has been planted to tobacco continuously for the eleventh successive year was again planted to Burley this season. The soil of this plot is a light sandy loam. Standup Resistant Burley was the variety grown. The tobacco showed excellent growth, was free from disease throughout the growing period, and produced an average yield of 1,542 pounds of excellent tobacco per acre compared with 1,445 pounds per acre the previous year. It is doubtful if non-resistant strains of tobacco would yield satisfactorily on this field.

DIRECT VS. INDIRECT APPLICATIONS OF MANURE TO BURLEY

This experiment was continued again during the past season. The manure was applied on the clover sod followed by corn in one case, and the corn stubble was manured direct and followed by tobacco in the other case. Both of these plots were spring ploughed. The colour and quality obtained from the indirect application of manure was best while the direct applications of manure gave a slightly higher yield.

The results were as follows:—

Plot	Time of applying Manure	Yield per acre	Gain	Quality
		lb.		
A	In spring to corn (indirect)	1,514	.....	Best
B	In fall to stubble (direct)	1,594	80	

FALL PLOUGHING VS. SPRING PLOUGHING FOR BURLEY

In the fall of 1926 two plots were staked off and manured. One was fall ploughed and the other was not ploughed until the spring of 1927. The tobacco on these plots was planted, fertilized, cultivated and treated alike in all respects in order to make the time of ploughing the only factor affecting the results.

The results were as follows:—

Plot No.	Time of ploughing	Yield per acre	Increase
		lb.	lb.
1	Fall	2,059	52
2	Spring	2,007	

Nine years out of twelve fall ploughing has given higher yields than spring ploughing. It has also been found on the Station that ploughing can be done more cheaply in the fall than in the spring. Fall ploughing gives a better distribution of labour and aids in control of cutworms.

It is a practice on the Station to plough practically all fields in the fall, if possible, leaving only those fields for comparison for spring ploughing.

CONTINUOUS PLANTING OF THE SAME FIELD TO FLUE-CURED TOBACCO

A plot which was started in 1925 to be continuously planted to flue-cured tobacco was planted again this year. The same variety is planted each year. The yield of this plot in 1927 was 1,120 pounds per acre; in 1926 950 pounds per acre; and in 1925 1,172 pounds per acre.

The plot is a rather fertile, medium sandy loam soil. The same quantity of fertilizer of identical analysis is drilled into the row for the tobacco each year.

No conclusions seem justifiable as yet concerning this experiment.

CROP ROTATIONS FOR TOBACCO

The three, four, and five-year rotations for all types of tobacco were continued again this season. From the standpoint of yield and quality and maintaining soil fertility, excellent results are being obtained with the four year rotation of corn, tobacco, cereal, and grass for flue tobacco.

Taking into consideration the results obtained from the four-year rotation of tobacco, corn, oats and mixed hay, the results obtained show this rotation to be very satisfactory for producing Burley and black tobacco.

HOME GROWN VS. FOREIGN GROWN TOBACCO SEED

It has been found that home grown seed of flue-cured Burley and dark types produces plants which ripen much earlier and more uniformly than plants produced from imported seed.

ANIMAL HUSBANDRY

COST OF PRODUCING BEEF EXPERIMENT

With the object of securing data on the cost of producing beef in this district, using feeds grown on the farm, producing manure, and disposing of roughage for which there was not much demand, the steer feeding experiment begun in 1923 was continued in 1925.

Twenty-four mixed grade yearling steers were purchased from the stock yards in Toronto for this experiment.

These steers arrived at the Harrow Station on April 19, 1925, and were turned on pasture until November 20. The lot were fed from this date until sold on March 30, 1926. They were rather poor in flesh at the time of purchase and averaged 646 pounds.

Due to the lack of stabling facilities the steers were not divided into lots for comparative feeding tests. The entire lot ran loose in the barnyard with access to water at all times and a shed open on the south side.

The entire lot received the same ration. They had all the corn stover they would consume and about 4 pounds of alfalfa hay per head per day. The grain ration consisted of corn fed on the cob, oats and barley chop, and an occasional feed of oil cake meal. The corn was fed night and morning, the oats

and barley chop and the alfalfa at noon. In the beginning the corn was fed at the rate of 6 pounds of shelled corn per head daily which was gradually increased to 8½ pounds per head daily.

One steer died from infection soon after being put on pasture and one steer was lame from an infection in the foot most of the summer and never made much gain. The remainder did very well.

The steers were sold locally at 7 cents per pound and were fairly well finished.

RESULTS OBTAINED

Number steers in lot		24
Gross weight in Toronto		15,550 lb.
Freight from Toronto	$	49 00
Feed and water in shipping	$	4 55
Average cost per pound	$	0·0613
Average weight in beginning		646 lb.
Gross weight in May (23 steers)		14,848 lb.
Average weight in May (23 steers)		645·5 lb.
Gross weight at end of pasture time		21,058 lb.
Average weight at end of pasture time		915·6 lb.
Average gain per head on pasture		270·0 lb.
Gross weight beginning of feeding period		21,058 lb.
Average weight beginning of feeding period		915·5 lb.
Gross finished weight end of feeding period		24,595 lb.
Number of days on feed		130
Total gain during feeding period (130 days)		3,537 lb.
Average gain per steer		153·7 lb.
Daily gain per steer		1·18 lb.
Gross cost of feed for period	$	539·13
Cost per pound of gain for lot during period	$	0·152
Original cost April 29 (24 steers)	$	950 07
Total cost including pasture	$	1,579 28
Net selling price at $7 per cwt	$	1,721 65
Gain on lot	$	142 37
Average valuation of steers at start (24 steers)	$	39 59
Average valuation of steers at finish (23 steers)	$	74 85
Average increase in value	$	35 26
Average cost of feed per steer	$	23 44
Average cost of feed per steer including pasture	$	27 36

FEED CONSUMED BY LOT

402 bushels corn at $0·70 per bushel	$	281 40
91 bushels oats at $0.45 per bushel	$	40 95
54·5 bushels barley at $0.70 per bush	$	38 15
Cost of chopping oats and barley	$	6 60
12,550 pounds alfalfa hay at $15 per ton	$	94 13
2,900 pounds mixed hay at $12 per ton	$	17 40
200 pounds oil cake meal at $0.03½ per pound	$	6 50
18 acres Corn Fodder at $3 per acre	$	54 00
235 days on pasture at $0.01½ per head per day	$	90 08
Total cost of feed and pasture	$	629 21

A fair profit is shown even with the loss of one steer. But for this a good profit would have been shown.

A total of 210 tons of manure was produced which would have a value of at least $2 per ton or a total value of $420 which has not been included in the cost and profits.

FOLLOWING CORN FED STEERS WITH HOGS

Since the steers were fairly heavily fed on whole corn it was decided to follow them with hogs to determine the cost of producing pork under these conditions. Eight grade Duroc hogs were purchased locally on December 3, 1925, and turned in with the cattle. They were permitted the run of the barnyard and cattle shed with access to water, salt, and a sheltered pen. The feed they found was supplemented with sufficient corn to keep them in a thrifty condition. With the exception of one pig going lame for a short period they were all thrifty and made a good gain. They were sold on March 10 and were in good condition.

RESULTS

Number hogs in lot		8
Gross weight beginning of experiment		1,200 lb.
Average weight beginning of experiment		150 lb.
Days in barnyard		97
Gross weight end of experiment		1,855 lb.
Average weight end of experiment		231·9 lb.
Average gain during experiment		81·9 lb.
Total gain during experiment		655 lb.
Original cost of pigs (1,200 lb. at $12 per cwt.)	$	144 00
Total cost of feed and pigs	$	149 17
Net selling price (1,855 lb. at $0.12¾..)	$	236 51
Net profit on lot	$	87 34

CONCLUSIONS

1. Pork was produced at a profit in this manner.
2. Low grade corn and shelled corn from the husking machine which would have been difficult to sell was marketed through hogs at a good price.
3. Store hogs due to plenty of available feed sold relatively high, but even under these conditions a good profit was realized.
4. Considering the cattle and hog experiment as one, a profit would be shown and in addition 210 tons of manure were produced.

FIELD HUSBANDRY

Field husbandry experiments such as fertility investigations, studies of various rotations, etc., have been conducted for a number of years. This work is considered chiefly from the standpoint of tobacco and the experiments and results are largely treated in that portion of the report dealing particularly with tobacco. Work along field husbandry lines is being broadened and will soon include all crops grown on the Station.

COST OF PRODUCTION

As in the past careful records were kept of the cost of producing the various crops grown on the Station. These records include every item which can be justly charged against the crops in question. Fixed charges and yields vary greatly throughout this district especially in the case of tobacco so that in trying to make them applicable to any district due consideration must be given to fixed charges, yields, and produce values. The buildings on the Station are used for a number of purposes, therefore, rental charges on these against any crop is lower than would be the case on farms engaged solely in growing tobacco.

FIXED CHARGES—BASIS ONE ACRE

Land rental (7% interest on cost) all crops	$	15 00
Use of machinery (tobacco)		3 00
Use of machinery (corn, oats, or hay)		2 85
Rent of buildings and lath (Burley tobacco)		17 00
Rent of buildings and lath (Flue-cured tobacco)		10 00
Cost of tobacco plants (Flue-cured tobacco)		12 00
Cost of tobacco plants (Air-cured tobacco)		9 00

Cost of manure at $2 per ton charged to all crops as follows:

Three-year rotation:

1st year crop	50 per cent
2nd year crop	30 "
3rd year crop	20 "

Four-year rotation:	
1st year crop	40 per cent
2nd year crop	30 "
3rd year crop	20 "
4th year crop	10 "
Five-year rotation:	
1st year crop	40 "
2nd year crop	25 "
3rd year crop	20 "
4th year crop	10 "
5th year crop	5 "
Cost of mixed fertilizer charged to all crops:	
1st year crop	55 "
2nd year crop	30 "
3rd year crop	10 "
4th year crop	5 "
Nitrate of soda, or ammonium sulphate applied alone:	
1st year crop	80 "
2nd year crop	20 "

Cost of arsenate of lead (all tobacco)	$ 3 75
Cost of fuel (flue-cured tobacco)	15 00
Labour, man and team, per hour	0 50
Labour, man, per hour	0 30

Cost of Producing Burley Tobacco, 1927
Per Acre (Plot 23)

Rent of land	$ 15 00
Rent of machinery	3 00
Rent of barns and lath	17 00
Plants	9 00
Spraying material	3 75
Fertilizer (55% of cost)	12 11
Manure (40% of cost)	9 60
Labour—man and horse	109 92
Total cost per acre	$ 179 38
Yield per acre	1,700 lb.
Cost per pound	$ ·105
Selling price per pound	$ 0 22
Profit per acre	$ 194 62

Continuous Cropping of Burley Tobacco, 1927. Twelfth Consecutive Year
Per Acre (Pump House Plot)

Rent of land	$ 15 00
Rent of machinery	3 00
Rent of barns and lath	17 00
Plants	9 00
Spraying material	3 75
Fertilizer (total cost)	17 65
Manure (total cost)	24 00
Labour—man and horse	122 42
Total cost per acre	$ 211 82
Yield per acre	1,542 lb.
Cost per pound	$ 0·137
Selling price per pound	$ 0 22
Profit per acre	$ 127 42

Cost of Producing Flue-cured Tobacco, 1927
Per Acre (Plot 8)

Rent of land	$ 15 00
Rent of machinery	3 00
Rent of barns and lath	10 00
Plants	12 00
Spraying material	3 75
Fertilizer (55% of cost)	9 97
Manure (30% of cost)	4 80
Fuel	15 00
Labour—curing	22 64
Labour—man and horse	113 80
Total cost per acre	$ 209 96

Yield per acre		1,314 lb.
Cost per pound	$	0 16
Selling price per pound	$	0 32
Profit per acre	$	210 52

CONTINUOUS CROPPING TO FLUE-CURED TOBACCO, 1927. THIRD CONSECUTIVE YEAR.
Per Acre (Plot L-West)

Rent of land	$	15 00
Rent of machinery		3 00
Rent of barns and lath		10 00
Plants		12 00
Spraying material		3 75
Fertilizer (total cost)		18 10
Fuel		15 00
Labour—curing		22 64
Labour—man and horse		129 52
Total cost per acre	$	229 01
Yield per acre		1,120 lb.
Cost per pound	$	0·205
Selling price per pound	$	0 32
Profit per acre	$	129 39

COST OF PRODUCING ALFALFA HAY, 1927
Per Acre (Plot B)

Rent of land	$	15 00
Rent of machinery		1 42
Preparing land and seeding (⅛ cost)		1 36
Cost of seed (¼ cost)		2 40
Cost of manure (20% cost)		4 00
Cost of fertilizer (10% cost)		0 85
Labour—man and horse		8 70
Total cost per acre	$	33 73
Yield per acre (2 cuttings)		6,780 lb.
Value of hay at $15 per ton	$	50 85
Profit per acre	$	17 12

COST OF PRODUCING OATS, 1927
Per Acre (Plot 25)

Rent of land	$	15 00
Rent of machinery		2 85
Cost of seed		1 60
Cost of fertilizer (10% cost)		1 80
Cost of manure (20% cost)		4 80
Cost of threshing at $0.04 per bushel		2 58
Labour—man and horse		7 84
Total cost per acre	$	36 42
Yield per acre		64·6 bush.
Value of oats per acre	$	32 30
Value of straw per acre	$	7 00
Cost of oats per bushel	$	0 46
Profit per acre	$	2 88

COST OF PRODUCING WHEAT, 1927
Per Acre (Plot G 2)

Rent of land	$	15 00
Rent of machinery		2 85
Cost of seed		4 00
Cost of fertilizer (30% cost)		4 50
Cost of manure (20% cost)		3 00
Cost of threshing at $0.06 per bushel		1 44
Labour—man and horse		9 84
Total cost per acre	$	40 63
Yield per acre		24 bush.
Value of wheat per acre	$	28 80
Value of straw per acre	$	3 00
Cost of wheat per bushel	$	1 53
Loss per acre	$	8 83

HORTICULTURAL WORK

All work along horticultural lines was continued during the past season.

PEAS.—Several varieties of canning peas were again planted, and a good quantity of seed was secured of the following varieties: Alaska, Lincoln, Thos. Laxton, Gradus x American Wonder, Gregory Surprise x English Wonder, and McLean Advancer.

Local canning factory representatives were very favourably impressed with the Lincoln and Gradus x American Wonder varieties.

BEANS.—A good quantity of excellent seed beans of the following varieties were grown: Masterpiece, Round Pod Kidney Wax, and Stringless Green Pod. All of these varieties produced heavily, made rapid and thrifty growth, and were very free of disease. So far as yield and growth are concerned these three varieties seem about equal on this Station.

TOMATO VARIETY TESTS

A test of twenty-four varieties of early tomatoes was continued again this year. The plants were set in the field on May 25. The vines made excellent growth and the first pickings were made on July 16, exactly the same date that the first picking was made in the previous season. The first pickings sold at $3 per basket on the Toronto market. Picking was continued as long as 60 cents per basket could be realized, and when the price went below this figure picking and shipping was discontinued. That date was August 24.

The following table gives the variety and seedsman from whom obtained, date the first tomatoes were ripe, number of baskets per acre, and market returns per acre.

No.	Variety	Date ripe	Baskets per acre	Market return per acre
				$ cts.
1	Alacrity x Hipper—52 1-7-1 06567	July 16	1,184 8/9	1,290 29
2	Alacrity—1-8-1 3-1 06568	" 16	1,027 5/6	1,289 99
3	Fifty Day—Buckbee	" 16	1,223 1/18	1,263 33
4	Alacrity x Earlibell—1-3-1-4-1 06572	" 16	1,254 5/6	1,240 30
5	Alacrity x Hipper—06567 Selection from 05458-5-2 1.7.1	" 13	1,303 8/9	1,223 88
6	Alacrity x 1-8-1-31—06558 Selection from 0561	" 19	1,101 2/9	1,046 07
7	Earliana Select—Moore	" 16	1,035 1/6	989 91
8	Avon Early—Vaughan	" 11	1,002 7/9	976 97
9	Prosperity—Bolgiano	" 19	1,146 1/2	872 99
10	Burbank—Bruce	" 19	969	855 63
11	Red Head—Langdon	" 26	1,107 2/9	844 97
12	Earliest of All—Steele Briggs	" 19	953	832 81
13	Earliana—Ferry	" 16	1,011 1/6	829 80
14	Bonny Best—Stokes	" 22	1,041 1/9	786 09
15	Chalks Early Jewel	" 29	945 2/3	656 47
16	John Baer—Steele Briggs	" 26	744	629 99
17	Pink No. 2—2.5.1—06569	" 26	729 5/9	629 54
18	Pink No. 1—06573	" 26	563 5/8	493 40
19	Marglobe—Stokes	" 29	440	355 69
20	Rosy Morn—Livingston	" 29	503 1/18	329 99
21	Livingston Globe—Livingston	" 29	338 1/6	271 67
22	Early Detroit—Ferry	" 16	333 1/18	247 07
23	Greater Baltimore—Stokes	Aug. 4	331 2/3	206 30
24	Stone—Livingston	July 29	283 1/2	173 82

OBSERVATIONS

This is the second year that early tomatoes have been marketed from this Station. The high yielding and early varieties of 1926 are the high yielders of this season.

Alacrity x Hipper showed very well indeed for both seasons. Earliana, which is the variety grown extensively throughout this district, while good has not topped the list either season.

VARIETY TEST OF SWEET CORN

A trial of twenty-eight varieties of sweet corn was made, but all of the varieties were so completely destroyed by the European corn borer as to render all data worthless. The corn was planted June 8. It germinated at once and made excellent growth till borers began work. Possibly by very much later planting than has been customary it might be possible to escape borer damage. This would mean planting at such a date that sweet corn could just reach the milk stage before fall frosts.

FERTILIZER TEST ON EARLY POTATOES

Irish Cobblers No. 1 certified seed from New Brunswick were used in this test. The potatoes were treated with formalin, cut and planted at the rate of ten bags per acre. The plots were one-tenth acre in size.

The following table gives the results of this test:—

Plot number	Sulphate of ammonia pound per acre	Acid phosphate pound per acre	Sulphate of potash pound per acre	Dried blood pound per acre	Yield per acre bags potatoes	Increase in yield over no fertilizer bags per acre	Cost of fertilizer per acre	Value of increase at $1.75 per bag selling price
							$ cts.	$ cts.
1	150	600	300	.....	119	36	17 50	63 00
2	300	600	300	.....	113½	30½	21 63	55 12
3	450	600	300	.....	104½	21½	25 75	37 62
4	450	200	300	.....	120	37	21 07	64 75
5	450	400	300	.....	119¾	36¾	23 91	64 31
6	450	600	300	.....	122	39	25 75	68 25
7	Check			.....	83	.....	.....	.....
8	450	600	100	.....	122	39	20 51	68 25
9	450	600	200	.....	122¾	39¾	23 13	69 41
10	450	600	300	.....	116⅔	33⅔	25 75	58 91
11	.....	600	300	230	119	36	20 85	63 00
12	.....	600	300	460	125½	42½	28 32	74 37

From the above it can be seen that all fertilizers were quite profitable over no fertilizer.

In nearly all cases a return of approximately three dollars was made for each dollar spent on fertilizer.

The most profitable rate of fertilizing from this one season's work would seem to be as follows:—

450 pounds sulphate of ammonia per acre.
600 " acid phosphate per acre.
100 " sulphate of potash per acre.

The soil was a light sandy loam rather lacking in fertility and low in humus.

The experiment has been conducted only one season and will be continued.

ORCHARDS

The apple and peach orchards were carefully sprayed and pruned. Rather more spraying was required in this district than usual during the season.

There was only a very light crop of both apples and peaches.

The grafts of thirty-nine new varieties of apples which were made in 1923 on the old orchard on the farm made satisfactory growth and the following matured fruit: Melba, Rosilda, Atlas, Kildare, Lowbeth, Joyce, and Charlamanoff.

ORNAMENTAL GARDENING

The annual border of Narcissi, Tulips, Hyacinths, and late blooming annuals was very attractive. A new border of annuals was planted on the west side of the lawn with a large number of varieties of Asters, Salpiglossis, Calendula, Antirrhinum, Zinnia, etc. All of these flowering plants do well in this locality.

The flowering shrubs and perennials planted the past year made excellent growth, and more were planted during the past season.

More interest is manifested each season by the home builders and owners of this district in this line of horticulture, and more is being demanded of the Station each year along this line.

CEREALS

OATS

Thirteen varieties of oats in rod row plots were again tested this season. The results are the average of four plots of each variety.

All plots were seeded April 12. (Plot C).

The results of the varieties were as follows:—

No.	Variety	Days to ripen	Average yield per acre
			lb.
1	Mansholts	90	1,857
2	Banner No. 49	90	1,852
3	O.A.C. No. 72	90	1,837
4	Irish Victor P	87	1,819
5	Victory	90	1,818
6	Legacy	87	1,805
7	Longfellow No. 478	85	1,751
8	Prolific No. 77	90	1,686
9	Gold Rain	90	1,636
10	Columbian	90	1,632
11	Alaska	82	1,565
12	O.A.C. No. 3	82	1,473
13	Laurel	87	1,149

Mansholts was the best again this season with Banner No. 49, O.A.C. No. 72, and Irish Victor P. yielding in the order named and very close to Mansholts.

All varieties yielded very well and gave a higher yield than in 1925 and 1926.

FALL WHEAT

During 1927 twenty varieties of winter wheat were tested in rod row plots. These plots were seeded October 16, 1926, in field G2 on what seemed a uniform

part of the field. The results represent the average of four plots and were as follows:—

No.	Variety	Type	Date ripe	Average yield per acre
				lb.
1	Minturki	Bearded	July 18	3,007
2	O.A.C. No. 104	Beardless	" 14	2,894
3	Red Rock	Bearded	" 18	2,662
4	Dawson's Golden Chaff Pur	Beardless	" 18	2,352
5	Kanred	Bearded	" 18	2,338
6	Gladden	Bearded	" 18	2,275
7	Red Wave	Bearded	" 18	2,214
8	Imperial Amber	Bearded	" 16	2,178
9	Burkley Rock	Bearded	" 19	2,029
10	Egyptian Amber 1	Bearded	" 18	1,992
11	Iobred	Bearded	" 14	1,968
12	Neudorf	Beardless	" 16	1,964
13	Triplett	Beardless	" 18	1,947
14	Crail Fife	Beardless	" 18	1,869
15	Dawson's Golden Chaff No. 61	Beardless	" 16	1,844
16	Kharkov No. 2212	Bearded	" 18	1,840
17	Egyptian Amber	Bearded	" 18	1,795
18	Trumbull	Beardless	" 18	1,724
19	Mickekoff	Beardless	" 16	1,592
20	Ohio	Beardless	" 18	1,330

Of the varieties grown Minturki proved to be the highest yielder, O.A.C. No. 104 second, and Red Rock third. All of the above varieties are placed in order of yield.

In addition to the rod row plots, three one one-hundredth acre plots were grown of the following crosses:

Ottawa cross No. 24-1150 from Kanred and Yeoman.

Ottawa cross No. 24-1028 from Kharkow No. 2212 and Dawson's Golden Chaff.

Ottawa cross No. 24-1047 from Kanred and Dawson's Golden Chaff.

The wheat on all of these plots made excellent growth and ripened at about the same time. Seed was harvested from these varieties and sown again for the 1928 crop. 1927 was the first year the one one-hundredth acre plots were grown.

A five-acre field of O.A.C. No. 104 registered wheat was grown.

REPORT OF F. DIMMOCK, FORAGE CROP ASSISTANT

The work carried on by the Forage Crop Division at this Station included the following crops: corn, soybeans, sugar beets and broom corn.

FIELD CORN

1. BREEDING.—Only 100 of the 200 strains that are being inbred were grown at Harrow this year. These consisted of strains representative of the late maturing varieties. It was considered advisable to grow the strains of the earlier varieties at Ottawa on account of the extremely heavy damage which they suffered last year due to the heavy corn borer infestation.

As the strains have now been inbred for five years there is very little discarding necessary on account of hereditary weaknesses. Purity is evident in the similarity of type of the plants in each individual strain.

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.

2. TEST OF RECOMBINATIONS.—The following table gives the yield results obtained in the recombinations:—

Strains Recombined	Variety	Days to Maturity	Yield of corn (containing 15% moisture)			Average per cent grain on ear
			Ears	Grain	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 174.....	Variegated.....	129	54·9	52·8	884·7	77·0
183 x 180.....	Wisconsin No. 7.....	129	41·0	41·0	576·5	79·?

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

The above results are sufficient to indicate the promise of certain recombinations. There was not a single barren stalk in the whole test and also no sign of smut infection although other corn plants nearby showed considerable smut infection. The corn borer was kept off the plot by artificial means. A more detailed discussion and description of these recombinations will be found in the Annual Report of the Forage Crop Division for 1927.

3. CORN BORER CONTROL.—A series of four plots was arranged and planted with five varieties in each plot. 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 in order to secure a high yield coupled with good maturity.

In addition 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 additional fertilizer at the time when the corn plants were one foot in height. The remaining 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 yield increased especially in the late planted plots.

In the late plantings poor maturity resulted except in the early varieties which were destroyed to a large extent by the borer.

It might be said that where the effect of the fertilizer did appear to be hastening the maturity, the destructive effect of the borer appeared to be more marked than in the unfertilized portion of the plot.

One or two varieties were left to mature and the results obtained from these are shown below.

Variety	Date planted	Date harvested	Yield (ears) per acre
			bush.
Burr Leaming	May 26	Oct. 15	83·8
Pride Yellow Dent	June 16	Oct. 18	70·2
Twitchell's Pride	June 16	Oct. 9	32·5

The ears upon which the above yields are based were harvested from that portion of the plots receiving no additional fertilizer.

While the corn was considered ripe the ears undoubtedly carried a fairly high percentage of moisture, especially those of Pride Yellow Dent and Burr Leaming.

SOYBEANS

VARIETY TEST.—Eighteen varieties of soybeans were tested both for yield of fodder and of seed. The beans had difficulty in breaking through the soil and getting started but they made an excellent growth and the yields as shown in the following table were well up to the average and higher in many cases.

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

Variety	Source	Fodder								Seed			
		Days to maturity		Green weight				Moisture free dry weight					
				1927		Average four years 1924–27		1927		Average four years 1924–27		As harvested		Moisture free dry weight	
		1927	Average four years 1924–27	tons	lb.	tons	lb.	tons	lb.	tons	lb.	1927	Average four years 1924–27	1927	Average four years 1924–27
												bush.	bush.	bush.	bush.
Ste Anne's No. 92	MacDonald Col. P.Q.	108	108	4	1,932	4	917	1	685	1	252	24·82	20·27	21·82	17·95
*Early Brown	Salmon Arm, B.C.	108	109	4	1,362	4	710	1	633	1	412	24·53	22·76	21·56	20·02
**Mandarin	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	27·70	24·37
Yellow 17	China	114	117	6	1,939	6	1,029	1	1,898	1	1,355	29·04	29·52	25·36	26·17
Chinaton Echo	China	114	116	6	661	6	448	1	1,393	1	1,067	30·73	26·16	26·92	23·11
Black (China)	China	115	117	6	1,649	6	1,069	1	1,423	1	1,187	27·95	25·15	24·42	21·96
**Italian	?	115	119	6	1,242	7	1,155	1	1,704	1	1,869	32·79	35·10	28·52	30·59
**O.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	O.A.C. Guelph, Ont.	115	116	7	505	6	322	2	91	1	1,372	37·21	28·72	32·41	25·22
Summerland, B.C.	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. Nohle, 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	Dakota Impr. Seed Co.	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. Nohle, Harrow, Ont.	123	125	8	771	7	1,446	2	468	1	1,930	43·50	36·81	37·03	32·15
**A.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

*Averages for two years only (1926–1927).
**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. (Rows 2½ feet apart. Plants in rows approximately 3½ inches apart.)

The beans were grown in rows 2½ feet apart this year, the plants in the row being spaced approximately 3-4 inches apart. This rate of planting appears to give excellent results so long as the rows are kept free from weeds.

A further discussion of this test of soybeans will be found in the Annual Report of the Forage Crop Division for 1927.

SUGAR BEETS

TEST OF VARIETIES AND STRAINS.—A number of strains of sugar beets were obtained from the Michigan State College, Lansing, Michigan, and the United States Department of Agriculture at Fort Collins, Colorado. These were included in a preliminary experiment to test them for yield and content of sugar against a number of varieties that are commonly grown each year in the sugar beet area. Seed of these varieties was obtained from the Dominion Sugar Company Limited, of Chatham, Ont.

Four plots in all were planted with the above seed; one at the Experimental Station, Harrow, and three on different farms in the sugar beet district obtained through the courtesy of the Dominion Sugar Company. The plots were planted in the same fields as the farmers were growing their beet crop.

SUGAR BEET VARIETY AND STRAIN TEST, 1927—TEST AT DOMINION EXPERIMENTAL STATION, HARROW, ONTARIO

Soil: Sandy loam to clay—gravelly.

Variety or Strain	Source	Beets yield per acre		Average weight per beet	Per cent sugar	Purity	Sugar per acre % x yield	Relative yield of sugar	Tops, yield per acre green weight	
		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
2. 60500	Mich St. Co.. (2)	16	28	1·0	16·8	87·8	5,380·70	93·6	9	681
3. 31000	"	15	1,844	1·0	10·7	89·5	5,317·95	97·5	8	1,890
4. 61100	"	16	1,310	1·1	17·0	87·9	5,062·70	103·3	9	1,087
5. 62500	"	14	748	0·9	14·9	89·0	4,283·45	75·5	9	586
6. 64900	"	18	1,518	1·2	16·0	89·7	6,002·88	110·1	7	1,646
7. 65700	"	15	1,039	1·0	17·2	87·3	5,441·91	99·8	7	1,432
8. 66300	"	16	1,485	1·1	16·6	85·0	5,558·51	101·9	7	400
9. 68200	"	18	1,458	1·2	16·4	87·5	6,143·11	112·6	9	1,008
10. 69100	"	15	1,977	1·0	17·4	88·3	5,564·00	102·0	10	698
11. Home grown	H. Stokes, Dom. Sug. Co., Cha. (3)	14	680	0·9	16·5	87·9	4,732·20	86·8	3	1,841
12. 554–24	U.S.D.A. Ft. Coll (4)	13	980	0·9	15·7	89·7	5,045·26	92·5	9	1,404
13. 582–24	" "	14	1,003	0·9	17·2	86·3	4,988·52	91·5	7	40
14. 1340–24	" "	16	1,545	1·1	17·0	87·6	5,702·65	104·6	7	1,840
15. 1512–24	" "	17	1,377	1·1	17·9	87·8	6,332·45	116·1	9	317
16. 1749–24	" "	16	123	1·0	16·3	86·3	5,396·06	98·9	6	362
17. 2361–23	" "	14	96	0·9	16·6	86·0	4,663·94	85·5	7	293
18. 4477–24	" "	14	538	0·9	16·2	85·4	4,623·16	84·8	7	1,238
19. Schreiber	Dom. Sugar Co. (5)	18	929	1·2	17·7	87·8	6,536·43	119·8	7	1,461
20. R. & G.	" "	16	412	1·0	17·5	87·5	5,672·10	104·0	6	1,953
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. Buszczyski	" "	15	203	1·0	17·1	86·5	5,164·71	94·7	8	1,278

See notes page 38.

SUGAR BEETS VARIETY AND STRAIN TEST, 1927—TEST AT FARM NO. 1, NEAR CHATHAM, ONT.

Soil: Clay loam.

Variety of Strain	Source	Beets Yield per acre		Average weight per beet	Per cent sugar	Purity	Sugar per acre % x yield	Relative yield of sugar	Tops, yield per acre green weight	
		tons	lb.	lb.			lb.		tons	lb.
1. Kleinwanzlebener	Columbia Sugar Co., Mich. (1)	17	321	1·5	16·0	84·4	5,571·36	111·3	9	478
2. 60500	Mich St. Coll (2)	20	1,057	1·7	13·0	83·7	5,337·41	106·6	15	800
3. 61000	"	17	1,957	1·5	15·2	82·4	5,465·46	109·1	11	680
4. 61100	"	16	162	1·4	13·8	85·9	4,438·36	88·6	10	1,960
5. 62500	"	13	821	1·1	15·7	84·9	4,210·90	84·1	10	1,496
6. 64900	"	20	95	1·7	13·4	85·1	5,372·73	107·3	11	1,364
7. 65700	"	18	364	1·5	14·0	87·6	5,090·96	101·7	9	480
8. 66300	"	19	331	1·6	13·7	87·4	5,251·35	104·9	9	480
9. 68200	"	22	450	1·9	15·2	86·9	6,756·40	134·9	16	120
10. 69100	"	20	480	1·7	15·7	87·0	6,355·66	126·9	13	1,720
11. Home grown	H. Stokes, Dom. Sugar Co. Cha. (3)	15	1,971	1·3	15·8	86·0	5,051·42	100·9	10	1,960
12. 554–24	U.S.D.A. Ft. Coll. (4)	12	1,304	1·1	16·5	88·5	4,200·46	83·9	9	1,008
13. 882–24	"	14	1,379	1·2	14·9	88·3	4,377·47	87·4	10	834
14. 1340–24	"	14	1,084	1·2	13·8	86·4	4,013·59	80·1	11	640
15. 1612–24	"	18	473	1·5	15·7	88·2	5,726·26	114·4	12	1,842
16. 1749–24	"	15	1,660	1·3	14·7	87·6	4,654·02	92·9	10	1,459
17. 2361–23	"	16	157	1·4	14·0	88·5	4,501·98	89·9	10	1,674
18. 4477–24	"	15	934	1·3	12·7	86·9	3,928·62	78·5	9	1,937
19. Schreiber	Dom. Sugar Co. (5)	15	1,021	1·3	14·9	87·9	4,622·13	92·3	11	680
20. R. & G.	"	17	1,922	1·5	15·8	89·3	5,675·68	113·3	11	1,758

See Note, page 38.

SUGAR BEETS VARIETY AND STRAIN TEST, 1927—TEST AT FARM No. 2, NEAR CHATHAM, ONT.

Soil: Clay loam.

Variety or Strain	Source	Beets Yield per acre		Average weight per beet	Per cent sugar	Purity	Sugar per acre % x yield	Relative yield of sugar	Tops, yield per acre green weight	
		tons	lb.	lb.			lb.		tons	lb.
1. Kleinwanzlebener	Columbia Sugar Co., Mich. (1)	16	587	1·4	15·1	84·1	4,920·64	102·7	7	1,840
2. 60500	Mich St. Coll. (2)	17	943	1·5	14·7	84·2	5,136·62	107·2	6	1,902
3. 61000	"	13	1,463	1·1	15·2	85·6	4,174·37	87·2	6	337
4. 61100	"	13	886	1·1	15·0	82·0	4,032·90	84·2	9	103
5. 62500	"	14	338	1·2	15·3	85·2	4,335·71	90·5	6	1,001
6. 64900	"	16	1,630	1·4	14·7	81·3	4,943·61	102·2	5	715
7. 65700	"	18	102	1·5	14·9	84·0	5,379·20	112·3	5	80
8. 66300	"	17	958	1·5	13·6	84·4	4,754·29	99·3	5	1,627
9. 68200	"	19	329	1·6	14·1	86·2	5,404·39	112·8	6	1,251
10. 69100	"	19	757	1·6	15·2	84·4	5,891·06	123·0	7	155
11. Home grown	H. Stokes, Dom. Sug. Co., Cha. (3)	13	1,087	1·1	15·0	88·9	4,063·05	84·8	5	347
12. 554–24	U.S.D.A. Ft Coll. (4)	13	1,838	1·2	15·2	84·3	4,231·38	88·3	6	552
13. 882–24	" "	17	425	1·4	14·7	79·9	5,060·48	105·7	4	640
14. 1340–24	" "	16	1,242	1·4	14·3	85·3	4,753·61	99·3	8	1,703
15. 1612–24	" "	14	133	1·2	15·6	83·9	4,388·75	91·6	9	1,277
16. 1749–24	" "	13	1,186	1·1	14·4	85·2	3,914·78	81·7	4	814
17. 2361–23	" "	16	520	1·4	14·3	83·5	4,650·36	97·1	5	847
18. 4477–24	" "	15	1,903	1·3	14·7	85·2	4,689·74	97·9	4	1,936
19. Schreiber	Dom. Sugar Co. (5)	18	298	1·5	15·2	85·1	5,517·30	115·2	7	173
20. R. & G.	" "	16	1,203	1·4	15·1	85·9	5,013·65	104·7	6	728
21. Horning	" "	17	780	1·5	15·3	84·4	5,321·34	111·1	9	1,111

See Note, page 38.

SUGAR BEETS VARIETY AND STRAIN TEST, 1927—TEST AT FARM No. 3, KINGSVILLE, ONT.

Soil: Sandy to clay loam.

Variety or Strain	Source	Per cent sugar	Purity
1. Kleinwanzlebener	Columbia Sugar Co., Mich (1)	16·0	82·6
2. 60500	Mich St. Coll (2)	15·6	84·9
3. 61000	"	16·0	88·2
4. 61100	"	16·7	85·3
5. 62500	"	16·7	86·7
6. 64900	"	16·6	83·8
7. 65700	"	15·8	89·4
8. 66300	"	16·5	84·8
9. 68200	"	16·6	89·7
10. 69100	"	16·8	89·7
11. Home grown	H. Stokes, Dom Sug. Co., Cha. (3)	15·9	90·6
12. 554–24	U.S.D.A. Ft. Coll.	16·4	79·2
13. 882–24	" "	16·0	86·1
14. 1340–24	" "	15·9	81·7
15. 1612–24	" "	16·9	89·0
16. 1749–24	" "	16·4	83·5
17. 2361–23	" "	16·1	86·8
18. 4477–24	" "	16·5	85·6
19. Schreiber	Dom. Sugar Co. (5)	16·8	87·5
20. R. & G	"	17·7	86·9
21. Horning	"	17·3	89·1

NOTE.—Yield per acre based upon stands corrected to 9 inches apart in the row at Harrow and 12 inches apart in the row on farms No. 1 and No. 2.

Per cent sugar figure obtained from analyses made by Dominion Sugar Co. Ltd., Chatham, Ont.

Sugar per acre=per cent sugar x yield.

Relative yield of sugar=comparison with average yield of sugar of all varieties and strains in each individual test (average 100).

No yields obtained from plots on farm No. 3 owing to poor stand.

(1) Columbia Sugar Company, Bay City, Mich.

(2) Michigan State College.

(3) H. Stokes, Dominion Sugar Company, Chatham, Ont.

(4) U.S.D.A., Fort Collins, Col.

(5) Dominion Sugar Company, Chatham, Ont.

Test at	Type of Soil
Harrow Experimental Station	Sandy loam to gravelly.
Farm No. 1	Clay loam.
Farm No. 2	Clay loam.
Farm No. 3	Sandy to clay loam.

The figures indicating the relative yield of sugar are probably the best index of the value of the strain or variety. Where this exceeds 100 it shows that the yield of sugar is in excess of the average for all the strains and varieties in that particular individual test. For example strain No. 9 (68200) shows a relative yield of sugar of 112.6, 134.9 and 112.8 in the three tests. In each case it is considerably in excess of 100, which figure represents the average yield of sugar per acre for each individual test.

Unfortunately the stand obtained on the plot located on Farm No. 3 was so poor that it was considered inadvisable to obtain yield results.

The remaining plots were quite good and those conducting this test wish to thank both the Dominion Sugar Company and the farmers who co-operated in this work.

One year's results while indicative are by no means conclusive in the determining of the best strains or varieties. It is hoped that it will be possible to conduct a similar test next year with the same varieties and strains in order that breeding work may be commenced with the best material available for the improvement of the sugar beet crop.

BROOM CORN

VARIETY TEST.—Eighteen varieties of broom corn were grown for the purpose of determining the yield 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 appears in the following table. The average yields for the two years 1926-27 are also given. Last year's length of brush is also shown for purposes of comparison.

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 1926-1927	Poor 1927	Poor Average 1926-1927	Total 1927	Total Average 1926-1927	Length of brush: Good 1927	Good 1926	Poor 1927	Poor 1926	Yield of fodder per acre: Green weight 1927	Green weight Average 1926-1927
						ft. in.	lb.	lb.	lb.	lb.	lb.	lb.	inch	inch	inch	inch	tons lb.	tons lb.
Longbrush Evergreen 26-g-o	U.S. Dept. Agr.	Standard	May 31	Sept. 14	Oct. 15	10 6	348	351·0	282	374·5	630	726·0	15	21·0	13	18·5	11 651	11 531
Longbrush Evergreen 56-g-0-3	"	"	" 31	" 16	" 15	11 0	418	448·0	212	291·5	630	739·5	15½	21·0	13½	19·5	11 1,087	12 243
Standard C.I. No. 583	"	"	" 31	" 14	" 15	10 6	385	474·0	220	284·0	605	758·0	15	21·0	12	17·0	10 909	11 1,569
Standard (Illinois)	Salzer, Ill.	"	" 31	" 27h	" 20	10 6	556	487·5	123	301·5	679	789·0	15	20·5	13	18·0	10 598	11 220
Black Spanish	Oklahoma	"	" 31	" 12	" 10	10 0	356	432·0	313	323·0	669	755·0	18	19·0	16	15·5	9 544	9 1,149
Black Spanish	Pfeifer, Ill.	"	" 31	" 14	" 11	10 0	364	426·0	348	338·5	712	764·5	16	20·5	13½	16·0	9 1,291	9 444
Illinois Favorite	"	"	" 21	" 21	" 19	11 0	599	515·0	150	284·0	749	799·0	15	21·0	13½	17·5	10 1,469	11 521
Canada Evergreen	Botany Div. Ottawa	Interm.	" 31	" 8	Sept. 27	7 3	531	548·0	325	352·0	856	900·0	18	20·5	16	18·0	6 1,628	8 816
Black Seeded	Botany (Rob Ste Eustache)	" ...	" 31	" 7	" 26	7 3	585	460·0	340	452·5	925	912·5	17	16·0	14	10·5	8 1,051	8 909
Black Seeded (Que.)	Botany (Quebec)	" ...	" 31	" 8	" 26	7 6	694	522·0	229	359·5	923	881·5	17	16·0	15	11·0	7 1,713	7 912
Black (1921)	Botany	" ...	" 31	" 8	" 26	7 9	560	450·0	296	411·0	856	861·0	18	15·5	16	10·5	7 904	7 839
C.E.F. (1922)	Botany	" ...	" 31	" 8	" 26	7 6	655	511·0	274	422·5	929	933·5	16	15·0	14	10·5	7 1,433	8 183
Acme C.I. No. 243	U.S. Dept. Agr.	Dwarf	" 31	" 19	Oct. 17	5 9	622	570·0	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	308·0	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	523·0	1,056	991·5	15½	20·5	15	18·0	11 278	11 759
Dwarf Evergreen	Salzer, Ill.	" ...	" 31	" 16	" 10	5 3	459	455·0	259	281·5	718	736·5	16	19·0	12	14·5	8 1,735	9 1,118
Scarbough	Oklahoma	" ...	" 31	" 27h	" 20	5 6	521	385·0	169	354·0	690	739·0	14½	20·5	13	18·5	10 878	11 806
Improved Evergreen	Steele Briggs, Toronto	" ...	" 31	" 27h	" 20	5 6	465	459·5	152	147·5	617	607·0	14	18·0	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 beads.
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 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 from the Botany Division, Central Experimental Farm, Ottawa, Ont., in 1924 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 the plant growth was in part responsible.

A sample of brush was sent to the National Woodenware Co., Ltd., St. Thomas, Ont., to determine its suitability for manufacture into brooms and whisks, also to obtain its approximate value per pound. The report from this company has so far not been received but it will be given in the Annual Report of the Forage Plant Division for 1927.

FIBRE CROPS

Growing hemp for seed was further extended this season. Several varieties and selections were studied for seed production, as well as the effect of distance of planting on the production of seed.

Varieties grown and seed produced per acre were as follows:—

Variety	Bushels of seed per acre	Remarks
Minnesota No. 8 C.D. 21	3·8	
Racolta No. C.D. 19	18·0	
Chington No. C.D. 20	10	
Kentucky Seed No. C.D. 595	1	Very slow maturity.
Western No. C.D. 22	9	
Chington x Racolta No. C.D. 25	7·5	
F2 Seed		

The variety No. C.D. 19 showed excellent results with Chington No. 20 and Western No. 22 showing fair production.

The soil on which these varieties were grown is a light sandy loam of medium fertility on which a four year rotation of tobacco, corn, oats and hay has been followed. Hemp has been substituted for corn in the rotation. The economic production of hemp seed in this district would still be regarded as in the experimental stage.

EFFECT OF THE DISTANCE BETWEEN ROWS ON PRODUCTION OF HEMP SEED

Plots were planted with hemp seed produced on the Harrow Station. This original stock seed was imported from Kentucky the previous year.

The following table gives the average of five one-tenth acre plots planted in rows 3 feet, 4 feet, and 5 feet apart. In the row the plants were thinned to the same distance apart regardless of row spacing:—

Plot Number	Distance between rows	Yield of seed per acre
	feet	bush.
1 to 5 inc.	3	8
6 to 10 inc.	4	5
11 to 15 inc.	5	4

The closer the planting, the higher the yield has been this season for this variety. However, none of the yields are as high as had been previously obtained nor as high as was expected. The soil on which the crop was grown was a black sandy loam and dried up very slowly in the spring. This no doubt retarded maturity so much that low yields of ripe seed resulted.

IMPROVEMENTS

During the year a new iron frame Lord & Burnham greenhouse was erected. Two hundred rods of new fences were built and several rods of gravel roadways around the farm buildings and office were constructed. The lawns around the office and Superintendent's residence were extended and well established. A sixty foot flag pole was also erected. A four hundred foot hedge was set, also a number of ornamental shrubs. A new grain bin was built.

EXTENSION WORK

During the past season many growers were visited, the results on the Station discussed and explained, suggestions given, and farmers clubs in Essex, Kent, Elgin and Norfolk counties were addressed.

A great number of growers availed themselves of the opportunity of having their tobacco seed cleaned and tested without charge.

Many articles were written for the local press and exhibits were displayed at some of the local fairs, and at the Canadian National Exhibition at Toronto.

During the year the Station was visited by 1,384 visitors, 2,070 letters were received and answered, and 1,030 telephone calls for information were received.

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