DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION

HARROW, ONTARIO

REPORT OF THE SUPERINTENDENT

H. A. FREEMAN

FOR THE YEAR 1926

Printed by authority of the Hon. W. R. Motherwell, Minister of Agriculture, Ottawa, 1927

TABLE OF CONTENTS

EXPERIMENTAL STATION, HARROW, ONTARIO

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

SEASONAL NOTES

The season of 1926 was abnormal in regard to high winds, temperature, sunshine, early fall frosts, and rainfall.

Winter wheat killed very badly throughout this district due to heavy snowfalls in March followed by considerable thawing and freezing.

The frost was two weeks later in getting out of the ground in 1926 than in 1925.

After the middle of April it became rather dry, but the land was well stocked with water due to the previous wet fall and winter so that work was greatly helped by the dry weather. Excellent oat and hay yields were obtained, also good catches in seedings were secured. The drought became more severe, however, as the season advanced. The last half of June and July became so dry that crop growth was very much retarded. Second cuttings of alfalfa gave extremely low yields.

The first of August the drought was broken and then followed three and one-half months of excessively wet weather and abundant growth. This growth while especially needed by tobacco, which showed the smallest size at the first of August that it had shown for ten years, continued so luxuriant that ripening was delayed, and harvest and air-curing conditions made very bad indeed. Many low-lying fields were ruined by flooding. Shed-burn occurred in varying amounts in nearly all crops. These adverse conditions along with frosts on September 25 and 26 resulted in some loss to the tobacco crop.

Excessive moulding occurred on ears of corn in the field which had been damaged by corn-borers.

Harvesting of corn and third cuttings of alfalfa were difficult, and losses were rather high. Oat and wheat harvesting was well advanced when the rains commenced but it was exceedingly difficult to get these crops dry enough to haul from the field and thresh. Much loss occurred in the fields, and through moulding in the storage bins. Practically all crops of oats were off colour throughout the district.

Sugar beets were harvested with great difficulty, and the acreage devoted to fall wheat was very much reduced on account of the excessive wet weather.

The last week of October and the month of November were fairly favourable to fall work and much fall ploughing was done on the lighter sandy loam lands. Corn was cribbed with a fairly high moisture content, but corn fodder was fairly dry when stored the first week of December.

The following table gives the 1926 meteorological records for this Station, also averages of the past five years. The excessive rainfall and lack of sunshine in 1926 are clearly shown.

1926 METEOROLOGICAL RECORDS

Month	Temperature (° F.)						Precipitation (Inches)				Sunshine (Hrs.)	
	Mean		Maximum		Minimum		Rain	Snow	Total Precipitation			
	1926	Average 5 years	1926 Highest	1926 Mean Min.	1926 Lowest	1926 Mean Min.	1926	1926	1926	Average 5 years	1926	Average 5 years
January	24·90	22·95	42·5	31·24	−3·0	18·56	0·83	23	3·13	2·25	79·7	85·6
February	26·06	25·13	41·0	31·64	7·0	21·54	2·33	22¾	4·60	1·91	76·0	89·6
March	29·78	33·04	54·5	37·37	5·0	22·2	2·055	2¼	2·33	2·58	120·0	128·2
April	40·35	46·13	76·0	50·2	21·0	30·5	3·68	6¼	4·30	2·68	151·7	182·5
May	56·85	55·26	85·0	70·2	32·5	43·5	2·22	.....	2·22	1·95	271·0	254·8
June	64·5	54·54	89·5	76·2	36·0	52·8	3·63	.....	3·63	2·87	295·8	275·0
July	70·7	70·4	99·0	82·9	49·5	58·6	0·71	.....	0·71	1·79	273·3	297·4
August	69·5	68·9	98·0	81·9	48·0	57·4	4·49	.....	4·49	2·0	196·0	252·8
September	61·4	63·5	82·0	70·5	32·0	52·4	7·13	.....	7·13	3·59	107·7	152·7
October	50·5	50·8	80·8	59·2	27·0	40·9	2·58	.....	2·58	1·90	120·3	150·5
November	38·3	39·7	59·0	45·7	16·0	30·7	1·54	3	1·57	1·65	87·1	98·5
December	26·7	28·7	55·0	59·0	2·0	19·0	0·03	11	1·13	1·36	50·7	65·9

Total Precipitation

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

TOBACCO

TOBACCO SEED-BEDS

The sunny weather of May made conditions satisfactory for the production of tobacco plants under glass, but the relatively cool nights retarded growth under cotton. There were some failures, however, as a result of poor methods of preparing and handling the beds.

Besides producing enough plants of all varieties to meet the requirements of the Station, 140,250 plants were sold to tobacco-growers which gave a return of $394.25.

Three-thousand square feet of glass-covered beds and 1,900 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

A top dressing of about 2 inches of well-rotted muck which had been obtained the previous year was applied on all beds.

While small sections of one bed were given an application of root-rot-infected soil and then sterilized at different pressures and lengths of time, all of the other beds were sterilized by being subjected to steam at 100 pounds pressure for thirty minutes.

The growth and vigour of plants from bed sections steamed for different periods was about the same, but growth from the steamed sections was much more rapid and vigorous than that from unsteamed sections even on root-rot-free soil. Plants were obtained about twelve days earlier from steamed than from unsteamed sections of the bed.

Acid phosphate and sulphate of potash, singly and in combination, and commercial 3-8-4 fertilizer applications were made on certain sections of the beds. A weak solution of nitrate of soda was applied to other sections after the plants were large enough to shade the ground.

Grain straw was used in making the fall-prepared semi-hot beds. Under some of the spring-prepared beds straw was used, while on others corn stalks were used.

The beds were sown with dry seed on April 17 and 19 at the rate of $\frac{1}{8}$ ounce per 100 square feet for flue-cured, and $\frac{1}{7}$ ounce for all air- and fire-cured tobaccos.

For the tenth season the semi-hot beds produced plants ready for transplanting much earlier than cold beds. This season there was a ten-day difference.

Glass-covered beds produced plants two weeks earlier than cotton-covered beds. This resulted in a much larger total number of plants per 100 square feet of plant bed reaching the field from the glass-covered beds.

Plant-beds made and steamed in the fall produced plants just as early as similar beds made and steamed in the spring.

Beds top-dressed with black well-rotted muck produced earlier plants than those receiving no compost.

Observations and Summary

1. For ten seasons the semi-hot bed has proven to be the most efficient type of bed tested. This season it averaged 11,000 plants per 100 square feet at a cost of $1.50 per 1,000.

2. Seven years' results indicate that by using straw and covering the bed completely after steaming to keep out wind-blown material of all kinds, weed seed, etc., the semi-hot bed can be made and sterilized in the fall without sacrificing its effectiveness.

3. Weeds and diseases are apparently well controlled by steaming for thirty minutes at 100 pounds pressure provided the soil is in a good loose condition and not too wet.

4. Applications of acid phosphate and sulphate of potash, singly and in combination, apparently had no effect on the growth and vigour of the plants. A weak solution of nitrate of soda was more effective than the commercial fertilizer and sufficient for the production of early thrifty plants on the fairly fertile black muck soil used.

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

6. Steaming hastens growth and also controls weeds and diseases.

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 and one-eighth of an ounce contains about 41,000 seeds. One hundred square feet of plant-bed contains 14,400 square inches. Seed germinating 85 per cent or better should be sown at the rate of one-eighth ounce of flue-cured or Green River seed, and one-seventh of an ounce of Burley seed per 100 square feet. On account of the tendency of flue-cured and Green River varieties to grow spindling they should be sown more thinly than Burley. At these rates it can be seen that more than three seeds are sown per square inch while if only one plant is produced per square inch, 100 square feet of bed would be sufficient for planting two acres of tobacco.

8. A top dressing of black muck soil on plant-beds gave excellent results.

Transplanting Tobacco

Transplanting was begun at the Station on May 31 and completed on June 19. The transplanting was done in the afternoon. For two successive evenings (after six o'clock) preceding the planting of the area to tobacco, a poison mixture composed of 25 pounds of bran, ½ pound of Paris Green, ½ gallon of molasses and sufficient water to make the whole mass pasty, was applied per acre. Good stands of tobacco were obtained and cutworms were effectively controlled at planting time. Some two or three weeks later apparently a second brood of cutworms came and cut some of the smaller plants.

On account of the extended drought the earliest planted tobacco was more severly injured in its finished quality than that planted later. However, by reason of the lateness of maturity in all tobacco and the earliness of frost, the earlier tobacco can be planted the more sure one is of harvesting it.

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

The results are given in the following table and in each case are the average of four plots.

Distance of planting in row	Distance between row	Yield per acre	Percentage bright	Variety
Inch	Inch	Lb.		
18	36	1,465	50	Hickory Pryor.
23	36	1,380	33	"
28	36	1,125	25	"
18	36	1,395	54	Warne.
23	36	1,260	36	"
28	36	1,125	24	"

The tobacco made such a luxuriant and heavy-bodied growth in these plots that the percentage of bright leaf was low. A very rich mature mahogany tobacco made up the remainder of the yield. From this and other experiments which have been conducted, it seems that the closer tobacco is planted down to 18 inches, the larger the yield will be and the brighter the colour of the cured leaf.

A surprising part of this experiment was the out-yielding of Warne by Hickory Pryor. Whether this result was due to the nature of the season or to varietal differences can be determined by further experimentation.

Tobacco Insect Pests

Cutworms were very numerous in spring-ploughed fields and where no control measures were used the worms destroyed practically all the plants on many fields throughout the district. On fall-ploughed land they were not so numerous.

This pest was controlled almost completely, on the Station, by the use of the following mixture:—

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

Bring these mixtures together and add sufficient water to make the whole mass into a crumbly dough condition.

Hornworms were fairly numerous but were completely controlled by spraying with 4 to 5 pounds of arsenate of lead per acre. The arsenate of lead in dry powdered form dusted on the tobacco was only used where the tobacco

had reached too large a size to go through with the spray-cart without damage. Dusting is wasteful of the material and the dust does not stick like the spray.

Grasshoppers caused the crops no harm.

Harvesting Tobacco

Harvesting was begun on September 8. Practically all of the tobacco was harvested by the split-stalk method. After being cut and as soon as the tobacco had wilted sufficiently to handle without breaking it was hauled to the curing-barns. In a comparison of curing split-stalk and spudded- or needled-stock tobacco, it was practically impossible this season to cure spudded-stalk tobacco without pole-burn. That tobacco spudded also cured very slowly indeed and with a lot of swelled stems. On the other hand the split-stalk tobacco cured much sooner, more readily, and with brighter colour.

Flue-Curing Tobacco With Steam Heat

The equipment used for this experiment was the same as used in 1923, 1924, and 1925. It consists of a 30-horsepower boiler and three five-room curing barns each of which is equipped with thirteen radiators each 18 feet in length. During the past season it was possible to have three kilns running simultaneously several times during the curing season. On two occasions two kilns were filled in one day and the third filled the following day. When high temperatures had to be run on the three kilns, and particularly on cool nights, the boiler seemed to have about all it could handle properly. During the yellowing period, however, when lower temperatures are required, more kilns could have been handled.

The boiler was fired continuously from September 8 to October 2. During that period 33,150 pounds of soft coal were burned and 10 curings made.

The average fuel consumption per curing was 3,315 pounds of soft coal as compared with 3,207 pounds in 1925, 3,347 pounds in 1924, and 3,830 pounds in 1923.

Fewer single curings were made in 1926 than in 1925.

Most of the curings were steamed into case and the figures given on fuel consumption cover both curing and steaming into case.

It required from four and one-half to five days for each curing in 1926.

When three kilns were being operated at temperatures of 170 degrees F. to 195 degrees F. For the purpose of drying out the stalks, it required a pressure of 95 to 105 pounds on the boiler. This pressure, however, would not maintain these temperatures on very cool and windy nights.

The average cost for fuel per curing with steam was $13.26 as compared with an estimated cost of $18.50 per curing with wood.

Observations and Summary

1. Until the equipment consists of as many kilns as the boiler will handle during curing and steaming operations, and the tobacco acreage is large enough to ensure ripe tobacco to fill these kilns, no definite conclusions can be reached as to the economy of curing with steam. From one year's observation it cannot be said whether the saving in the fuel by this system over the twin brick and iron furnaces will pay interest charges, upkeep and replacement of the steam plant.

2. Tobacco was cured as satisfactorily with steam as with any other method. However, in the past extremely wet season and with the resultant sappy

tobacco, the humidity seemed a little more difficult to reduce in the steam-curing barns than in the the twin-furnace hot-air barns. In a dry season this advantage might be reversed.

3. A more uniform temperature was maintained with steam than was maintained in the twin-furnace wood-burning barns.

4. The 30-horsepower boiler handled three kilns at high temperatures fairly satisfactory by maintaining a pressure of 40 to 60 pounds on the boiler, and might have handled two more barns at low temperatures.

5. Five kilns with only one being filled each day might be very satisfactorily handled by the boiler.

6. Curing with steam eliminates the fire-hazard.

7. It is recommended that the boiler be located centrally, and the kilns built as close around the steam plant as possible on account of economy in piping, rapidity of circulation, and prevention of loss of heat by radiation on its way to the kilns.

Experiments With the Becket-Covill Twin Furnace

The kiln used in this experiment is a four-room barn equipped in 1925 with two Beckett and Covill furnaces.

Four curings were made with the furnaces during the past season. One curing was made with wood as the fuel while for the other a combination of wood and coal was used. Wood was used only while yellowing and at the beginning of the fixing of the colour stage, as coal made so much heat that it could not be used for such low temperatures. However, relatively little fuel is used during these stages.

When the fuel consisted solely of wood the furnaces required constant attention to control the temperature, and constant additions of fuel on account of the relatively small capacity of the fire-box.

When burning soft coal in these furnaces a more uniform temperature, requiring less attention, could be maintained. It was not necessary to fire as frequently when using coal as when using wood.

Except for the tendency of the heat to be too high just over the furnaces when burning wood, and for the temperature to be too low over the furnaces when burning coal, which difficulties were largely overcome by a combination of wood for low temperatures and coal for high temperatures, the furnaces were quite satisfactory.

It would have been very interesting to compare these furnaces in the same size kiln with the steam-equipped kilns.

The average fuel cost for four curings made in the four-room kiln using a combination of coal and wood was $7.25 per curing. The cost per curing in 1925 was $7.11 per curing using the same combination.

The fuel cost with wood alone was $9.28 per curing this year, and $9.91 in 1925.

The tobacco was more difficult to cure, especially to dry out, this year than in 1925.

Relation of Relative Humidity in Curing-Barn to Colour of Cured Leaf

During the past six years records have been kept of the relative humidity in the flue-curing barn at the various stages in the curing process with the object of determining, if possible, what the humidity should be at the various stages of curing, in order to secure a better colour in the cured leaf.

Due to variations in climatic conditions each season, as well as marked difference in the character of each crop, the results have not been uniform.

However, it has been fairly well demonstrated that the humidity should be lowered more rapidly towards the end of the yellowing process with large heavy-bodied tobacco than with tobacco of medium size and body.

The averages of this year bear out the results of the past five years; that in general the relative humidity should be 74 per cent when the lugs begin to yellow, 66 per cent when the middles begin to yellow, 58 per cent when the tips begin to yellow and 46 per cent when the tobacco is about yellow enough for fixing the colour.

Effect of Weather Conditions and Ripeness on the Cure

The best results were obtained with ripe tobacco which yellowed in the field before harvest.

Flue-cured tobacco which was rained on during harvesting operations cured somewhat darker than that not rained on.

Better results were obtained with tobacco which had been left in the field long enough to become well wilted than with tobacco excessively or only slightly wilted.

Variety Tests of Flue-Cured Tobacco

Warne and Hickory Pryor composed the bulk of the flue-cured crop. Both are broadleaf varieties, but the Hickory Pryor has the broadest leaf and is more brittle than Warne.

During the past year, which was very wet, neither of these varieties showed appreciable amounts of leaf spot and other diseases, mosaic, etc. Averaging the results of a number of plots of similar soil the Hickory Pryor outyielded the Warne and gave a higher per cent of bright leaf. This greater yield is contrary to previous seasons' results but there were so many plots in the test and the yields were so consistently higher for the Hickory Pryor that little doubt upon the result is possible. Judging from past work on the Station the result would be regarded as seasonal. However, it cannot be definitely decided by one season's work.

Two other varieties were tested, namely, Lizzard Tail and Tilley. These yielded only fairly well, and were very poor producers of bright colour. The Lizzard Tail variety has long, narrow, heavy-bodied tapering leaves with large midribs. The internodes are of medium length. The Tilley variety has fairly broad, short, corrugated, medium-heavy bodied leaves with small midribs and ruffles; the internodes are rather short.

The yields of the varieties were as follows:—

Variety	Yield per Acre
Hickory Pryor	1,293 pounds
Warne	1,209 "
Lizzard Tail	980 "
Tilley	882 "

Variety Tests of Burley Tobacco

The bulk of the Burley crop was composed of four varieties, namely, Station Standup, Standup Resistant, Broadleaf, and Broadleaf Resistant Burley. Other Burley varieties tested were Recessive, Judy's Pride, Metzger, Stoner, and Routt's Resistant (C.R.B.).

The yields of the Burley varieties were as follows:—

Variety	Yield per Acre
Broadleaf Resistant	2,024 pounds
Broadleaf	2,068 "
Station Standup	1,540 "
Standup Resistant	1,760 "
Judy's Pride	1,232 "
C. R. B.	1,298 "
Metzger	1,672 "
Stoner	1,012 "
Recessive	1,716 "

It is felt that these results are fairly indicative of what may be expected from these varieties. The standup varieties were of better colour and quality. During the past season there was little difference between Station Standup and Standup Resistant as to colour, yield, and quality. The resistant varieties are recommended for diseased or doubtful soils, Broadleaf for soils susceptible to drought, and Station Standup on heavy sandy loams and light clay loams.

Tests of Resistant Burley and Green River Tobacco

Three 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 infected with the black root-rot disease.

The Burley varieties included Broadleaf Resistant, Standup Resistant, and C. R. B. The Standup Resistant grows well on badly diseased soil, and has the highest resistance to root-rot of any variety grown on the Station. Broadleaf Resistant also does very well on badly diseased soil.

The three strains of Resistant Pryor, 11001, 11008 and 11009, were obtained from Professor James Johnson of the University of Wisconsin in the spring of 1925. Of these 11001 was apparently most resistant and 11008 a close second. Strain 11008 looked the most promising, producing the best cured leaf in size, colour, and quality. It sems to be well fixed and breeds true to type with long broad leaves of good body. Strains 11001, and 11009 are similar to 11008 in shape and size of leaf, but they have a number of off type plants, and do not seem so well fixed.

A number of non-resistant varieties of Burley and Green River tobacco were grown on this plot alongside the resistant varieties and strains, but none of them were worth harvesting.

Tests of Green River Varieties

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

The Little Hill, which is not a small tobacco as the name seems to indicate, has somewhat oval, medium length, and medium breadth corrugated leaves with small ruffle, short internode, medium-size midrib, and is standup in type. In the field, and in the cured leaf this variety resembles Greenwood. The colour, body and yield of Little Hill was superior to all others the past season.

The Greenwood has long, fairly broad, heavy bodied, smooth leaves with medium-size midrib. This variety is also standup in type and is the most popular varicty of dark tobacco grown in Ontario in recent years.

The Yellow Pryor has long, fairly smooth, broad, drooping leaves, fairly large midribs and veins, small ruffles, medium body, and a good red colour.

This is a decidedly drooping type, and on heavy land the leaves become very dirty and sometimes covered with mud in the field. This variety ripens ten days to two weeks later than Little Hill and Greenwood.

The Rudolph Improved is a large plant, standup in type, with large somewhat oval, corrugated, leaves of a very dark green colour, and body. The leaves are carried well up off the ground. This variety was the latest in reaching maturity of any of the dark tobaccos grown on the Station the past year. This may not hold good when grown from seed of Canadian origin.

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

The One Sucker matured earlier than any other type of dark tobacco grown on the Station in 1926. It is a standup type with long, narrow, pointed leaves, very coarse midrib and veins. The cured leaf had a rich brown colour and heavy body.

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

Variety	Yield per Acre
Little Hill	1,892 pounds
Greenwood	1,782 "
Yellow Pryor	1,716 "
Rudolph Improved	1,540 "
Smith	1,628 "
One Sucker	1,540 "
Strain 11001	1,650 "
Strain 11008	1,720 "
Strain 11009	1,760 "

Since the Little Hill and Greenwood are from seven to ten days earlier than Yellow Pryor, are standup in type, produce equal to better yields and better quality leaf than any of the other dark varieties, it appears that, for Canadian conditions, they are the most desirable varieties to grow.

Fertilizer Tests on Flue-cured Tobacco

Twenty-one $\frac{1}{20}$-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 formulæ drilled in the rows. Each plot contained the same number of plants of tobacco, were all planted the same day, cultivated, harvested, and cured under conditions as similar as possible, and all possible precautions taken to make the fertilizer the only factor affecting the results.

No manure was used on the plots and the tobacco was grown in a four-year rotation of (1) corn, (2) tobacco, (3) oats, (4) hay.

The yields obtained on these plots in duplicate are given in the following table under A and B:—

FERTLIZER TESTS ON FLUE-CURED TOBACCO

Plot No.	Sulphate of ammonia lb. per acre	Acid phosphate lb. per acre	Sulphate of potash 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 $0.48		Cost of fertilizer per acre
									A	B	A	B	A	B	A	B	
															$	$	$
1	100	600	200						1,225	885	67·0	84·1	395		189 60		14 75
2	Check								805	885	90·5	74·7					
3	140	600	200						1,045	1,105	73·2	80·1	215	224	103 20	107 52	16 05
4	180	600	200						1,105	1,045	61·9	80·8	275	164	132 00	78 72	17 35
5	210	600	200						1,225	1,045	54·2	52·1	395	164	189 60	78 72	18 32
6	140	300	200						995	1,265	67·9	76·2	165	384	79 20	184 32	13 05
7	Check								735	1,075	91·4	90·3					
8	140	400	200						915	1,185	73·9	81·5	85	304	40 80	145 90	14 05
9	140	500	200						725	1,245	58·8	77·4		364		174 72	15 05
10	140	600	100						865	1,145	69·9	87·7	35	264	16 80	126 72	13 30
11	140	600	140						905	1,145	73·4	88·7	75	264	36 00	126 72	14 40
12	140	600	166						945	1,250	78·8	75·2	115	369	55 20	177 12	15 11
13	150	500	80						945	1,130	60·8	46·9	115	249	55 20	119 92	12 45
14	1,000 lbs. Commercial 3-8-4								1,020	1,105	70·6	60·1	190	224	91 20	107 52	17 50
15	50	600	200	83					1,150	975	87·8	80·5	390	94	187 20	45 12	16 02
16	70	600	200	116					1,045	985	82·7	66·8	215	84	103 20	40 32	17 84
17	140	600			192				1,165	1,115	63·9	60·5	335	234	160 80	112 32	15 54
18	140	600				368			1,165	1,140	74·2	78·9	335	259	160 80	124 32	18 83
19	70	569·4	193·3					233	1,035	985	73·7	67·4	235	104	112 8	049 92	19 21
20	70	450·6	200				171		1,130	1,035	75·2	84·5	300	154	144 0	073 92	15 70
21	Check								820	685	86·6	76 6					

Judging from the variations in yield on the duplicate plots it is apparent that the soil on which this experiment was conducted is not as uniform as might be desired. The abnormally wet period during August and September no doubt considerably accentuated the effects of the soil variations.

Observations and Conclusions

1. All the plots, except Nos. 1 and 9, which were on very infertile spots, showed considerable profit from the use of fertilizer.

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

	Pounds per Acre
Sulphatae of ammonia	140
Acid phosphate	300
Sulphate of potash	200

3. Comparing plots No. 1, 15, 19, and 20, and their duplicates, the supplying of nitrogen from a mixture of tankage and sulphate of ammonia proved superior to obtaining the nitrogen from sulphate of ammonia alone. Supplying the nitrogen from a mixture of sulphate of ammonia and cotton-seed meal was not equal to sulphate of ammonia alone. A mixture of dried blood and sulphate of ammonia was very slightly superior to sulphate of ammonia alone.

4. As during the previous two seasons, tankage again seemed a better source of nitrogen than either dried blood or cotton-seed meal.

5. The comparison between home-mixed and factory-mixed fertilizers shows a slightly higher return in favour of the factory-mixed fertilizers. This is the first time, however, that factory-mixed fertilizers have outyielded home-mixed material, and is very possibly due to soil variations.

6. In the comparison of various sources of potash on plots No. 3, 17, and 18 and their duplicates, the highest yields were obtained with double manure salts, with carbonate of potash second and sulphate of potash third.

7. Had all the fertilizer plots been fertilized like and yielded as did plot No. 18 and its duplicate, the net return due to the use of fertilizer would have been $142.56 per acre, or a net return of $7.57 for each dollar spent for fertilizer.

8. During the past season the general formula, home-mixed, used for flue-cured tobacco consisted of:—

70 lb. sulphate of ammonia per acre.
160 " dried blood per acre.
600 " acid phosphate per acre.
200 " sulphate of postash per acre.

This mixture proved satisfactory from the standpoint of yield and maturity.

Fertilizer Tests on Burley

Twenty-four $\frac{1}{20}$-acre fertilizer plots were run in duplicate on a sandy loam field of rather low fertility, using the Station Standup variety. This field became a part of the Experimental Station three years ago. The rotation followed is: (1) corn, (2) tobacco, (3) fall wheat, (4) hay. The corn 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 1926 crop the field was spring-manured and ploughed.

The same procedure was followed in the case of the Burley fertilizer plots as in the flue-cured tobacco experiments.

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

Fertilizer Tests on Burley

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. A	Yield per acre, lb. B	Increase in yield over average of check plots (per acre) A	Increase in yield over average of check plots (per acre) B	Value of increase per acre at $0.28 per lb. A	Value of increase per acre at $0.28 per lb. B	Cost of fertilizer per acre
														$	$	$
1	240	400	200							1,130	1,090	433	383	121 24	107 44	17 30
2	320	400	200							1,320	1,260	623	563	174 44	157 60	19 90
3	400	400	200							1,360	1,100	663	403	185 64	112 84	22 50
4	480	400	200							1,230	1,060	533	363	149 24	101 64	25 10
5	Check									640	700					
6	400	200	200							1,260	1,120	563	423	157 64	118 44	20 50
7	400	300	200							1,040	1,320	343	623	96 04	174 44	21 50
8	400	500	200							900	1,180	203	483	56 84	135 44	23 50
9	400	400	100							1,140	1,060	443	363	124 04	111 64	19 75
10	400	400	130							1,280	1,150	583	453	163 44	126 84	20 57
11	400	400	180							1,320	1,070	623	373	174 44	104 44	21 95
12	Check									620	640					
13	150	500	80							1,060	1,060	363	363	101 64	101 64	12 87
14	1,000 Commercial 3-8-4									980	1,080	283	383	81 24	107 24	17 50
15	320	400	200							1,080	1,580	383	883	107 24	249 24	19 90
16	320	400	200							1,120	970	423	273	118 44	76 44	19 90
17	320	400		190						1,260	1,000	563	303	157 64	84 84	19 38
18	Check									820	680					
19	160	400	200		270					1,120	1,170	423	473	118 44	132 44	24 15
20	160	350	180			450				1,140	1,060	443	363	124 24	101 64	24 45
21	160	400	200				210			1,300	1,150	603	453	168 84	126 84	21 52
22	160	100	200					400		1,140	1,090	443	393	124 04	110 04	19 70
23	320	400							370	1,140	1,620	443	923	124 04	258 44	22 72
24	Check									700	780					

Observations and Conclusions

1. All of the fertilizer mixtures on all of the plots were highly profitable.

2. The rather infertile condition of the soil is apparent from the consistently low yields of the check plots and especially so when it is noted that these plots had barnyard manure at the rate of 12 tons per acre, the same as the other plots.

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

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

4. Comparing the results obtained on Plots No. 13 and 14 and the duplicates it would seem that our home-mixed fertilizer was better and much more economical than factory-mixed fertilizer.

5. Carbonate of potash gave a slightly higher yield than sulphate of potash on Plots No. 16 and 17 and their duplicates.

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

7. Sulphate of ammonia as the sole source of nitrogen was superior to all others.

8. Dried blood produced the highest yield of any organic source of nitrogen.

9. Had all of the plots yielded and been fertilized like Plots No. 2 and 15 and the duplicates, the average return per acre would have been $172.52 or a net return of $8.66 for each dollar spent for fertilizer.

Fertilizer Tests on Green River Tobacco

Twenty 1/20 acre fertilizer plots were laid out with the Green River type of tobacco using the same procedure as was followed with the fertilizer tests on flue-cured and Burley tobacco.

The fertilizers used and results obtained were as follows:—

Fertilizer Tests on Green River Tobacco

Plot No.	Sulphate of ammonia, pound per acre	Acid phosphate, pound per acre	Sulphate of potash, pound per acre	Yield per acre in pounds		Increase in yield over check plots, pounds		Value of increase at $0.28		Cost of fertilizer
				A	B	A	B	A	B	
								$ cts.	$ cts.	$ cts.
1	240	400	200	860	1,170	98	408	27 40	114 24	17 30
2	Check			960	600					
3	320	400	200	1,350	1,300	588	538	164 64	150 64	19 90
4	400	400	200	1,140	1,200	378	438	105 84	122 64	22 50
5	320	300	200	1,040	1,180	278	418	77 84	117 24	18 90
6	320	500	200	1,040	1,120	278	358	77 84	100 24	20 90
7	Check			720	770					
8	320	400	200	1,170	1,080	408	318	114 24	89 04	20 00
9	320	400	100	1,080	1,100	318	338	89 04	94 64	17 15
10	320	400	150	1,130	1,080	368	318	103 24	89 04	18 53

These plots are located on a part of the farm which has been recently acquired and 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 per acre of manure on the hay sod for corn and fertilizer on the tobacco. It will be interesting to see how much improvement in fertility can be accomplished in this way.

All of the plots except No. 1 showed an excellent profit from the use of fertilizer.

From the standpoint of yield and economy it would seem that the best formula for this soil would consist of:—

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

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

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

The field devoted to the experiment in 1926 was less fertile than the one used in 1925.

Drilling vs. Broadcasting Fertilizer

Ten plots on the Station were staked off side by side and the same kind and amount of fertilizer drilled into the row on four plots, and sown broadcast on four other plots. Two plots were staked out on which no fertilizer was applied. Five of the plots were devoted to a study of broadcasting vs. drilling for Green River tobacco, the Greenwood variety being used; and the other five plots were devoted to a study of broadcasting vs. drilling for Burley tobacco, the Station Standup variety being used. The natural fertility of the soil on which these experiments had to be conducted is rather low as can be seen from the check plot yields. The results were as follows:—

Drilling vs. Broadcasting Tobacco—Green River

Plot No.	Method of applying the Fertilizer	Yield per acre	Increase in yield, average	Value of increase at 28c.
		Lb.	Lb.	$ cts.
20	Drilled... 400 lb. sulphate of ammonia, 400 lb. acid phosphate, 200 lb. sulphate of potash	1,340	252	70 56
21	Check—No fertilizer	700		
22	Broadcast. 400 lb. sulphate of ammonia, 400 lb. acid phosphate, 200 lb. sulphate of potash	1,160		
23	Drilled—Above amount	1,345		
24	Broadcast—Above amount	1,020		

By comparing all yields with the "no fertilizer" plot it can be seen that both drilling and broadcasting were very profitable, but it can also be seen that drilling was $70.56 more profitable than broadcasting the fertilizer.

Drilling vs. Broadcasting Fertilizer—White Burley

Plot No.	Method of applying the Fertilizer	Yield per acre	Increase in yield, average	Value of increase at 28c.
		Lb.	Lb.	$ cts.
1	Broadcast. 400 lb. sulphate of ammonia, 400 lb. acid phosphate, 200 lb. sulphate of potash	1,000	215	60 20
2	Drilled same as above	1,320		
3	Broadcast same as above	1,240		
4	Drilled same as above	1,330		
5	Check—No fertilizer	700		

In the case of the White Burley it can also be seen that both drilling and broadcasting were highly profitable over no fertilizer but drilling was more profitable than broadcasting for Burley by $60.20 per acre.

Observations and Conclusions

Judging by these and previous results on drilling and broadcasting fertilizer, it seems that fertilizer drilled in the row gives superior results to the same amount broadcast. The difference in yields which have been obtained are not apparent in the tobacco while it is growing in the field, but shows up when the stripped tobacco is weighed. Both drilling and broadcasting have always shown a profit over no fertilizer on the Station, but drilling often proves sufficiently more profitable than broadcasting to pay for the fertilizer and leave a substantial profit, due solely to the method of applying the plant food.

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 1/10 acre plots were staked off, and fertilizer of the same analysis and in equal quantities was applied to each. The plots were manured at the rate of 8, 12, 16, and 20 tons per acre. The soil is a rather light sandy loam. The fertilizer used was home-mixed and consisted of:—

	Lb. per acre
Sulphate of ammonia	240
Acid phosphate	400
Sulphate of potash	200

The results will be found in the following table:—

Plot No.	Manure per acre	Yield per acre
	ton	lb.
1	8	1,510
2	12	1,470
3	16	1,400
4	20	1,400

These results indicate that 8 to 12 tons of manure will give larger and more economical yields with applications of fertilizer than will larger applications of manure under the same conditions.

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 1/40-acre plots since 1925 have been manured with hen, horse, hog, cow, and sheep manure respectively. Those plots are run in triplicate.

The results in 1926 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	2,100	2,320	2,400	2,273
2	Hog	2,000	1,800	1,760	1,853
3	Horse	1,600	2,000	2,120	1,906
4	Cow	1,840	1,720	2,040	1,866
5	Sheep	1,920	1,880	1,560	1,786

These manures were applied at the rate of 12 tons per acre and in each plot were supplemented with a fertilizer composed of:

	Lb. per acre
Sulphate of ammonia	100
Acid phosphate	300
Sulphate of potash	150

This is the second year that this experiment has been conducted. The relative order in which the average yields indicated the manures would be placed in 1925 was, hen, sheep, horse, cow, hog. This season the relative order on the same basis is, hen, horse, cow, hog, sheep.

The sheep manure used is not from local sheep pens, but is a commercial ground product which may vary, but which is sold in considerable quantity throughout the district at much higher prices than results on the Station would seem to indicate as economical.

Very little, if any difference could be observed in the quality of the tobacco grown from the different manures.

Continuous Planting of the same Field to Burley Tobacco

A plot which has been planted to tobacco continuously for the ten preceding years was again planted to Burley this season. The soil is a light sandy loam. Standup Resistant Burley was the variety grown. The tobacco showed excellent growth and freedom from disease from transplanting until harvest and made an average yield of 1,445 pounds of excellent tobacco per acre. It is not thought that 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 and resulted in brighter colour where tobacco followed corn, or indirect applications of manure to clover sod. Both were spring-ploughed. The results were as follows:—

Plot	Time of applying Manure	Yield per acre	Gain	Quality
A	In spring to corn (Indirect)	1,320	.....	Best.
B	In fall to stubble (Direct)	1,523	203	

Fall Ploughing vs. Spring Ploughing for Burley

In the fall of 1925 two plots were staked off and manured. One was then fall-ploughed and the other was not ploughed until the spring of 1926. The tobacco on the plots were planted, fertilized, and harvested alike in all respects in order to make the time of ploughing the only factor affecting yields. The results were as follows:—

Plot No.	Time of ploughing	Yield per acre	Increase
		lb.	lb.
1	Fall	1,566	116
2	Spring	1,450	

In eight years out of eleven 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 has been found to give a better distribution of labour, and better control of cutworms. All tobacco lands on the Station were fall-ploughed in 1926 for the 1927 crop except four plots for comparing spring and fall ploughing.

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 a four-year rotation of corn, tobacco, cereal, and grass for flue-cured tobacco.

Taking into consideration this and past seasons results, the four-year rotation of tobacco, corn, oats, and mixed hay is proving very satisfactory for producing Burley and Dark tobacco.

Home-Grown vs. Foreign-Grown Tobacco Seed

It was found that home-grown seed of both the flue-cured, Burley, and Dark types would produce plants which ripened much earlier and more uniformly than did plants produced from imported seed.

Bagging Tobacco Seed Heads

During the past season, forty-four Warne tobacco seed heads were bagged with cheese-cloth bags alongside forty-four heads of Warne under paper bags for comparison. The following table gives the results:—

Number of Plants	Kind of bags	Pound No. 1 seed	Pound No. 2 seed	Germination
				per cent
44	Cheese-cloth	1¼	1	85
44	Paper	¼	½	30

Twice as much seed was obtained with over twice as high a percentage germination under the close-woven cheese-cloth than was obtained under the paper bags. The fall was very wet and lacking in sunshine which might have acted somewhat adversely against the paper bags. Excellent results have been obtained in the past with paper-covered seed heads. This study will be continued during the coming season.

ANIMAL HUSBANDRY

Cost of Producing Beef

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

Twenty-three grade Aberdeen-Angus yearling steers shipped in from the West were secured.

These steers were purchased on September 4, 1926, and turned on pasture till November 22, and sold on April 1, 1927. They were in fair flesh at the time of purchase, and averaged 776 pounds.

Due to a 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. As roughage they had all the corn stover they would consume, and 4 pounds of alfalfa hay per head per day. The grain ration consisted on corn fed on the cob, an occasional feed of bran, and oilcake meal. The corn was fed night and morning. At the beginning, the equivalent of 3 pounds of shelled corn per head was fed daily, and this was later doubled.

Two of the steers died, one from infection and one from digestive trouble. The remainder did very well considering the feed.

The steers were sold locally at 7 cents per pound. They were very well finished.

STEER-FEEDING RESULTS OBTAINED

No. steers in lot at start	23
Gross weight when purchased (23 steers)	17,850 lb.
Gross weight when purchased (21 steers)	16,298 "
Average weight each	776 "
Finished weight end of feeding period (21 steers)	21,550 "
Average weight end of feeding period (21 steers)	1,026 "
No. of days on pasture	79
No. of days on feed	119
Total gain 198 days (21 steers)	5,252 lb.
Average gain per steer	250 "
Average daily gain per steer in 198 days	1.26 "
Gross cost of feed for period including pasture	$ 436 87
Cost per pound of gain during period	0.118
Original cost Sept. 4	1,071 00
Total cost, feed, pasture, purchase price	1,507 87
Net selling price at $7	1,508 50
Profit on lot	63
Profit per steer	03
Average valuation per steer at start	46 55
Average valuation per steer at finish	71 83
Average increase in value	25 28
Average cost of feed, including pasture, per steer	20 80

FEED CONSUMED BY LOT

22½ bus. oats at 40 cents	$ 9 00
12 bus. barley at 80 cents	9 60
100 lb. oilcake at $1.35 per cwt.	1 35
1,500 wheat bran at $33 per ton	24 75
358 bus. corn at 60 cents	214 80
11,746 lb. hay at $15 per ton	88 09
20 acres corn fodder at $3 per acre	60 00
79 days pasture at 50 cents per head per month (23 steers)	30 28
Total cost feed and pasture	$ 436 87

During the experiment two steers died, leaving twenty-one head to carry all feeding and pasture charges and the original cost. But for the loss of these animals a fair 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 of $420, which has not been included in costs and profits.

The feed was marketed at a good price in this experiment considering its quality, which was poor due to unfavourable weather and corn-borer damage. It is believed that the results indicate that in feeding steers feeds produced on the farm there is a reasonable assurance of marketing these feeds to good advantage; at the same time good quantities of manure are produced, which must eventually mean better land and better feeds at lower cost.

Following Corn-fed Steers with Hogs

Since the steers fed last winter 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. Also a large amount of high moisture corn was on hand for which there was no market. Twenty-nine grade Poland China pigs averaging about 92 pounds per head were purchased on November 25, 1926, 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. All pigs were thrifty and made good gains. They were sold on April 1, 1927, and were well finished.

Hogs following Corn-fed Steers

No. of hogs in lot	29
Gross weight beginning of experiment	2,696 lb.
Average weight beginning of experiment	92⅞ "
Days in barnyard	125
Gross weight end of experiment	6,013 lb.
Average weight end of experiment	207½ "
Average gain during experiment	114½ "
Total gain during experiment	3,323 "
Average daily gain	0.96 "
Cost of feed, 250 bush. corn at 60 cents	$150 00
Original cost of pigs (2,696 lb. at 11¼ cents)	303 30
Total cost feed and pigs	453 30
Net selling price (6,013 at 10 cents)	601 30
Net profit on lot	148 00
Cost per pound of gain	0.045

Conclusions

1. Pork was produced at a profit in this manner.
2. Low-grade corn which on account of borer and wet weather damage would have been difficult to sell was marketed through pigs at a good price.
3. Store hogs due to plently 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 produced.

HORTICULTURE

Vegetables

Peas.—Several varieties of canning peas were 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.

Beans.—A quantity of seed beans of the following varieties were grown: Masterpiece, Round Pod Kidney Wax, and Stringless Green Pod. These beans made excellent growth, were free of disease, and produced heavily of seed. The extreme wet weather made harvesting practically impossible and caused a great deal of the seed to mould.

Tomato Varieties.—A test of twenty-one varieties of early tomatoes was continued again this year. The plants were set in the field on May 27. The vines made excellent growth and the first picking was made on July 16. The first pickings brought $3 per basket on the Toronto market. Picking was continued as long as 75 cents per basket could be realized, and when the tomatoes went below this figure picking and shipping was discontinued. The date was August 16.

TOMATO VARIETY TEST

Variety	Date ripe	Baskets per acre	Market return per acre
			$ cts.
Avon Early—Vaughan	July 24	577	882 05
Alacrity X Hipper 5458—C.E.F	" 19	526	800 61
Alacrity 5461—C.E.F	" 19	546	799 95
50 Day—Buckbee	" 16	525	797 30
Earliana—Ewing	" 16	465	782 33
Bonny Best—Stokes	" 19	404	671 30
Earliest of All—Steele Briggs	" 24	452	638 42
Prosperity—Bolgiano	" 19	461	627 62
Alacrity X Earlibell—C.E.F	" 16	390	620 27
John Baer—Steele Briggs	" 24	432	567 58
Chalks Early Jewel—Steele Briggs	" 24	439	586 52
Pink No. 1—C.E.F	" 19	366	533 90
Earliana Select—Moore	" 24	377	515 87
Red Head—Langdon	" 26	335	474 75
Pink No. 2—C.E.F	" 19	305	433 79
Burbank—Bruce	" 24	303	427 26
Livingston	" 29	185	249 05
Early Detroit	" 26	175	244 51
Rosy Morn	" 26	133	189 96
Greater Baltimore	" 29	130	157 40
Stone	" 24	126	152 33

VARIETY TEST OF SWEET CORN.—A test of thirty-one varieties of sweet corn was so badly damaged by corn-borers as to render yield data useless. The corn was planted on May 29. It germinated at once and made excellent growth till borers began work. The data secured and the varieties tested were as follows:—

SWEET CORN VARIETY TEST

Variety	Date ripe	Height of stalk	Size of ears circumference	Colour of kernels	Distance of ears from ground
		inch	inch		inch
Early Mayflower	Aug. 10	42	6	White	9
Earliest Catawba	" 8	44	5	White	8
Golden Early Market	" 24	42	7	Yellow	6
Extra Early Harvestman	" 24	36	5	White	6
Whipple	" 28	66	8	White	12
Early Market	" 30	38	6	White	5
Extra Early Cory	" 28	48	5	White	11
Early Malcolm	" 10	42	6	White	7
Alpha	" 24	39	5	White	4
Early Adams	" 30	64	6	White	14
Early Minnesota	" 27	64	5	White	10
Pickaninny	" 5	30	4	Blue	4
Golden Bantam	" 15	42	4	Yellow	7
Golden Bantam	" 14	42	5	Yellow	6
Golden Dawn	Sept. 3	48	6	Yellow	6
Whipple Yellow	" 3	48	6	Yellow	6
The Burbank	Aug. 27	42	6	Yellow	6
Whipple New Yellow	Sept. 3	54	7	Yellow	9
De Lue Golden Giant	Aug. 28	48	5	Yellow	8
Seymour Sweet Orange	" 20	54	5	Yellow	10
Sweet Squaw	" 12	48	6	White	8
Country Gentleman	Sept. 15	66	8	White	18
Bantam Evergreen	" 12	66	8	White	14
Golden Giant	" 10	54	6	White	11
Malakoff	Aug. 27	56	6	White	6
Bolearly Novelty	" 24	36	5	White	5
Pocahontas	" 24	48	6	White	8
Assinaboine	" 30	36	6	White	5
Tom Thumb	" 29	30	4	Yellow	3
Pocahontas	" 25	54	6	White	9
Banting	" 24	30	4	Yellow	5

Orchards

The apple and peach orchards were carefully sprayed and pruned.

There was an excellent crop of both apples and peaches of all varieties.

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 thirteen of them, namely: Duchess, Charlamanoff, Yellow Transparent, Melba, Joyce, Petrel, Lowbeth, Wealthy, Atlas, Kildare, Rosilda, and Glenton matured fruit, some with very high colour, which is encouraging from the market standpoint for this section.

CEREALS

OATS

During 1926 thirteen varieties of oats were tested in rod-row plots. These varieties were somewhat affected by the drought of June and July.

In the test, Mansholts was the best, Irish Victory second, and O.A.C. third with Alaska very close. The results of the test were as follows:—

Variety	Days to ripen	Average yield per acre
		lb.
Mansholts	88	1,704
Irish Victor P	88	1,460
O.A.C. 72	88	1,409
Alaska	84	1,407
Longfellow	86	1,331
Gold Rain	86	1,307
Columbian	88	1,278
O.A.C. No. 3	85	1,242
Banner Ottawa 49	85	1,198
Victory	84	1,186
Legacy	84	1,141
Prolific	88	1,070
*Laurel	84	779

*Hulless variety.

This is the second year that this test has been conducted. The yields of all varieties were higher in 1926 than in 1925.

Winter Wheat Varieties

Twenty-five varieties of fall wheat were planted during the fall of 1925. Due to the plots becoming flooded and then frozen, all varieties were killed.

In the field a great deal of winter-killing due to floods and freezing was experienced. This resulted in low yields.

FORAGE CROPS*

The work conducted by the Forage Crop Division at this Station included the following crops: field corn, soybeans and broom corn.

Field Corn

Variety Test.—Owing to the corn crop being so heavily infested with the European Corn Borer this test had to be abandoned. The yields of either fodder or grain from such heavily damaged plots would have been unreliable and misleading.

* Report of F. Dimmock, Forage Crop Assistant.

This test has, however, been conducted for the past three years and the summarized results for the three-year period appear in the accompanying table.

FIELD CORN—VARIETY TEST

Average yields per acre and maturity for three-year period (1923-1925)

Variety	Source		Days to maturity	Moisture Free Weight per acre			
				Fodder		Shelled Corn	
				Actual yield	Relative yield	Actual yield	Relative yield
				tons lb.		bush.	
Lancaster	G. Hoffman		142	3 1,000	100·0	54·4	97·8
U.S. Selection No. 119	U.S. Dept. Agriculture			3 957	99·4	38·4	69·1
Burr Leaming	G. S. Carter		143	3 864	98·1	55·6	100·0
Leaming	John Parks	x	130	3 418	91·7	53·8	96·8
Bailey	J. O. Duke, Ruthven, Ont.	x	130	3 46	86·4	53·7	96·6
Wisconsin No. 7	John Parks	x	132	2 1,885	84·1	53·7	96·6
Yellow Dent	A. J. Wimple	x	130	2 1,787	82·7	51·3	92·3
White Cap Yellow Dent	J. O. Duke, Ruthven, Ont.		127	2 1,749	82·1	50·2	90·3
Hybrid	A. J. Wimple	x	126	2 1,602	80·0	44·3	79·7
Early Kent	M. Backus, Chatham, Ont.	x	123	2 1,595	79·9	41·1	73·9
Disco 90 Day White Dent	Dakota Impr. Seed Co.	x	130	2 1,535	79·1	51·8	93·2
Wisconsin No. 7	Experimental Sta. Harrow.	x	131	2 1,445	77·8	51·5	92·6
White Cap Yellow Dent	Steele Briggs		127	2 1,434	77·6	48·8	87·8
Longfellow	Dakota Impr. Seed Co.		122	2 1,341	76·3	42·8	77·0
Golden Glow	J. O. Duke		126	2 1,279	75·4	46·9	84·3
Compton's Early	J. O. Duke		123	2 1,236	74·8	42·1	75·7
Golden Glow	Univeristy of Edmonton		125	2 1,104	72·9	45·2	81·3
Silver King	A. E. Popp		129	2 1,055	72·2	49·0	88·1
North Dakota	Steele Briggs		121	2 810	68·7	45·7	82·2
King Phillip	Wm. Rennie Seed Co.	x	121	2 762	68·0	40·1	72·1
Cold Resistant	University of Wisconsin.		126	2 728	67·5	45·1	81·1
Disco N. W. Dent	Dakota Impr. Seed Co.		117	2 525	64·6	41·5	74·6
Disco Pride Yellow Dent	Dakota Impr. Seed Co.	o	119	1 1,487	49·8	32·1	57·7
Twitchell's Pride	Exp. Farm, Fredericton.		110	1 1,124	44·6	30·9	55·6
Amber Flint	A. J. Wimple	x	111	1 475	35·4	24·9	44·8

x Average for two years 1924-25. o Average for two years 1923 and 1925.

A study of the table will result in the following general conclusions:

1. U.S. Selection No. 119 (Boone County White) is too late in maturing and is, therefore, unsuitable for this or any other section of Canada, either for fodder or grain.

2. Lancaster and Burr Leaming are the highest yielding varieties in both fodder and grain but can only be ripened in this district in a good season. Both varieties would prove excellent for silage purposes.

3. There is little to choose between the higher yielding strains of the varieties Leaming, Bailey, Wisconsin No. 7, and White Cap Yellow Dent, either from the standpoint of maturity or yield of fodder or grain. The last-named variety is probably slightly earlier in maturing and not quite as high yielding as the first three varieties. Choice of a variety from among them is, therefore, one of personal preference largely and not one based upon maturity and yield.

It will be seen that there is a considerable difference in the yields obtained from different strains of some of the above mentioned varieties and also some differences in maturity. These facts should be borne in mind when purchasing seed.

4. Golden Glow is somewhat earlier but not as heavy yielding in either fodder or grain as the varieties mentioned in (3).

5. Early Kent, Longfellow and Compton's Early yielded higher in fodder than North Dakota but the latter exceeded the others in yield of grain. All four are flint varieties maturing in approximately the same length of time.

All these varieties are lighter yielding in both fodder and grain than the dent varieties already mentioned except Golden Glow, which is exceeded by some of them in fodder yields. They are, however, from seven to ten days earlier than the dents and are suitable for growing in districts where the season is too short for the late dent varieties.

6. Northwestern Dent is an early dent variety somewhat lighter in yield than the flints already mentioned, but it is also from four to six days earlier in maturity.

7. Twitchell's Pride and Amber Flint (both flint varieties) are the earliest maturing and highest yielding varieties in the test. Twitchell's Pride is considerably heavier yielding than Amber Flint and is suitable for short-seasoned districts where early maturity is essential.

First-Generation Hybrids.—A number of first-generation hybrids resulting from crosses between varieties and also between varietal strains were grown again this year. Several of these were obtained through the generosity of Mr. F. D. Richey, Agronomist, of Washington, D.C.

Unfortunately the destruction resulting from the corn-borer infestation was again so severe that although the grain yields were taken they are undoubtedly unreliable and provide no basis for comparing the relative merits of the various hybrids.

Observations recorded up to the time of tasseling showed marked earliness and vigour in some of the crosses and it is unfortunate that the yields and time of maturity could not be accurately obtained.

The results obtained in 1925 and the observations of the present year would indicate that there is undoubtedly a place for first-generation corn hybrids in Canada, especially in those districts where high yield coupled with early maturity is a most important consideration.

Classification of Varieties.—For the third year in succession samples representative of the different varieties of corn commonly grown in Canada were secured from the various sources of seed supply both in Canada and the United States.

This year one hundred and seventy different samples of corn were obtained and grown. Accurate records of plant and ear-characters were taken, and as far as possible, the length of time taken by each variety to mature. Corn-borer damage made the taking of maturity records very difficult.

Based upon the work of the past three years a classification will now be made in which those lots exhibiting the same characters and maturing in the same time will be included under one varietal name. This will result in a reduction in the number of varieties. The varieties will then be grouped according to maturity, thus making the selection of varieties for a given district a comparatively easy matter.

Breeding.—Inbreeding or self-fertilization was continued with about two hundred strains selected in 1925. In addition to the inbreeding a number of these strains were recombined and several crosses were made between strains of different varieties. These will be tested out in 1927.

As a result of the inbreeding process which has now been carried on for four years, the plants within each individual strain are becoming very similar in type. This indicates the degree of purity that is being achieved by the self-fertilization process.

It is most unfortunate but highly probable that unless the corn-borer is brought under some measure of control, it will prevent the successful testing of the recombinations and the hybrids obtained from these purified inbred strains. Under these conditions the best that can be done will be to carry on the breeding material until such time as the borer is actually brought under control.

IMMUNITY OF STRAINS TO CORN-BORER ATTACK.—While all of the inbred strains, both early and late, were attacked by the corn-borer, observations showed that some were considerably less heavily attacked than others. While it is impossible at present to say that this was due to something inherent in those strains, close observations will be made next year to determine, if possible, whether the immunity was only accidental or does actually exist.

SOYBEANS

VARIETY TEST.—Twenty varieties of soybeans were tested both for yield of fodder and of seed. The long period of very hot dry weather during the month of June and the first two weeks of July affected the varieties very seriously during their growing period and as a consequence the yields of fodder were reduced to somewhat below the average. The bean yields, however, were not so seriously affected and were quite up to the average.

Most of the varieties included in the test have now been grown for three years, a few for two years and one for only one year. An average of the yields and maturity for the two- three-year periods has been made and appears in the accompanying table.

SOY BEANS, 1926—YIELD PER ACRE OF BEANS AND FODDER FOR 1926 AND AVERAGE FOR 3 YEARS (1924-1926)

Variety	Source	Days to maturity		Fodder				Seed			
				Green weight		Moisture-free. Dry weight		As harvested		Moisture-free. Dry weight	
		1926	Average 3 years 1924-26	1926	Average 3 years 1924-26	1926	Average 3 years 1924-26	1926	Average 3 years 1924-26	1926	Average 3 years 1924-26
				tons lb.	tons lb.	tons lb.	tons lb.	bush.		bush.	
Early Brown		110	.....	2 1,756	.....	1,565	.....	15·0	.....	13·2	.....
Ste. Anne's No. 92	Macdonald College, P.Q.	112	108	2 1,891	3 128	1,564	1,506	13·5	13·4	11·9	11·8
Mandarin	U.S. Dept. of Agriculture	115	*116	3 119	*1 1,331	1,622	*1,905	18·0	*18·1	15·7	*15·9
O.A.C. 81	O.A.C., Guelph	116	116	4 7	4 758	1 115	1 237	19·8	18·5	17·4	16·3
Chinatown Echo	China	117	117	3 1,510	4 841	1,954	1 113	18·1	17·6	16·0	15·6
Black (China)	China	118	118	4 205	4 1,197	1 141	1 220	18·4	17·3	15·8	15·1
Yellow 17	China	119	118	4 651	4 1,088	1 230	1 267	23·2	21·2	20·6	18·9
Yellow 210	China	121	117	3 918	3 1,559	1,778	1,854	19·6	18·7	17·3	16·6
Summerland	Exp. Farm, Summerland	121	118	4 1,315	5 268	1 300	1 392	18·9	16·4	16·7	14·5
Italian		121	*121	4 682	*5 1,509	1 238	*1 822	20·9	*25·9	18·1	*22·6
O.A.C. 211	O.A.C., Guelph	122	*122	4 350	*4 1,233	1 173	* 438	22·4	*22·5	19·4	*19·2
Ito San	J. Noble, Harrow	123	122	5 746	5 1,421	1 846	1 762	20·5	21·6	17·9	19·0
Manchu	Dakota Impr. Seed Co	123	122	4 1,449	5 598	1 459	1 630	24·2	24·6	21·1	21·6
Black Eyebrow	Dakota Impr. Seed Co	123	122	4 951	5 1,032	1 293	1 632	23·1	25·5	20·0	22·6
Early Korean	China	124	121	4 1,563	5 286	1 324	1 391	24·5	22·4	20·9	19·4
Green	J. Noble, Harrow	124	122	4 827	4 1,159	1 366	1 349	24·7	23·2	21·5	20·4
Golden	J. Noble, Harrow	127	125	4 1,263	5 717	1 352	1 679	23·2	24·7	19·9	21·8
A. K.	U.S. Dept. of Agriculture	128	*128	5 1,171	*6 975	1 967	*1 1,204	27·2	*28·5	23·4	*24·7
Hoosier	U.S. Dept. of Agriculture	134	*133	5 1,378	*7 484	1 818	*1 1,499	23·3	*29·4	19·9	*25·0
Black Beauty	China	137	*137	7 1,703	*8 142	1 1,901	*1 1,765	27·6	*28·9	23·1	*24·1

*Average for two years only (1925 and 1926).
Add 10 per cent moisture to yields of moisture-free dry weight of seed to obtain air-dry weight yields.
Add 15 per cent moisture to yields of moisture-free dry weight of fodder to obtain approximate air-dry weight yields of hay.

While the table indicates the possible merits of certain varieties further testing is necessary before reliable recommendations can be made.

Broom Corn

Variety Test.—While a few broom corn varieties have been grown at Harrow for the past few years no extensive test was made to determine whether or not the recognized Standard and Dwarf varieties could be grown successfully for brush and seed matured.

This year a collection of varieties of both types was made. In all, eighteen varieties were obtained, thirteen from various sources in the United States and five from Canada, four of which had previously been grown at Harrow for the past three years.

The yield of brush per acre was obtained for all varieties, the weight being taken at the air-dry stage. The weight was again taken after the brush had been graded according to quality, upon which depends the purpose for which it can be used.

After the brush was harvested the remaining fodder was harvested and its green yield obtained. While it is claimed that the fodder of the Standard varieties has little value as feed, the fodder of the Dwarf varieties is stated to be equal in feeding value to corn stover.

The various yields, length of brush and dates of harvesting are given in the accompanying table:—

BROOM CORN—VARIETY TEST 1926

Variety	Type	Source	Date of planting	Date of harvesting brush	Date of ripening seed	Height	Air-dry yield of brush per acre: Good	Air-dry yield of brush per acre: Poor	Air-dry yield of brush per acre: Total	Length of brush: Good	Length of brush: Poor	Yield of fodder per acre: Green weight
							lb.	lb.	lb.	inch	inch	tons lb.
Longbrush Evergreen 56-g-0-3	Standard	U.S. Dept. of Agriculture	2-6-26	Oct. 1	Oct. 17	10′-10′6″	478	371	849	20–22	18–19	12 1,398
Longbrush Evergreen 26-g-0	"	U.S. Dept. of Agriculture	2-6-26	Sept. 30	" 14	10′6″	354	467	821	20–22	19–20	11 410
Standard C.I. No. 583	"	U.S. Dept. of Agriculture	2-6-26	" 22	" 11	9′-10′	563	348	911	20–22	15–20	13 228
Standard (Illinois)	"	Salzer, Ill	2-6-26	Oct. 1	" 16	9′6″-10′6″	419	480	899	20–21	17–19	11 1,821
Illinois Favorite	"	Pfeifer, Ill	5-6-26	Sept. 30	" 14	9′6″-10′6″	431	418	849	20–22	17–18	11 1,572
Black Spanish	"	Pfeifer, Ill	5-6-26	" 17	" 4	9′6″-10′6″	488	329	817	20–21	15–17	8 1,596
Black Spanish	"	Oklahoma	2-6-26	" 17	" 2	10′-10′6″	508	333	841	18–20	15–16	9 1,754
Canada Evergreen	"	Exp. Station, Harrow	2-6-26	" 15	Sept. 29	9′9″-10′6″	565	379	944	20–21	17–19	10 3
Black Seeded	.....	Exp. Station, Harrow	2-6-26	" 2	" 18	7′6″-9′	335	565	900	15–17	10–11	8 766
Black Seeded (Que.)	.....	Exp. Station, Harrow	2-6-26	" 2	" 18	7′6″-9′	350	490	840	15–17	10–12	7 110
Black Seeded	.....	Exp. Station, Harrow	2-6-26	" 2	" 18	7′3″-9′	340	526	866	15–16	10–11	7 774
Broom Corn (C.E.F.)	.....	Exp. Station, Harrow	2-6-26	" 2	" 18	7′6″-9′	367	571	938	13–17	10–11	8 932
Acme Dwarf C.I. No. 243	Dwarf	U.S. Dept. of Agriculture	2-6-26	" 22	Oct. 11	5′9″-6′ 3″	518	271	789	20–23	15–18	9 1,754
European C.I. No. 559	"	U.S. Dept. of Agriculture	2-6-26	Oct. 5	" 20	5′9″-6′ 3″	307	620	927	20–21	17–19	11 1,240
Jap C.I. No. 442	"	U.S. Dept. of Agriculture	2-6-26	Sept. 30	" 16	4′6″-5′	233	453	686	16–17	13–14	9 675
Scarbough	"	Oklahoma	2-6-26	Oct. 1	" 16	5′9″-6′	249	539	788	20–21	18–19	12 734
Dwarf Evergreen	"	Salzer, Ill	2-6-26	Sept. 21	" 9	5′9″-6′ 6″	451	304	755	18–20	13–16	10 501
Improved Evergreen	"	Steele Briggs	2-6-26	" 22	" 10	5′9″-6′ 9″	454	143	597	16–20	13–14	8 1,596

Poor brush includes those with (*a*) large central stems
(*b*) twisted straws
(*c*) crooked heads.

It is interesting to note that all of the varieties matured seed in spite of the very unfavourable weather during the late summer and fall.

A small composite sample of brush was sent to the Elgin Broom Works, St. Thomas, Ontario, to determine its suitability for manufacture into brooms or whisks. Through the courtesy of this company the brush was put through the regular process and was found to be quite suitable as regards texture, etc., although a little off colour. Of good colour it was stated to be worth about six cents per pound.

The yields of brush, with the possible exception of a few of the lowest yielding varieties, are quite up to the average of the yields obtained in the broom corn district of the United States. The cost of production, therefore, will determine whether or not this crop can be grown profitably in Canada. The present importation of brush into Canada from the United States for manufacture into brooms and whisks is approximately three thousand tons yearly.

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 per cent interest on cost) all crops	$15 00
Use of machinery (tobacco)	1 50
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)	12 00
Cost of tobacco plants (air-cured)	9 00
Cost of fertilizer (flue tobacco ⅛ cost)	13 20
Cost of fertilizer (Burley tobacco ⅛ cost)	18 50
Cost of manure (Burley tobacco ⅛ of actual cost)	8 00
Cost of manure (Green River ⅛ of actual cost)	8 00
Cost of manure (flue-cured ⅛ of actual cost)	5 40
Cost of arsenate of lead, all tobacco	3 75
Cost of curing fuel (flue-cured tobacco)	15 00
Cost of manure (corn)	4 00
Cost of fertilizer on corn (following Burley)	4 62
Cost of fertilizer on corn (following flue-cured)	3 29
Labour, man and team, per hour	50
Labour, man, per hour	30

Cost per Acre of producing Burley Tobacco, 1926

Rent of land	$ 15 00
Rent of machinery	1 50
Rent of barns and lath	17 00
Plants	9 00
Spraying material	3 75
Fertilizer	18 50
Manure	8 00
Labour—man and horse	120 93
Total cost per acre	$193 68
Yield per acre	1,563 lb.
Cost per pound	$ .124
Profit per acre	243 96

Cost per Acre of producing Flue-cured Tobacco, 1926

Rent of land	$15 00
Rent of machinery	1 50
Rent of barns and lath	10 00
Plants	12 00
Spraying material	3 75
Fertilizer	13 20
Manure	5 40
Fuel	15 00
Labour—man and horse	107 12
Total cost per acre	$182 97
Yield per acre	1192 lb.
Cost per pound	$ 0.153
Profit per acre	389 19

Cost per Acre of producing Corn, 1926

Rent of land	$ 15 00
Rent of machinery	2 85
Manure	4 00
Fertilizer	3 29
Toll—husking	3 49
Seed	12
Labour—man and horse	21 29
Total cost per acre	$ 50 04
Yield per acre	44.6 bush.
Cost per bushel	$ 1 12
Value of corn per acre	44 60
Value of fodder per acre	4 00
Loss per acre	1 44

Cost per Acre of producing Oats, 1926

Rent of land	$ 15 00
Rent of machinery	2 85
Cost of seed	2 74
Toll—threshing	2 60
Labour—man and horse	6 96
Total cost per acre	$ 30 15
Yield per acre	65.1 bush.
Value of oats per acre	$ 32 55
Value of straw per acre	4 00
Cost of oats per bushel	.463
Profit per acre	6 40

Cost per Acre of producing Hay, 1926

Rent of land	$ 15 00
Rent of machinery	2 85
Cost of seed	5 00
Preparing land, seeding	5 65
Labour—man and horse—harvesting	8 05
Total cost per acre	$ 36 55
Yield per acre	5,686 lb.
Value of hay per acre	$ 42 64
Profit per acre	6 09

FIBRE CROPS

The experiments on growing hemp for fibre and seed were much broadened. Variety tests of Russian, French, and Kentucky hemp types for fibre indicated that only the Kentucky varieties showed promise. All types matured excellent yields of good seed.

Planting hemp in hills 5 feet apart each way, or in check rows in triplicate plots of 1/20 acre yielded an average of 10 bushels per acre of seed.

Planting one-half acre of hemp in rows which were 5 feet apart and in which the hemp plants stood about 2 inches apart in the row gave a yield of 12 bushels per acre of seed. Several bundles of hemp were sent to Ottawa for fibre production tests.

The soil on which these experiments were conducted was a rather light sandy loam, not very fertile. On better soil it is believed that even higher yields of seed would have been obtained.

The seed was threshed with the Vessot Hemp Deseeder which knocked seed, leaves, etc. off together. This was then screened to remove leaves, trash, parts of stalks, etc., and then put through a clipper fanning mill. This left the seed clean and in excellent condition.

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 on the Provincial Seed-Cleaning Demonstration train.

During the year the Station was visited by 1,493 visitors, 2,263 letters were received and answered, and 967 telephone calls for information were received.

OTTAWA: Printed by F. A. ACLAND, Printer to the King's Most Excellent Majesty, 1927.