DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION
HARROW, ONTARIO

REPORT OF THE SUPERINTENDENT

D. D. DIGGES, B.S.A., M.S.A.

FOR THE YEAR 1924

Printed by authority of the Hon. W. R. Motherwell, Minister of Agriculture, Ottawa, 1925

TABLE OF CONTENTS

	Page
The season	3
Tobacco—	
Tobacco seed-beds	3
Transplanting tobacco	5
Tobacco insect pests	5
Harvesting tobacco	6
Flue-curing tobacco with steam heat	6
Experiments with the Beckett-Covill furnace	7
Variety tests of flue-cured tobacco	8
Variety tests of Burley	8
Tests of resistant strains of tobacco	9
Variety tests of Green River type	9
Fertilizer tests with flue-cured tobacco	9
Fertilizer tests with Burley tobacco	12
Fall ploughing *vs* spring ploughing for Burley	16
Direct *vs* indirect applications of manure	16
Drilling *vs* broadcasting fertilizer	17
Continuous planting of the same field to Burley	17
Manure tests on Burley	17
Crop rotations for tobacco	18
Home-grown *vs* imported tobacco seed	18
Variety tests of oats	18
Forage crops	19
Horticultural work	21
Steer feeding experiments	21
Costs of producing crops	23
Experimental projects	25

DOMINION EXPERIMENTAL STATION, HARROW, ONTARIO

REPORT OF THE SUPERINTENDENT, D. D. DIGGES, B.S.A., M.S.A.

SEASONAL NOTES

With the exception of the hay crop, the season of 1924 was decidedly a poor one for the production of practically all crops common to southwesten Ontario. The spring was late, and cold, with frequent showers which greatly retarded the seeding of small grains; and an exceptionally late killing frost, on May 21, did considerable damage to early-planted vegetables, particularly early tomatoes. Hot, dry weather during the latter part of June and in July prevented the proper filling out of small grains, and the continuance of the drought during July and most of August seriously affected the growth and yield of the corn and tobacco. Conditions were further aggravated by continued cool, cloudy days, with frequent showers during the early fall, which so retarded the ripening of the corn and tobacco that a considerable portion of the tobacco, throughout the district, was harvested immature, and a large portion of the corn did not harden satisfactorily.

As a result of the very poor season, the average yields of corn and tobacco were the poorest recorded for nine years.

METEOROLOGICAL RECORDS

Month	Temperature F.			Rainfall		Snowfall		Sunshine
	Highest	Lowest	Mean					
	° F.	° F.	° F.	days	inches	days	inches	hours
January	43·5	−11·0	16·25	4	1·42	7	11·25	60·4
February	38·0	− 3·0	17·5	2	0·42	8	12·25	106·8
March	54·0	11·0	32·5	5	2·07	4	7·0	82·4
April	70·0	23·5	46·75	9	2·36	1	2·0	168·6
May	72·0	32·0	52·0	9	1·66	.....	.....	234·5
June	92·0	42·0	66·0	7	4·17	.....	.....	231·1
July	91·5	45·0	68·25	7	0·80	.....	.....	326·5
August	94·0	46·0	70·0	7	1·33	.....	.....	277·9
September	85·0	38·5	61·75	7	4·07	.....	.....	151·1
October	76·0	33·0	54·5	3	0·36	.....	.....	202·2
November	69·0	16·0	42·5	4	0·47	.....	.....	126·1
December	54·0	− 8·0	23·0	7	1·68	3	6	55·9

TOBACCO

TOBACCO SEED-BEDS

The cold, cloudy spring was unfavourable for the production of early seedlings and the shortage of plants was quite marked. In Kent County this shortage was so great as to reduce appreciably the acreage planted to tobacco.

Besides producing enough plants of all varieties to meet the requirements of the Station and the various outside experimental plots we sold 97,000 which gave a return of $242.50.

Three thousand square feet of glass-covered beds and 1,900 square feet of canvas-covered beds of the following types were seeded:—

(1) Cold-frame	Glass-covered	Spring steamed.
(2) Cold-frame	Glass-covered	Fall steamed.
(3) Semi-hotbed	Glass-covered	Fall steamed.
(4) Semi-hotbed	Glass-covered	Spring steamed.
(5) Semi-hotbed	Canvas-covered	Spring steamed.
(6) Cold-frame	Canvas-covered	Spring steamed.

All beds had a top dressing of about three inches of well-rotted compost.

The greater portion of the beds were sterilized by being subjected to live steam under 100 pounds pressure for 30 minutes. Small sections of the beds were steamed for 45 and 60 minutes respectively and other portions were left unsteamed.

No difference was observed between the growth and vigour of the plants grown on the sections of the beds steamed for different periods of time; however, the growth of the plants on the steamed sections was much more rapid and vigorous than that of those grown on the unsteamed sections. Plants grown on steamed soil were nine days earlier than those grown on unsteamed soil.

No signs of Root Rot were observed on either the sterilized or unsterilized portions of the beds.

Applications of potash alone, phosphoric acid alone and commercial 3-8-4 were made on various sections of the beds before steaming. A solution of nitrate of soda was applied to other sections of the beds after the plants were up.

Straw was used in making the semi-hotbeds in the fall and also in making a portion of the spring-made semi-hotbeds. Corn-stalks were used in making other portions of the spring-made semi-hotbeds.

The beds were seeded with dry seed from April 11 to 12 at the rate of from one-eighth to one-seventh of an ounce per 100 square feet of bed.

For the eighth season, the semi-hotbeds produced plants ready for transplanting earlier than did the cold-frame.

Glass-covered beds produced plants ten days earlier than canvas-covered beds and also, as would be expected, produced a much larger total number of plants.

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 the black compost produced earlier plants and required less watering than those receiving no compost.

Treating the seed with a corrosive sublimate solution again retarded and lowered the germination of the seed.

DEDUCTIONS

1. Possibly due to the very adverse season, the results were not quite so outstanding as those obtained in past seasons.

2. During eight seasons the semi-hotbed has proven to be the most efficient type of bed tested.

3. Five years' results strongly indicate that, by using straw, the semi-hotbed can be made and steamed in the fall without sacrificing its effectiveness, provided it is well covered.

4. Steaming at 100 pounds pressure for 30 minutes is apparently sufficient for the control of diseases and weeds.

5. Applications of potash alone or phosphoric acid alone are apparently useless in plant production. On fairly fertile soils, a weak solution of nitrate of soda is apparently sufficient for the production of tobacco plants and is more effective than a complete ready-mixed fertilizer.

6. Apparently straw, right from the stack, and cornstalks which have been used as bedding are equally effective under the semi-hotbed.

7. Steaming not only eradicates weeds and diseases but also hastens the growth of the plants.

8. The rate of seeding must be governed by the germinative power of the seed. Due to their natural tendency to grow long and spindling the flue-cured varieties must be sown more thinly than the Burley varieties. With seed germinating 85 per cent sow one-eighth of an ounce of flue-cured seed or one-seventh of an ounce of Burley seed per 100 square feet of bed.

TRANSPLANTING TOBACCO

Transplanting was begun May 29 and completed on June 20. All transplanting was done by machine.

A comparison between the yields obtained on plots set out on different dates showed that the earliest-planted plots were the best yielders.

With the object of determining the best distances at which to transplant tobacco, from the standpoint of both yield and quality, two plots of the flue-cured type and two plots of Burley were planted at different distances. The results with the flue-cured were as follows:—

Plot No.	Distance between plants in row	Distance between rows	Yield per acre	Increase in yield	Type	Per cent Bright
	inches	inches				%
9	24	36	1229	107	Flue-cured	80·4
13	28	36	1122	.....	"	61·6

With Burley the following results were obtained:—

Plot No.	Distance between plants in row	Distance between rows	Yield per acre	Increase in yield	Quality
	inches	inches			
R.B. 5	28	42	1309	57	Best.
27	31	42	1252	.....	.....

The results with both types strongly indicate that closer planting than is usual in the district will result in both an increased yield and an improvement in quality.

TOBACCO INSECT PESTS

Much replanting was necessary due to the ravages of the cutworms. While they were not so numerous in the late-fall-ploughed fields as in fields which were not fall ploughed, the time of ploughing had much less effect than it usually does.

Sowing a poisoned-bran mixture broadcast over the field, late in the evening two days before planting, proved quite effective in combating this pest. Two light applications of the poison on successive days proved more effective than a single heavy application.

Horn worms were very numerous and were most effectively controlled by spraying with arsenate of lead. Spraying with the solution of dry powdered arsenate of lead and water, again proved more effective than dusting.

Grasshoppers gave comparatively little trouble.

HARVESTING TOBACCO

Harvesting was begun on August 27. In harvesting, the stalks of practically all of the tobacco were split and as soon as it had wilted sufficiently to handle without breaking it was hauled to the barn. On comparison with tobacco harvested at the same time, the stalks of which were not split and which was spudded on the lath, it was found that splitting the stalks shortened the curing period fully three weeks, resulted in an improved colour, and lessened the danger from pole burn.

FLUE-CURING TOBACCO WITH STEAM HEAT

The equipment used for this experiment was the same as used in 1923; namely, a 30-horsepower boiler and three five-room kilns. Each kiln was equipped with thirteen coils.

Although the acreage planted to flue-cured tobacco was sufficient to have permitted running all three kilns simultaneously several times during the season, yet due to the slowness of the crop in ripening it was impossible to have three kilns running simultaneously more than twice, and then only for periods of 38 and 43 hours. During those periods 35 pounds pressure on the boiler gave any temperature desired in the kilns, thereby showing that the boiler could handle more than three kilns satisfactorily.

The boiler was fired continuously from August 27 to September 28, during which time 36,815 pounds of soft coal were burned. During that period eleven curings were made; however, had the tobacco ripened more rapidly it should have been possible to make, at least, fifteen curings and this would have greatly reduced the fuel consumption per curing.

The average fuel consumption per curing was 3,347 pounds of soft coal as compared with 3,830 pounds of coal required in 1923.

Since more single curings were made in 1923 than in 1924, the results strongly indicate that had the boiler been run at full capacity the fuel consumption would have been much lower.

Due to the nature of the season in 1924, all curings had to be steamed into case; therefore the above figures on fuel consumption cover both the curing and the steaming operations, and we must also take into consideration the fact that it required an average of five days to complete each cure.

The average cost for fuel per curing with steam was $15.06; while the average cost per curing with wood during the same period was $20.80.

DEDUCTIONS

1. Until the equipment consists of a sufficient number of kilns to run the boiler at full capacity during the curing operations and the tobacco ripens rapidly enough to permit that procedure, no definite conclusions as to the economy of curing with steam can be reached.
2. From the standpoint of quality, tobacco was cured just as satisfactorily with steam as by any other method.
3. Fuel costs were lower with steam than with furnaces burning wood.
4. A much more uniformly steady heat was obtained with steam than with furnaces burning wood or coal.

5. The 30-horsepower boiler will handle four and quite possibly more kilns simultaneously.

6. Fire-hazard was eliminated with steam.

7. Past results show that in building up a steam curing plant the boiler should be centrally located and the kilns should be built as closely as possible to the boiler.

8. The cost of installation is the only bad feature of the steam-curing process. However, that is not prohibitive when the low cost of upkeep is considered, and steam-curing would be practical on many farms on which the boiler could be used for a variety of purposes.

EXPERIMENTS WITH THE BECKETT-COVILL FURNACE

The experiments, begun in 1923, with the Beckett-Covill single furnace were continued during the season of 1924, with the same furnace in use.

The furnace was installed in a four-room kiln and three curings were made with a combination of wood and coal as fuel. On the start so little fire was needed that it was impossible to use coal as fuel.

The furnace required more attention and labour to maintain the desired temperature than the old twin-furnaces burning wood; there was also a tendency, particularly with coal, for the heat to strike too hard just over the furnace and for the kiln to be a little cold on the side most distant from the furnace. With the exception of the foregoing faults the furnace was quite satisfactory.

The average cost per curing for wood and coal, in the four-room kiln, was $7.09.

This firm is now manufacturing twin-furnaces and from observations made through the district it is thought that the twin furnaces will prove much more satisfactory than has the single furnace.

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

With the object of determining the relation of the humidity in the curing barn to the colour of the cured leaf and the humidity desired at various stages in the cure to give the best results, careful records were kept of the relative humidity at the various stages in all cures.

The results indicated that for a fairly large, heavy-bodied type of tobacco, the relative humidity should be 71 per cent when the lugs begin to yellow, 58 per cent when the middles are fairly yellow, 54 per cent when the tips begin to yellow, and 48 per cent when the tobacco is about yellow enough to fix the colour; and for a medium-sized fairly light type of tobacco the relative humidity should be 71 per cent, 66 per cent, 62 per cent and 48 per cent respectively, at the different stages of the cure.

EFFECT OF RIPENESS OF TOBACCO AND WEATHER CONDITIONS ON THE CURE

The best results were obtained with tobacco which was fairly ripe, not dead ripe, and which had faded out to a nice yellow colour before harvesting.

Getting caught in rain, during harvesting, caused the tobacco to cure somewhat darker. Tobacco which has been wet by rain should be permitted to drip for about six hours before the heat is applied.

Tobacco which was fairly well wilted cured more satisfactorily than either that which was excessively wilted or that which was rather brittle when placed in the curing barn.

Heavy rains and high winds were decidely disadvantageous if occurring before the colour had been fixed.

VARIETY TESTS OF FLUE-CURED TOBACCO

The general crop of flue-cured tobacco was composed of Warne and Hickory Pryor. Both are broadleaf types but the Hickory Pryor has the broadest leaf of the two. Of the two, Warne produced the smoothest leaf, the highest percentage of wrappers and the heaviest yield while the Hickory Pryor produced the highest percentage of bright tobacco.

Other varieties grown were Duke, Souths, Cash, and White Stem Orinoco.

Possibly due to the character of the season none of the above varieties cured very well nor did they show much indication of yellowing on the hill.

The Duke produced medium-sized, fairly broad, blunt, smooth, thin leaves with small ruffles, and medium-sized veins and internodes.

The Souths, a South African variety, produced short, broad, nearly oval, rough, heavy-bodied leaves with fairly large midribs, and veins, long internodes and an erect habit of growth.

The Cash produced long, large, rather blunt, broad, heavy-bodied, fairly smooth leaves with medium-sized veins, midribs and ruffles.

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

The last four of the above named varieties were very slow in maturing. The yields of the varieties were as follows:—

YIELD OF VARIETIES

Variety	Yield per acre
Warne	1,226 pounds
Hickory Pryor	1,122 "
Duke	1,207 "
Souths	1,123 "
Cash	1,081 "
White Stem Orinoco	1,008 "

Nine years' results indicate that for the general run of soils, in this district, the Warne is the best variety.

BURLEY VARIETIES

The general crop of Burley was composed of Resistant, Station Standup, Broadleaf and Recessive Burley. Of those varieties the Broadleaf was slightly the best yielder with the Station Standup and Recessive practically tied for second place. From the standpoint of quality, the Station Standup was best with the Recessive second.

Other varieties tested were Metzger, Stoner, Judy's Pride, and Kelly.

The Stoner and Judy's Pride were Standup types which were of practically the same quality as the Station Standup but inferior to it as yielders.

The Metzger and Kelley were apparently Broadleaf-Standup types which cured practically the same colour as the Broadleaf and were inferior to it as yielders. The Metzger was a very pretty type of plant when growing, with fairly long, broad, somewhat blunt leaves with medium-sized ruffles and internodes and a fairly erect habit of growth.

The characteristics of the other varieties have been given in previous reports.

From past results it is recommended that for both yield and quality the Resistant Burley be planted only on diseased or doubtful soils; the Broadleaf Burley on soils particularly susceptible to drought; and Station Standup or the Recessive Burley on heavy sandy loams and light clay loams.

TESTS OF RESISTANT STRAINS

Standup Resistant Burley, C. R. B., Kentucky Yellow, selection R39P29 and selection R36P49 were grown on a plot which had been repeatedly inoculated with Thielavia Basicola. While it is doubtful that the entire plot was infected with Root Rot a portion of it did show indications of being diseased.

Selections R39P29 and R36P49 were supposedly resistant strains of Burley which were originated by the Kentucky Experiment Station and though they have been grown for two years they have proven decidely inferior as yielders when compared with the Burley varieties grown in this district. Since these strains have shown no indication of possessing any disease resistant qualities during the two seasons in which they were grown they are of no value to this district.

The Kentucky Yellow proved to be a black type of tobacco of no particular value to this district.

The Standup Resistant Burley is a new variety developed by Dr. Johnson, of Wisconsin. This variety is apparently a true Standup type of Resistant Burley and is very promising. It had fairly broad, erect, slightly blunt leaves of fair length and with medium internodes. The cured leaf was smooth and of good texture and almost as bright as the Station Standup but with slightly more prominent veins than that variety. It is apparently a good yielder.

The C R. B. is a type of resistant Burley possessing more resistance than the strain of resistant Burley now commonly grown. It was originated by the Tobacco Division and with a little more improvement should prove valuable. Its characteristics have been described previously.

VARIETY TESTS OF THE GREEN RIVER TYPE

Yellow Pryor, Little Hill and Greenwood were the varieties of the Green River tested. Those varieties were grown on a fairly heavy loam with a high silt content which was of a rather close nature. A heavy beating rain which fell shortly after transplanting and packed the soil very tightly, coupled with the dry season, reduced the yields of those varieties considerably. The Yellow Pryor was the best yielder with the Little Hill second; however, the difference in yield between the three varieties was not very great.

Due to the fact that the Yellow Pryor requires from seven to ten days longer to reach maturity than the other two varieties, it is thought that the Little Hill or Greenwood will be most suitable for Canadian conditions.

The Greenwood had long, fairly broad, smooth leaves with medium-sized midribs and veins and a small ruffle. It is a standup type and the most brittle of the three varieties.

The Little Hill had short, broad, nearly oval, corrugated leaves with a small ruffle, short internode, and medium midrib. It is a standup type but with slightly more droop than the Greenwood.

The Yellow Pryor had long, fairly smooth, drooping leaves with fairly large midribs and veins and small ruffles. It is a broadleaf type and the coarsest of the three varieties.

FERTILIZER TESTS ON FLUE-CURED TOBACCO ON THE STATION

Eighteen one-twentieth acre fertilizer plots were run in duplicate on the Station. Those plots were staked off on land as nearly uniform as could be found and all of them, with the exception of the check plots and two plots on which ready mixed commercial fertilizer was used, had home-mixed fertilizers of different formulæ drilled into the rows. The rows were so laid off that each plot contained the same number of plants of tobacco. The tobacco on those plots

was all planted on the same day, cultivated alike, cured under as nearly the same conditions as possible, and every precaution taken to make the fertilizer the only factor affecting the results. No manure was used on those plots.

The date concerning those plots will be found in the following table:—

FERTILIZER TESTS ON FLUE-CURED TOBACCO AT HARROW

Plot No.	Pounds per acre of fertilizer			Yield per acre		Percentage of Bright leaf		Increase in yield over check plot		Value of increase at $0.44		Cost of fertilizer per acre
	Sulphate of ammonia	Acid phosphate	Sulphate of Potash	A.	B.	A.	B.	A.	B.	A.	B.	
				lb.	lb.			lb.	lb.	$ c.	$ c.	$ c.
1	100	600	200	820	820	48·7	87	60	50	26 40	22 00	15 15
2	140	600	200	1,130	1,040	52·2	82	370	270	162 80	118 80	16 49
3	180	600	200	1,050	750	41·9	90	290	0	127 60	0 00	17 83
4	210	600	200	1,020	860	27·4	74	260	90	114 40	39 60	18 83
5	140	300	200	910	790	38·4	83	150	20	66 00	8 80	13 34
6	140	400	200	540	860	26·0	87	0	90	0 00	39 60	14 39
7	140	500	200	780	790	18·0	89	20	20	8 80	8 80	15 44
8	140	600	200	840	925	35	87	80	155	35 20	68 20	16 49
9	140	600	100	815	1,130	23	90	55	360	24 20	158 40	13 74
10	140	600	133	1,000	1,087	36	88	240	317	105 60	139 48	14 65
11	140	600	166	730	1,002	53	86	0	232	0 00	102 08	15 55
12	140	600	200	820	995	48·7	87	60	225	26 40	99 00	16 49
13	150	500	83⅓	1,060	965	49·0	91	300	195	132 00	85 80	12 56
14	1,000 lb. ready mixed 3-8-4 per acre	.....	.....	1,000	995	50	87	240	225	105 60	99 00	17 00
15	Check no fertilizer	.....	.....	760	770	71	92	.....	.....	.....	.....	.....
16	Dried blood 83⅓ Sulphate of ammonia 50	600	200	770	1,040	68	90	10	270	4 40	118 80	16 17
17	Dried blood 116⅔ sulphate of ammonia 70	600	200	900	950	57	92	140	180	61 60	79 20	17 81
18	Sulphate of ammonia 140	600	192*	1,005	975	53	90	245	205	107 80	90 20	14 83

*Carbonate of potash.

Plots 16 and 17 have the same plant food content as plots 1 and 2 respectively.

Plots 2, 8, 12, 17 and 18 have the same plant food content but in different forms in the cases of plots 17 and 18.

The soil of field A had a higher silt content than that of field B and some plots on A were damaged considerably by heavy beating rains shortly after transplanting.

The soil of field B was more uniform than that in field A.

DEDUCTIONS

1. Probably due to slight soil variations the effect of which were accentuated by seasonal conditions, the results were very variable.

2. Most of the fertilizer plots were more profitable than the unfertilized plots.

3. Apparently the best formula, from the standpoint of both yield and economy, consisted of:—

Sulphate of ammonia, 140 pounds per acre.
Sixteen per cent acid phosphate, 600 pounds per acre.
Sulphate of potash, 133 pounds per acre.

4. Probably due to the drought and the slower availability of the nitrogen with dried blood, supplying a portion of the nitrogen with dried blood was not as satisfactory as supplying all of the nitrogen with sulphate of ammonia.

5. The home-mixed fertilizer was less expensive and apparently just as good as the ready mixed fertilizer carrying its equivalent in plant food.

6. Comparing the results obtained on plots 2 and 18 it would seem that carbonate of potash is not quite as good a source of potash as the sulphate.

7. Had all of the fertilizer plots been fertilized and yielded like plot number two, of field A, the net return for the use of the fertilizer would have been $146.31 per acre, or for every dollar spent in fertilizer a net return of $8.87.

CO-OPERATIVE FERTILIZER EXPERIMENTS ON FLUE-CURED TOBACCO

Plots 1, 6, 9, 11, 12, 13 and 14 have the same plant food content; however, in some cases the nitrogen is derived from different sources.

The soils of the above plots were apparently quite uniform and produced a good crop of tomatoes in 1923.

The stand of tobacco was good.

Due to a heavy thunder shower catching a portion of the tobacco during harvesting no comparisons could be made as to quality.

The fertilizers on plots 15 and 16 carry the same plant food.

RESULTS OF FLUE FERTILIZER EXPERIMENTS WITH MR. WM. SETTERINGTON, LEAMINGTON

Plot No.	Fertilizer in pounds per acre			Yield per acre	Quality	Increase in yield	Value of increase at $0.40	Cost of fertilizer per acre
	Sulphate of ammonia	Acid phosphate	Sulphate of potash					
				lb.		lb.	$ c.	$ c.
1	140	600	200	1,500	Fair	40	16 00	16 49
2	180	600	200	1,400	"	.....	.....	17 83
3	210	600	200	1,460	"	.....	.....	18 83
4	140	400	200	1,320	"	.....	.....	14 39
5	140	500	200	1,500	"	40	16 00	15 44
6	140	600	200	1,540	"	80	32 00	16 49
7	140	600	133	1,400	"	.....	.....	14 65
8	140	600	166	1,480	"	20	8 00	15 55
9	140	600	200	1,600	"	140	56 00	16 49
10	No fertilizer-check plot	.....	.....	1,460	"	.....	.....	.....
11	Sulphate of ammonia 70, Dried blood 116⅔	600	200	1,500	"	40	16 00	17 81
12	Sulphate of ammonia 70, Tankage 175	448	200	1,560	"	100	40 00	17 25
13	Sulphate of ammonia 70, Cotton-seed meal 200	573·7	193·3	1,580	"	120	48 00	18 68
14	Sulphate of ammonia 70, 15% nitrate of soda, 92	600	200	1,560	"	100	40 00	17 14
15	Sulphate of ammonia 150	500	83⅓	1,460	"	.....	.....	12 56
16	1,000 pounds per acre, 3-8-4	.....	.....	1,360	"	.....	.....	17 00

DEDUCTIONS

1. On comparing the results obtained on the various plots, it is plainly evident that some factor, possibly preceding applications of manures or fertilizers, other than the fertilizer applied to the plot has affected the yields.

2. Apparently the best and most economical formula would consist of:—
   140 pounds sulphate of ammonia per acre.
   600 pounds acid phosphate per acre.
   200 pounds sulphate of potash per acre.

3. Of the organic sources of nitrogen, cottonseed meal was apparently best, with tankage second.

4. By comparing the results obtained on plots 12 and 13 with those obtained on most of the other plots it would seem that this soil would respond profitably if it were supplied with more organic material.

5. The home-mixed fertilizer was apparently more effective and economical than the ready mixed fertilizer, carrying the same plant food.

DEDUCTIONS FROM COMBINED RESULTS OF FERTILIZER TESTS ON FLUE-CURED TOBACCO

From the results obtained on the Station and from co-operative fertilizer plots the following deductions were made:—

1. The best formula for the district would apparently consist of:—
   Sulphate of ammonia, 140 pounds per acre.
   Acid phosphate, 600 pounds per acre.
   Sulphate of potash, 133 to 200 pounds per acre.

2. Home-mixed fertilizers are more economical than ready-mixed fertilizers carrying the same plant food.

3. Sulphate of ammonia alone is a better source of nitrogen than combinations of sulphate of ammonia and organic nitrogenous materials.

FERTILIZER TESTS ON BURLEY

Twenty-two one-twentieth-acre fertilizer plots were run in duplicate on Burley using the same procedure as followed in the fertilizer tests on flue-cured tobacco.

DEDUCTIONS

1. All of the fertilizer plots were highly profitable.

2. The best and most economical formula apparently would consist of:—
   Sulphate of ammonia, 400 pounds per acre.
   Acid phosphate, 400 pounds per acre.
   Sulphate of potash, 200 pounds per acre

3. Comparing the results on plots 13 and 14, it will be seen that the home-mixed fertilizer was more economical and apparently better than the ready-mixed fertilizer.

4. Ground limestone neither increased the yield nor improved the quality of the tobacco.

5. Apparently carbonate of potash is as good a source of potash as the sulphate of potash.

6. Apparently one-half of the nitrogen may be supplied from dried blood with satisfactory results.

7. Cottonseed meal nitrate of soda and tankage combined with sulphate of ammonia as sources of nitrogen were neither as effective nor as economical as sulphate of ammonia alone.

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

FERTILIZER TESTS ON BURLEY

Plot No.	Pounds per acre			Yield per acre		Increase in yield over check plot		Value of increase at $0.20		Cost of fertilizer per acre
	Sulphate of ammonia	Acid phosphate	Sulphate of potash	Plot A.	Plot B.	A.	B.	A.	B.	
				lb.	lb.	lb.	lb.	$ c.	$ c.	$ c.
1	240	400	200	1,060	1,180	420	580	84 00	116 00	17 74
2	320	400	200	1,180	1,280	540	680	108 00	136 00	20 42
3	400	400	200	1,060	1,180	420	580	84 00	116 00	23 10
4	480	400	200	1,100	1,450	460	850	92 00	170 00	25 78
5	400	200	200	1,040	1,200	400	600	80 00	120 00	21 00
6	400	300	200	960	1,380	320	780	64 00	156 00	22 05
7	400	400	200	1,160	1,230	520	630	104 00	126 00	23 10
8	400	500	200	1,220	1,320	580	720	116 00	144 00	24 15
9	400	400	100	1,160	1,300	520	700	104 00	140 00	20 35
10	400	400	133	1,040	990	400	390	80 00	78 00	21 26
11	400	400	166	1,060	1,040	420	440	84 00	88 00	22 17
12	400	400	200	1,240	1,500	600	900	120 00	180 00	23 10
13	150	500	83⅓	1,060	1,230	420	630	84 00	126 00	12 56
14	1,000 per acre ready mixed, 3-8-4	.....	.....	980	1,140	340	540	68 00	108 00	17 00
15	Check	.....	.....	640	600	.....	.....	.....	.....	.....
16	Sulphate of ammonia 320 Ground limestone 2,000	400	200	1,200	1,120	560	520	112 00	104 00	21 42
17	Sulphate of ammonia 320 Carbonate of potash 192	400	.....	1,260	1,260	620	660	124 00	132 00	18 76
18	Sulphate of ammonia 160 Dried blood 266⅔	400	200	1,380	1,160	740	560	148 00	112 00	23 70
19	Sulphate of ammonia 160 Cottonseed meal 457	343	185·7	1,000	930	360	330	72 00	66 00	25 47
20	Sulphate of ammonia 160 Nitrate of soda 210	400	200	980	1,300	340	700	68 00	140 00	17 68
21	Sulphate of ammonia 320 Carbonate of potash 192	400	.....	980	1,340	340	740	68 00	148 00	18 76
22	Sulphate of ammonia 160 Tankage 400	100	200	820	900	180	300	36 00	60 00	18 91

NOTES.—The soil of field A was not quite as uniform as that of field B.

Field A was the more fertile of the two fields.

Plots 2, 17, 18, 19, 20, 21 and 22 had the same amounts of plant food applied but the sources of nitrogen, phosphorous and potash were different.

Plot 16 received the same application of fertilizer as plot 2 and in addition 2,000 pounds of ground limestone per acre.

CO-OPERATIVE FERTILIZER EXPERIMENTS ON BURLEY

Co-operative fertilizer experiments on Burely, using some of the same formulae which were used on the Station, were conducted with Mr. Henry Rhame of Pelee Island and Mr. R. J. Spence of Rodney. In all cases the type of soil used differed considerably.

The fertilizers used and results obtained at Rodney were as shown in the table:—

RESULTS OF BURLEY FERTILIZER EXPERIMENTS WITH MR. R. J. SPENCE—RODNEY, ONT.

Plot No.	Pounds per acre			Yield per acre	Increase in yield over check plot	Value of increase at $0.20	Cost of fertilizer per acre
	Sulphate of ammonia	Acid phosphate	Sulphate of potash				
				lb.	lb.	$ c.	$ c.
1	240	400	200	1,540	830	166 00	17 74
2	320	400	200	1,120	410	82 00	20 42
3	400	400	200	1,560	850	170 00	23 10
4	320	300	200	1,550	840	168 00	19 37
5	320	400	200	1,420	710	142 00	20 42
6	320	500	200	1,170	460	92 00	21 47
7	320	400	133	1,650	940	188 00	18 58
8	320	400	166	1,430	720	144 00	19 49
9	Check, not fertilizer			710			
10	320	400	200	1,290	580	116 00	20 42
11	Sulphate of ammonia 160 Dried blood 266⅔	400	200	1,480	770	154 00	23 70
12	Sulphate of ammonia 160 Tankage 400	100	200	1,550	840	168 00	18 91
13	Sulphate of ammonia 160 Cottonseed meal 457	343	185·7	1,390	680	136 00	25 47
14	Sulphate of ammonia 160 Nitrate of soda 210	400	200	1,350	640	128 00	17 68
15	Sulphate of ammonia 150	500	83⅓	1,120	410	82 00	12 56
16	1,000 pounds per acre, 3-8-4			1,160	450	90 00	17 00

The field on which the co-operative test plots were located at Rodney, had never grown tobacco previously and was in clover the preceding season. While it was apparently fairly fertile and fairly uniform, it proved to be quite variable as evidenced by the yields of 660, 620 and 830 pounds per acre obtained on three check plots located in various places in the field.

Plots 2, 11, 12, 13 and 14 carry the same plant food but in different forms.

DEDUCTIONS

1. All of the fertilizer plots proved highly profitable.
2. The best and most profitable formula would apparently consist of:
   Sulphate of ammonia, 320 pounds per acre.
   Acid phosphate, 400 pounds per acre.
   Sulphate of potash, 133 pounds per acre.
3. Apparently combinations of sulphate of ammonia with dried blood, tanakge, cottonseed meal, or nitrate of soda are more satisfactory than sulphate of ammonia alone on this type of soil.
4. The ready-mixed fertilizer was apparently slightly better than the home-mixed fertilizer.

Tests at Pelee Island

The soil on which the co-operative test plots were located on Pelee Island was a fairly fertile light clay loam.

Drought reduced all of the yields to some extent.

Plots 15 and 16 were planted one day later than the other plots, and following a rain, and possibly for that reason were quicker in starting growth than the other plots.

Plots 2, 11, 12, 13 and 14 carry the same plant food but in different forms.

RESULTS OF BURLEY FERTILIZER EXPERIMENTS WITH MR. HENRY RHAME—PELEE ISLAND

Plot No.	Pounds per acre			Yield per acre	Increase in yield over check plot	Value of increase at $0.20	Cost of fertilizers per acre
	Sulphate of ammonia	Acid phosphate	Sulphate of potash				
				lb.	lb.	$ c.	$ c.
1	240	400	200	1,620	220	44 00	17 74
2	320	400	200	1,560	160	32 00	20 42
3	400	400	200	1,500	100	20 00	23 10
4	320	300	200	1,620	220	44 00	19 37
5	320	400	200	1,560	160	32 00	20 42
6	320	500	200	1,540	140	28 00	21 47
7	320	400	133	1,280	.....	.....	18 58
8	320	400	166	1,620	220	44 00	19 49
9	320	400	200	1,520	120	24 00	20 42
10	Check.....	.....	.....	1,400	.....	.....	.....
11	Sulphate of ammonia.....160 Dried blood.....266⅔	400	200	1,720	320	64 00	23 70
12	Sulphate of ammonia.....160 Tankage.....400	100	200	1,480	80	16 00	18 91
13	Sulphate of ammonia.....160 Cottonseed meal.....457	343	185·7	1,540	140	28 00	25 47
14	Sulphate of ammonia.....160 Nitrate of soda.....210	400	200	1,700	300	60 00	17 68
15	Sulphate of ammonia.....150	500	83⅓	1,480	80	16 00	12 56
16	1,000 pounds per acre, 3-8-4.....	.....	.....	1,760	360	72 00	17 00

DEDUCTIONS

1. Most of the fertilizer plots were more profitable than the check plots; however, the drought undoubtedly affected those results considerably.

2. The best formula would apparently consist of:
   Sulphate of ammonia, 160 pounds per acre.
   Dried blood, 266⅔ pounds per acre.
   Acid phosphate, 400 pounds per acre.
   Sulphate of potash, 200 pounds per acre.

3. Apparently combinations of sulphate of ammonia with dried blood or nitrate of soda are superior to either sulphate of ammonia alone or combinations of sulphate of ammonia with cottonseed meal or tankage.

4. Apparently the ready-mixed fertilizer was vastly superior to the home-mixed fertilizer. However, due to the fact that seven years' results, on the Station, have proven the home-mixed fertilizer to be at least equal to the ready-mixed, it is felt that some factor other than the fertilizer has affected the results on plots 15 and 16.

GENERAL DEDUCTIONS REGARDING FERTILIZERS FOR BURLEY

From the results obtained co-operatively and on the Station it would seem that:—

1. Fertilizers are highly profitable on Burley tobacco.
2. The best formula for the entire Burley belt would apparently consist of:
   Sulphate of ammonia, 320 pounds per acre.
   Acid phosphate, 400 pounds per acre.
   Sulphate of potash, 166 pounds per acre.
3. A combination of dried blood and sulphate of ammonia is apparently superior to sulphate of ammonia alone.

FERTILIZER TESTS ON GREEN RIVER

Ten one-tenth acre fertilizer plots, in duplicate, were started with the Green River type. On account of the great variations in growth on the various plots due to the effect of packing by heavy beating rains falling soon after transplanting, and subsequent baking, which could not be avoided, it was considered useless to record the results .

FALL PLOUGHING VS. SPRING PLOUGHING FOR BURLEY

In the fall of 1923 two plots were selected and manured. One-half of each plot was then ploughed and the remaining halves were ploughed in the spring of 1924. The tobacco on those plots was planted and harvested on the same dates, fertilized and cultivated alike and every precaution taken to make the time of ploughing the only factor affecting the yields.

PLOUGHING LAND FOR BURLEY

Plot No.	Treatment	Yield per acre	Gain	Value of gain
		lb.	lb.	$ cts.
18	Fall-ploughed	1,225	154	30 80
18	Spring-ploughed	1,071	.....	.....
X	Fall-ploughed	1,700	80	16 00
X	Spring-ploughed	1,620	.....	.....

Plot X was ploughed very early in the spring while plot 18 was ploughed rather late in the spring.

The results indicate that fall ploughing is superior to spring ploughing; also that when ploughing must be done in the spring it should be done as early as possible.

DIRECT VS. INDIRECT APPLICATIONS OF MANURE TO BURLEY

In the spring of 1923 one plot to be planted to corn was selected and one-half of the plot was manured for corn. The following fall the other half received an application of manure at the same rate as the half manured in the spring. The entire plot was ploughed in the fall of 1923 for the 1924 tobacco crop.

With the exception of the difference in the time of applying the manure, both halves of the plot received the same care and treatment throughout.

The results were as follows:—

Plot	Time of applying manure	Yield per acre	Gain	Quality
A	In spring to corn (Indirect)	1,213	58	Best.
B	In fall to stubble (Direct)	1,155	.....	.....

The tobacco produced from the indirect application of manure was much brighter in colour and of a better quality than that to which manure was applied directly.

This experiment has been conducted for three years and each time the indirect application of the manure resulted in an improvement in quality. While in two years out of the three the indirect application of the manure has resulted in a slightly increased yield, it is felt that the manure could hardly be responsible for the increases.

DRILLING VS. BROADCASTING FERTILIZERS

Two plots, of equal size, on the Station, and two plots on Mr. Rhame's farm, on Pelee Island, were staked off side by side and the fertilizer drilled in the row on one and sown broadcast on the other. Every possible precaution was taken to make the manner of applying the fertilizer the only factor affecting the yield.

The results will be found in the following table:—

Plot No.	Manner of applying fertilizer	Yield per acre	Increase in yield	Value at $0.20
		lb.	lb.	$ cts.
22A	Drilled in row	936	313	62 60
22B	Broadcasted	623		
1 Rhame	Drilled in row	1,840	174	34 80
2 Rhame	Broadcasted	1,666		

There was a slight difference between the degree of maturity of the tobacco on the drilled and broadcast sections, that on the drilled section reaching maturity first.

Since in six years out of seven drilling the fertilizer in the row has proven superior to sowing it broadcast, it would seem safe to conclude that drilling is superior to broadcasting.

CONTINUOUS PLANTING OF THE SAME FIELD TO TOBACCO

A plot which has been planted to tobacco continuously for eight preceding seasons was again planted to Burley. Despite the fact that it has received heavy applications of manure and fertilizer annually for nine years, the yield obtained was considerably lower than that obtained on similar soil, on which a four-year rotation is being practised, and which receives the same application of manure and fertilizer once in four years; and the yield was also lower than that obtained in 1923 on the same plot.

It was also noted that the percentage of diseased plants was much higher in the plot planted to tobacco continuously than in plots where definite rotations are being followed.

The results emphasize very strongly the value of a good rotation and its influence on yield, quality and disease control.

MANURE TESTS ON BURLEY

With the object of determining the proper amount of manure to use on Burley in conjunction with a good fertilizer, four 1/10-acre plots were staked off and fertilizer of the same analysis and in equal quantities applied to each. The plots were manured at the rates of 10, 12, 14 and 16 tons per acre.

The fertilizer used consisted of:—

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

The results will be found in the following table:—

Plot No.	Manure per acre	Yield per acre	Value of yield	Return per acre less cost of fertilizer and manure
		lb.	$ cts.	$ cts.
1	10 tons	1,160	232 00	204 26
2	12 "	1,170	234 00	204 26
3	14 "	1,300	260 00	228 26
4	16 "	1,145	229 50	195 76

The above results indicate that 14 tons per acre when supplemented with a good fertilizer is the best and most economical rate of applying manure.

CROP ROTATIONS FOR TOBACCO

The rotations previously started were continued. Due to the effect of the late and very cool droughty season, deductions as to the relative merits of the various rotations are not justified.

HOME-GROWN VS. FOREIGN-GROWN TOBACCO SEED

Home-grown seed of both the flue-cured and Burley types produced plants which ripened several days earlier as well as much more uniformly than plants produced from imported seed.

CEREALS

During the past season thirteen varieties of oats were tested in rod-row plots.

OATS VARIETY TESTS

Variety	Days to ripen	Yield per acre
		lb.
Prolific O. 77	90	1,291
Columbian O. 78	90	1,166
Victory	90	1,153
O.A.C. No. 3	88	1,125
O.A.C. No. 72	90	1,108
Mansholt's 3	89	1,107
Irish Victor P	88	1,085
Gold Rain	89	1,073
Alaska	86	1,034
Banner O. 49	88	1,030
Longfellow O. 478	88	938
Legacy	89	894
Laurel	87	760

NOTE.—Due to the drought, the varieties did not ripen normally and the yields also were seriously affected. The Prolific made the best appearance in the field with the Banner and O.A.C. No. 3 apparently holding second place.

Large quantities of seed oats from registered Banner seed were produced.

In the fall twenty-five varieties of fall wheat were sown for a variety test.

FORAGE CROPS

The experiments conducted with forage crops included variety tests of corn, the production of hybrid seed corn, corn breeding work, and variety tests of soy beans.

Twenty-five varieties of corn were tested for their relative merits as producers of both grain and fodder.

More than six hundred lots of inbred corn were grown for further inbreeding with the object of eliminating all undesirable characteristics. The inbred strains are to be eventually recrossed with the object of producing strains of corn with increased vigour and yields.

For the production of hybrid seed a number of crosses were made between various types of corn. This work has apparently already yielded remarkable results.

Seventeen varieties of soy beans, procured from various sources in Canada and the United States, were tested for their general merits and grain-producing ability.

The Ste. Anne No. 92 and MacDonald No. 92 were the earliest maturing varieties with the Yellow No. 210, Yellow (Hira-la-dou-za) and Early Korean as next earliest, in the order named.

CONDENSED REPORT OF F. DIMMOCK, FORAGE CROP ASSISTANT

The work at Harrow conducted by the Forage Crop Division, was considerably more extensive in 1924 than in the previous year. Corn and soy beans were the principal crops worked with, although some small preliminary tests with other crops were made.

CORN BREEDING

Over 600 inbred strains of corn, representing early, medium, and late types of both flint and dent varieties were included in the breeding block. These were again inbred, the work necessitating the making of about 12,000 to 15,000 artificial pollinations.

Final selection, in which the poorer strains were eliminated, resulted in about 300 strains being kept for further work next year.

CORN VARIETY TEST

The variety test included 25 varieties of corn representative of those commonly grown in Canada, both for ensilage and seed purposes, also a number of varieties introduced from the United States. Each variety was harvested both for fodder and for grain and accurate records of the yields taken in order to show the yielding ability of each. It will be necessary to conduct this test further to obtain reliable results of the relative yielding ability of the different varieties.

CORN HYBRIDS AND HYBRIDIZATION

A small amount of hybrid seed produced as the result of crosses between different varieties in 1923 was grown this year and some rather remarkable results obtained in several cases. A cross made between Howe's Alberta, a small flint corn which matured this season in 92 days, and Wisconsin No. 7, which matured in 135 days, resulted in the production of a hybrid which not only matured in 95 days, but gave a yield of both fodder and grain almost

equal to that of Wisconsin No. 7, the larger and later parent. Other hybrids gave almost equally surprising results.

With the object of producing a hybrid that will be suitable for those districts in Canada where the season is comparatively short, and still give a high yield, a number of varieties were artifically crossed this year. Twelve varieties were used for this work representing early, medium, and late types of both flint and dent corn. A sweet corn variety was also included.

In all, over 50 different combinations were made necessitating about 2,000 artificial pollinations. Sufficient seed was obtained in most cases to carry out a test next year in order to find out the most desirable combinations to make for hybrid purposes.

CLASSIFICATION OF CORN

Work was begun on a classification of the corn varieties grown in Canada, and for this purpose over 160 varieties of corn were obtained. These were secured from as many sources as possible and represented all of the corn varieties grown in Canada that it was possible to secure. Records were taken of the various characters exhibited by each variety, including both the plant itself and also the ears.

The length of time which each variety required to mature was also recorded.

The object of this work is to reduce the number of corn varieties, by including all those exhibiting the same characters under one varietal name. The varieties will also be classified into seasonal groups, each separate group including those varieties which mature in approximately the same length of time. This will enable a farmer who knows the average length of his season, to choose a variety from among those included within the seasonal group which corresponds in the number of days to his own particular season. Thus he will have some assurance that the variety so selected will do, within a reasonable degree, what is expected of it.

SOY BEANS

The work with soy beans consisted of a variety test in which 17 varieties were included. As with the corn these were harvested both for fodder and for seed and the yields taken in each case. The highest yielding varieties were:—

Variety	Fodder per acre moisture free dry weight	
	tons	lb.
Hollybrook	1	594
Golden	1	446
Manchu	1	391
Black Eyebrow	1	367
Ito San	1	319
	Seed per acre Bushels	
Green	19·6	
Black Eyebrow	18·8	
Manchu	18·4	
Early Korean	18·2	
Golden	18·1	

Since the findings represent only one season's work, definite conclusions are not justified.

A more complete report of the Forage Crop work will be found in the divisional report of the Dominion Agrostologist for 1924.

HORTICULTURAL WORK

A large amount of work along horticultural lines was done during the past season. The greater portion of this work was carried on under the supervision of H. R. Murray of the Horticultural Division, Ottawa.

The old apple and peach orchards were thoroughly pruned and sprayed.

Thirty-nine promising new varieties of apples were top-grafted on the old apple trees. This work was quite successful and the number of grafts which lived gratifying.

Large quantities of seed of Pickaninny corn, a new variety of sweet corn which matured earlier than any other variety grown in the district and which had a flavour equal to any variety tested, were grown.

A large quantity of seed of two very promising garden pea hybrids was produced.

A purity test was conducted with 810 samples of commercial vegetable seed of radishes, lettuce, peas, beans, carrots, beets, celery, onions and parsnips. During the period of growth and at harvest time different strains and varieties were carefully compared and notes were prepared on the percentage of germination, earliness and trueness to type, and photographs made of the various types, variations and mixtures.

Many favourable comments were passed on a flower border containing eight varieties of narcissus, twenty-four varieties of tulips, five varieties of hyacinths, and six varieties of late blooming annuals.

A large amount of work was done towards beautifying the grounds. More than one-quarter of a mile of hedges was planted and many other plantings were made.

A more detailed report of this work will be found in the divisional report of the Dominion Horticulturist for 1924.

ANIMAL HUSBANDRY

STEER FEEDING EXPERIMENT

In order to get some data on the cost of producing beef in this section; to produce some manure which is scarce and high in price; and to dispose of a large amount of roughage for which there is not much demand, nineteen steers were purchased at the Toronto stockyards in June, 1923. At that time really good feeders could not be obtained and those received were rather lacking in uniformity and type and cost six and one-half cents per pound at the yards. The steers were between two and three years of age and most of them were grade Aberdeen Angus.

The steers were turned on pasture on June 26. Due to unavoidable circumstances they could not be brought up until December 1. Due to lack of stabling facilities the steers could not be divided into lots for comparative feeding tests. The entire lot was permitted to run loose in the barnyard with access to water at all times and given a shed, which was open on the south side, in which they were fed and bedded.

The entire lot received the same ration. For roughage they had all the corn stover they could eat and five pounds of alfalfa hay per head daily. The grain ration consisted of corn, fed on the cob, and a meal mixture consisting of 1 part wheat, 6 parts oat and one part oilcake. The corn was fed night and morning and the meal at noon. On the start the lot received 3 pounds of corn per head daily, which amount was gradually increased until by January 6 they were receiving 12 pounds per head per day. The meal was fed at the rate of 1 pound per head daily on the start, and gradually increased until 3 pounds per head was being fed.

With the exception of one steer which was injured, all of the animals made fairly good gains and had no digestive troubles.

Due to the high cost of freight and market fees the average cost f.o.b. Harrow, was $0.0694 per pound and due to the same causes the net price received in Toronto was $0.0622 per pound.

STEER FEEDING EXPERIMENT, 1923-1924

Number of steers in lot		19
Gross weight in Toronto	Lb.	15,410
Average weight in beginning	"	811
Gross weight end of pasture time	"	18,846
Average weight end of pasture time	"	992
Average gain per head on pasture	"	181
Cost per pound gain on pasture ($0.50 per head per month)	$	0.014
Gross weight beginning of feeding period	Lb.	18,846
Average weight beginning of feeding period	"	992
Finished weight, gross, end of feeding period	"	21,530
Finished weight, average, end of feeding period	"	1,133·1
Number of days on feed	Days	88
Total gain 88 days	Lb.	2,144
Average gain per steer	"	141·1
Daily gain per steer	"	1·6
Gross cost of feed for period	$	436.78
Cost per pound of gain for lot during feeding period	Cts.	20·37
Original cost, June 20	$	1,070.85
Total cost	$	1,555.13
Net selling price at $6.65	$	1,307.13
Loss on lot	$	248.00
Loss per steer	$	13.05
Shrinkage per head (2·5 per cent)	Lb.	28·4
Average valuation of steer at start	$	56.36
Average valuation of steer at finish	$	68.79
Average increase in value	$	12.43
Average cost of feed per steer	$	22.98

Feed consumed by the lot		*Value*
171½ bush. oats at $0.40	$	68.60
15½ bush. wheat at $1	$	15.50
500 pounds oilcake	$	16.50
352 bush. corn at $0.60	$	211.20
Hay, 7,220 lb	$	64.98
20 acres corn fodder at $3	$	60.00

One steer in the lot was badly injured and went off his feed for some time during the feeding period. That animal weighed only 1,000 pounds at the end of the feeding period, and naturally caused a reduction in the average increase in weight and in the sale value of the lot.

While the steers were sold at a loss, this was more than offset by the production of 144 tons of manure which, at a consevative estimate, was worth $2.50 per ton or $360 for the total tonnage.

Since this experiment has been conducted only one year final conclusions are not justified.

Due to the lack of proper facilities, no hogs were run with the steers.

This experiment will be continued in the future and hogs will be allowed to run with the steers.

FIELD HUSBANDRY

For a number of years field husbandry experiments, such as fertility experiments, tests of various rotations, etc., have been conducted. However, since, in the past, that work has been considered chiefly from the standpoint of its effect on the various types of tobacco, the experiments conducted and results obtained have been, and still are, treated largely in that portion of the report dealing particularly with tobacco. Work along field husbandry lines is still being carried on and in the future will be broadened sufficiently to include other crops, as well as new experiments with tobacco.

COST OF PRODUCING CROPS

Careful records are kept of the cost of production of the various crops occurring in the rotations. These records include every item which can be justly charged against the crops in question. Since the fixed charges and yields vary enormously throughout the district these figures are by no means applicable to the district as a whole and they show nothing more than the cost of production on the Experimental Station. Since our buildings and machinery are used for a variety of purposes the rental charged to any crop is naturally lower than that which would have to be charged on farms engaged only 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)	0.40
Rent of buildings and lath (flue-cured tobacco)	10.00
Rent of buildings and lath (Burley tobacco)	17.00
Cost of tobacco plants (flue-cured)	12.00
Cost of tobacco plants (Burley)	9.00
Cost of fertilizer (flue tobacco 4/5 cost)	13.20
Cost of fertilizer (Burley tobacco 4/5 cost)	18.50
Cost of manure (Burley tobacco 2/3 of actual cost)	8.00
Cost of curing fuel (flue-cured tobacco)	15.06
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	0.40

CROP VALUES

Flue-cured tobacco	$ 0.44 per lb.
Burley tobacco	0.20 "
Corn	1.00 per bush.
Oats (at threshing time)	0.50 "
Hay (at harvest time)	12.00 per ton
Straw	2.00 "

COST OF PRODUCING FLUE-CURED TOBACCO

Area of plot	0·58 acres	1·55 acres	3 acres
Rent of land	$ 8.70	$ 23.25	$ 45.00
Rent of machinery	0.87	2.15	4.50
Rent of barns and lath	5.80	14.50	30.00
Plants	6.96	16.80	36.00
Spraying material	2.61	6.45	12.50
Fertilizer	7.66	18.48	39.60
Fuel	8.73	21.08	45.18
Labour—man and horse	84.90	170.25	295.12
Totals	$ 126.23	$ 272.96	$ 507.90
Cost per acre	217.64	176.10	169.30
Yield per acre	1,122 lb.	1,229 lb.	1,117 lb.
Cost per pound	$ 0·194	$ 0·144	$ 0·152

Total acreage in above three plots	5·13 acres
Average yield per acre above 3 plots	1,156 lb.
Average cost per acre above 3 plots	$187.68
Average cost per pound above 3 plots	16·2 cts.

COST OF PRODUCING BURLEY TOBACCO

Area of plots	1·3 acres	1·48 acres	6 acres
Rent of land	$ 19.50	$ 22.20	$ 90.00
Rent of machinery	1.95	2.22	9.00
Rent of barns and lath	22.10	25.16	102.00
Plants	11.70	13.20	54.00
Spraying materials	6.45	6.66	18.00
Fertilizer	24.05	27.58	111.00
Manure	10.40	11.84	48.00
Labour—man and horse	150.44	134.38	451.72
Totals	$ 246.59	$ 243.24	$ 883.72
Cost per acre	189.67	164.35	147.29
Yield per acre	1,213 lb.	1,252 lb.	1,136 lb.
Cost per pound	15·6 cts.	13·1 cts.	12·9 cts.

Total acreage in above three plots	8·78 acres
Average yield per acre above 3 plots	1,200 lb.
Average cost per acre above 3 plots	$ 167.10
Average cost per pound above 3 plots	13·9 cts.

NOTE.—Due to the poor season the yields of flue-cured tobacco were a little below normal and those of Burley were fully 600 pounds per acre above normal.

COST OF PRODUCING CORN

Area of plots	0·49 acres	1·4 acres	6 acres
Rent of land	$ 7.35	$ 21.00	$ 90.00
Rent of machinery	0.20	0.56	2.40
Manure	1.96	5.60	24.00
Fertilizer	1.84	6.46	27.72
Toll—husking machine		4.20	18.00
Labour—horse and man	12.73	27.83	101.81
Totals	$ 24.08	$ 65.65	$ 263.93
Cost per acre	49.14	46.90	43.99
Yield per acre corn	52·4 bush.	51·6 bush.	25·5 bush.
Cost per bushel corn	93·7 cts.	90·8 cts.	$1.72
Value of corn per acre	$52.40	$51.60	$25.50
Value of fodder per acre	4.00	4.00	4.00

COST OF PRODUCING OATS

Area 1·5 acres.

Rent of land	$ 22.50
Rent of machinery	0.60
Cost of seed	3.00
Toll—threshing	3.66
Labour—man and horse	7.29
Total cost	$ 37.05
Cost per acre	24.70
Yield per acre	61 bushels
Value of oats per acre	$ 30.50
Value of straw per acre at $2 ton	2.46
Cost of oats per bushel	40·5 cents

COST OF PRODUCING HAY

Area of plots	0·5 acres	1·48 acres
Rent of land	$ 7.50	$ 22.20
Rent of machinery	0.20	0.59
Cost of seed	1.33	4.15
Preparing land and seeding	0.48	1.42
Labour—man and horse—harvesting	4.11	12.03
Totals	$ 13.62	$ 40.39
Cost per acre	27.24	27.29
Yield hay per acre	5,000 lb.	3,542 lb.
Value of hay per acre	$ 30.00	$ 21.25

NOTE.—In preparing land for oats one-half of cost of preparation and seeding was charged to oats and one-half to prospective grass crop.

IMPROVEMENTS

During the year many improvements were made. Four new buildings were constructed, four buildings were moved and repaired; practically all other buildings on the Station were repaired and painted; a water system for fire protection, was installed in the office and cottages; 500 rods of new fence were built; many stumps and rocks were blasted; many tons of rocks were removed from the fields, and unsightly ditch banks and fence rows were cleaned up.

EXTENSION WORK

During the past season numerous growers were visited, the results obtained on the Station discussed and explained, methods of culture discussed, suggestions given, and farmers' clubs in Essex and Kent were addressed.

Many articles were written for the local press and an exhibit displayed at the Essex Corn Show.

Throughout the year the Station was frequently visited by growers from all portions of the tobacco belt.

EXPERIMENTAL PROJECTS UNDER WAY AT THE EXPERIMENTAL STATION FOR SOUTHWESTERN ONTARIO—HARROW, ONT.

TOBACCO

PROJECT	TITLE
T. 1.	Merits of various types of tobacco beds.
T. 2.	Sterilization of tobacco seed-beds.
T. 3.	A comparison of fall-made-and-sterilized seed-beds with spring-made-and-sterilized seed-beds.
T. 4.	The type of soil most suitable for growing tobacco seedlings.
T. 5.	To determine the rate, date and method of sowing tobacco seed-beds, which gives the best results.
T. 6.	The fertilization of tobacco seed-beds.
T. 7.	A comparison of home-grown and foreign-grown seed.
T. 8.	The bacteria and fungi associated with tobacco seed.
T. 9.	Fertilizer tests with flue-cured tobacco.
T. 10.	A comparison of home-mixed and commercial ready-mixed fertilizers on flue-cured tobacco.
T. 11.	The comparative efficiency of various sources of nitrogen and potash on flue-cured tobacco.
T. 12.	To determine the proper distances for transplanting different varieties of tobacco.
T. 13.	Crop rotations with flue-cured tobacco.
T. 14.	Varietal tests of flue-cured tobacco.
T. 15.	Crop rotations with Burley tobacco.
T. 16.	A comparison of fall ploughing and spring ploughing for tobacco.
T. 17.	Varietal tests of Ontario air-cured tobaccos.
T. 18.	Fertilizer tests with Burley tobacco.
T. 19.	A comparison of home-mixed and commercial ready-mixed fertilizers on Burley tobacco.
T. 20.	The comparative efficiency of various sources of nitrogen and potash on Burley tobacco.
T. 21.	The relative efficiency of drilling vs. broadcasting commercial fertilizer on Burley tobacco.
T. 22.	The effect of splitting the stalk on the subsequent cure of cigarette tobaccos.
T. 23.	The value of scaffolding as an aid in curing Burley tobacco.
T. 24.	An inquiry into the feasibility of steaming tobacco into "case."
T. 25.	Control of the tobacco cutworm.
T. 26.	The production of pure, high-grade tobacco seed.
T. 27.	To determine the relation of the relative humidity in the barn to the flue-curing process.
T. 28.	A comparison of direct and indirect applications of manure to Burley tobacco.
T. 29.	The effect of different forms of lime on Burley tobacco.
T. 30.	To determine the most profitable rate of manuring Burley tobacco.
T. 32.	To study the effect of various fertilizers on the "burn" of tobacco.
T. 33.	Steam as a source of heat for flue-curing tobacco.
T. 34.	Flue-curing tobacco with Johnson's patent curing furnace.
T. 35.	A test of various fall-sown cover crops.
T. 36.	The effect of continuous cropping to Burley tobacco.
T. 37.	Cross-breeding to develop resistance to the Thielavia root-rot diseases.
T. 38.	The treatment of Thielavia-infested soils with acid phosphate, lime, gypsum, and soil fungicides.
T. 39.	Seed-bed sanitation as a control for certain diseases of tobacco.
T. 41.	The production of superior strains of tobacco.
T. 43.	Seed treatment to control seed-borne diseases.
T. 44.	The selection of strains resistant to the Thielavia root-rot diseases within pure varieties of White Burley, Snuff, and flue-cured tobacco.
T. 47.	General varietal tests.
T. 50.	Commercial tobacco culture.
T. 51.	General tobacco experiments.
T. 53.	A study of the cost of production of tobacco seedlings.
T. 56.	Co-operative fertilizer trials with bright tobacco.
T. 57.	Tobacco soil investigations.
T. 59.	Studies on topping and suckering tobacco.
T. 61.	To determine the best source of nitrogen for White Burley tobacco.
T. 62.	To determine the best source of nitrogen for flue-cured tobacco.
T. 63.	Studies on close planting and heavy fertilization of White Burley tobacco.
T. 64.	Studies on close planting and heavy fertilization of flue-cured tobacco.

Project	Title
T. 68.	Effect of rate and method of application of commercial fertilizers on yield, colour, and maturity of flue-cured tobacco.
T. 69.	Effect of rate and method of application of commercial fertilizers on yield, colour, and maturity of White Burley tobacco.
T. 70.	The effect of cultural variations upon the nicotine content of tobacco.
T. 71.	A comparison of various manures into tobacco fertilization.
T. 72.	A field study of the effect of the preceding crop on the subsequent growth of tobacco.
T. 73.	An experimental study of long and short rotations for tobacco.
T. 74.	Fertilizer tests with Green River tobacco.
T. 75.	Co-operative experiments with Burley tobacco.
T. 76.	Flue-curing tobacco with the Beckett-Covill Patent Curing Furnace.

ANIMAL HUSBANDRY

A. 194.	Cost of beef production.
A. 564.	Economy of following steers with hogs.

CEREALS

Ce. 4.	Tests of winter wheat varieties.
Ce. 17.	Tests of varieties of oats.
Ce. 50.	Production of registered seed grain.

FIELD HUSBANDRY

Cost of production of various crops.

FORAGE CROPS

Ag. 1.	Variety tests of ensilage corn.
Ag. 2.	Variety tests of grain corn.
Ag. 7.	Corn breeding experiments.
Ag. 181.	Variety tests of soy beans.
Ag. 259.	Experimental methods.

HORTICULTURE

H. 33.	Variety tests of apples.
H. 100.	Seed corn production.
H. 219.	Test of vegetable seed for trueness to name and type.
H. 430.	Pea seed production.

Ottawa: Printed by F. A. Acland, Printer to the King's Most Excellent Majesty, 1925.