DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

Dominion Experimental Station

Harrow, Ontario

and

Dominion Experimental Substation

Delhi, Ontario

RESULTS OF EXPERIMENTS

1932 - 1936

H. F. MURWIN
Superintendent

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RESULTS OF EXPERIMENTS CONDUCTED AT THE DOMINION EXPERIMENTAL STATION, HARROW, ONTARIO,

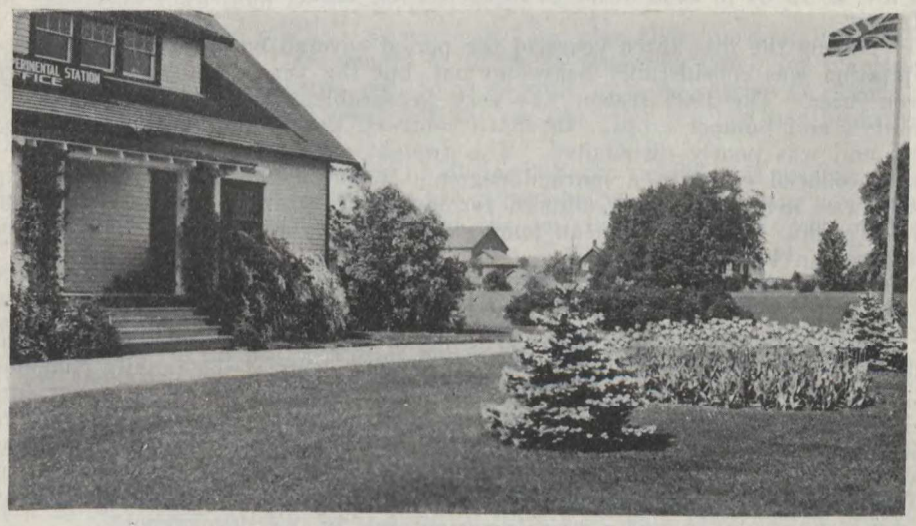
and the

DOMINION EXPERIMENTAL SUB-STATION, DELHI, ONTARIO, 1932 to 1936

H. F. MURWIN, Superintendent

INTRODUCTION

The purpose of this summarized report is to present brief discussions of the work in progress and practical results of numerous experiments conducted by the Harrow experimental station and the Delhi experimental sub-station. While experimental work at the Delhi sub-station is confined to flue-cured tobacco, investigations are in progress at the Harrow station in poultry and animal husbandry as well as on tobacco, corn, soybeans, oats, wheat, and various horticultural crops. Results of tobacco experiments at the two stations are treated together and general headings are used under which related projects in other phases of investigation are discussed. Detailed publications are available on some of the subjects covered in the report, and for that reason no attempt is made to include details regarding methods employed or experimental data on which recommendations are based.



A portion of the office and grounds on the Harrow Station.

THE WEATHER

The weather records taken at the Harrow station for the past 20 years consisted of temperatures (maximum and minimum), rainfall, snowfall, and sunshine. Similar records have been taken at Delhi since 1934. Fairly complete equipment was installed at Harrow in 1935 and during the past two years the weather observations have also included soil temperatures at depths

of 4, 8, and 24 inches below the surface, grass minimum temperatures taken on the surface of the soil, relative humidity records by the wet and dry bulb method and also with a hygrograph, daily evaporation from an evaporimeter, radiation of heat from the sun by an actinograph which records graphically, in addition to sight observations on wind direction and velocity and visibility.

The extreme southwestern portion of Ontario is favoured with a very mild climate. The climate and soils are particularly well suited to the production of a great variety of crops, a few of the more important ones being early vegetables, fruits, canning crops, tobacco, sugar beets, husking corn, and winter wheat. The Harrow station is located in the most southerly county in the Dominion, approximately three miles from the north shore of lake Erie. Extremes in temperature are seldom experienced at Harrow either in summer or winter. The records during the past 20 years show that the temperature reached 90° F. or above on an average of less than 14 days each summer, and that zero temperatures or below were experienced on an average of less than six days each winter. The highest temperature recorded during the 20-year period was 105·1° F., which occurred during July, 1936. This was the sixth time the temperature reached 100° F. at Harrow. The lowest temperature recorded, 17° F. below zero, occurred in February, 1934, which caused considerable damage to the orchards in some districts. The average frost-free period is 159 days. However, light frosts may be expected up until about May 24 and as early as September 25. While the frost-free period is not much different at the Delhi sub-station, the extremes in both temperatures and precipitation are somewhat greater. The average precipitation at Harrow for the past 19 years is 24·19 inches. The precipitation during this period has varied from as low as 13·04 in 1930 to 38·12 inches during 1926. The snowfall is light at Harrow.

During the first three years of the period covered by this report the precipitation was considerably below normal, but the years 1930 and 1931 were even drier. The 1935 season was very favourable with good distribution of rainfall and bumper crops. In sharp contrast, the rainfall during 1936 was less and was poorly distributed. The drought with extremely high temperatures reduced crops to a marked degree. However, the frost-free period in 1936 was 184 days, which allowed for much late growth and recovery from the drought. The lowest mean temperature for any winter month at Harrow occurred in February, 1936.

TOBACCO

Quality of the tobacco produced is one of the factors responsible for recent developments in the tobacco industry of Ontario. Out of the rapidly changing picture of a few years ago there has developed an industry which is now furnishing a steady source of income for several thousand growers in this southern peninsula. The acreage increase has principally occurred in flue-cured tobacco, which type constituted approximately 85 per cent of the 57,500-acre crop planted in 1937. The guidance and stabilizing influence of the buyer-grower organizations also played a very important role in this development.

In addition, tobacco manufacturers' requirements change, as well as the soil upon which tobacco is grown for a period of years, thus necessitating changes in fertilizers as well as varieties and cultural practices. There has been a complete change in fertilizers, varieties grown, cultural methods employed, and methods of harvesting during the past eight years in the case of flue-cured tobacco. A similar change has taken place in the production of burley tobacco but not to the same extent. Although experimental work on tobacco has been in progress at the Harrow station since 1909, recent developments in the industry have brought forth many new problems, particularly in

the flue-cured type, making it necessary to establish in 1933 a sub-station at Delhi, the centre of the new flue-cured tobacco belt. Most of the work on the flue-cured type is now being conducted by the Delhi sub-station, while all the work on burley and dark tobacco is being conducted by the Harrow station. Experimental work on tobacco covers practically all of the production phases of the three principal types of tobacco grown in Ontario.

Production of Tobacco Seedlings

The tobacco crop starts with the seedlings and an abundance of healthy, sturdy plants is required at the proper planting time for a uniform crop of tobacco. The three principal types of greenhouse utilized in the production of flue-cured plants are the inexpensive removable-sash greenhouse, a more expensive type with permanent rafters, and the small A-shaped greenhouse which also has permanent rafters. The removable-sash type is by far the most economical for the production of plants and has some advantages over the more permanent types of greenhouses. In the removable-sash type the capacity for ventilation is unlimited whereas ventilating facilities for the proper control of seedling diseases are often far too limited in the more permanent types. The removable-sash type is less confining during such operations as working and steaming the soil and pulling plants, and will produce plants in ample time for planting if proper management is practised. A semi-hot flat bed covered either with sash or cotton is principally used for the production of burley and dark tobacco plants. Sash-covered beds are much more desirable during unfavourable weather for controlling plant-bed diseases and soil moisture. Sash-covered beds will also produce seedlings for planting at an earlier date than cotton-covered beds.

A top coating of muck is recommended for plantbeds, particularly on the lighter types of soils. Care should be taken in procuring muck for plantbeds as only the top or weathered portion is suitable in most cases. One inch of muck is sufficient if spread evenly on the surface after the bed has been prepared for steaming.

Steam sterilization of soil for producing tobacco seedlings is recommended in all cases except where plantbeds are moved to healthy soil in a new location each year. Steam sterilization of the soil by the inverted-pan method will control plant diseases as well as weeds if properly performed. Effective sterilization can only be accomplished if the soil contains the proper amount of moisture. Steaming has little effect on soil-borne diseases if the soil is frozen, wet, or too dry. However, if the soil is in proper condition, one-half hour steaming will kill disease organisms and weed seeds present provided a pressure of 100 pounds is maintained in the boiler with the steam line to the pan well open.

A bag of commercial fertilizer, the same as is used in the production of the crop, applied to 900 square feet of bed surface is ample for the production of tobacco seedlings under normal conditions. When the plants reach the size of a 25-cent piece, a light application of nitrate of soda may hasten growth. This application is not recommended unless it is necessary because most plant-bed troubles are the result of over-fertilization or attempts to force plant growth whereas very few plantbed troubles are caused by under-fertilization. The seedlings will grow faster if no attempt is made to force early growth. If seeding is done the first week in April for flue-cured, and the second week in April for burley and dark tobaccos, plants will be ready in ample time for transplanting without forcing. At the same time, a light top dressing of fertilizer well washed off the plants after the first pulling often materially benefits the later pullings.

An ounce of seed is ample for seeding 1,200 to 1,600 square feet of bed if dry seed of good germination is sown. More seed may be required if it is sprouted before sowing. Good seed should germinate at least 80 per cent. Thin seeding, within the range recommended, will result in stronger and earlier plants than thick seeding.

Tobacco plantbeds should receive ample ventilation at all times. The greenhouse or plantbed should never remain closed after the temperature reaches 90° F. Too much watering with inadequate ventilation often results in losses from seedling diseases and, as stated before, there is seldom anything gained from attempts to force the growth of tobacco seedlings. The easiest way to control diseases is to prevent them by practising sanitation at all times and avoiding the introduction of diseased material from the preceding crop and other sources.

Fertilizers for Tobacco

Although fertilization of tobacco is but one of the factors responsible for quality, it is a very important one. Experiments have proved the value of commercial fertilizers for tobacco. If an unbalanced fertilizer is applied, either the quality or the yield may be lowered even with the best of soils, varieties, and cultural practices. Likewise, proper soil must be available, one of the better varieties must be grown, and proper soil management must be practised to derive maximum results from the fertilizer applied.

Experimental work has been conducted over a period of years at the Harrow station, at the Delhi sub-station, and on farms throughout the tobacco districts in an effort to determine the fertilizer mixtures best suited to the different types of tobacco. The information obtained from these studies is based on field growth, maturity, yield, and quality of tobacco produced in field-plot experiments, and is further supported by commercial tests based on experimental results.

Each year the information obtained from tobacco fertilizer experiments conducted in the province of Ontario is reviewed by the Standing Committee on Tobacco Fertilizers. Fertilizer recommendations for tobacco are formulated by the committee and are discussed in detail with the fertilizer manufacturers before being passed on to the producer. Less nitrogen and more potash is now required for best results in the production of flue-cured tobacco. Recent experiments definitely indicate that a flue-cured tobacco fertilizer should contain two per cent nitrogen, about ten per cent phosphoric acid, and at least eight per cent potash for best results under average conditions. Potash was found to be the most important part of the fertilizer mixture affecting the quality of tobacco. A 2-10-8 fertilizer is recommended under average conditions for flue-cured tobacco. The recommended rate of application is 800 to 1,000 pounds per acre.

Soil fertility and drainage vary considerably in some of the flue-cured districts, and it is fully realized that one fertilizer may not best suit all conditions. Where potash levels in the soil are low, the potash should be increased in the fertilizer used. In such cases a 2-10-12 fertilizer may be used to advantage. Likewise, where slow maturity has been experienced, particularly on some of the low-lying soils, less than two per cent nitrogen and more than ten per cent phosphoric acid will tend to hasten maturity and may better suit such conditions.

Potash is equally as important in the fertilization of burley tobacco. A fertilizer carrying high potash is required to produce the best burley on the sandy-loam soils. The clay-loam soils in general respond somewhat differently, requiring high phosphate in the fertilizer for best results. There is not as much response from potash applications on clay-loam soils as there is on the lighter burley soils. Recent experiments also definitely indicate that high potash is required on the gravelly-loam soils and on some of the other intermediate soils

in the tobacco area. As a result of these tests a 4-8-10 fertilizer is recommended on the sandy-loam and gravelly-loam soils. Where potash levels are low, still higher applications of potash may be used to advantage. In contrast, a 2-12-6 is recommended on the clay-loam soils because on these soils a greater response is obtained from phosphate than from potash.

With the wide range of soils utilized in the production of burley tobacco, it is readily understood that neither of these two fertilizers will best suit every condition. Recent tests throughout the burley tobacco districts indicated that some of the heavier gravelly loams as well as some of the intermediate loam soils require a fertilizer high in both phosphate and potash. A 4-12-10 or a 2-12-10, depending on the nitrogen levels in the soil, gave best results on these soils. The recommended rate of application is 500 to 1,000 pounds per acre. An application of at least 500 pounds has always given better results than a lesser quantity, and the tests show that higher rates pay good returns for the extra investment. An application of barnyard manure is taken for granted in this discussion of burley fertilizers. A combination of manure and a well-balanced fertilizer has always given best results. The recommended application of barnyard manure under average conditions is ten tons per acre.

Fertilizer tests conducted at Harrow over a period of years in which no manure was applied indicated that a fertilizer high in nitrogen and potash would produce the best dark tobacco. Recent experiments conducted in one of the best dark tobacco districts showed that when heavy applications of barnyard manure are made, less nitrogen and potash are required. Where heavy manuring is practised, a 4-8-6 fertilizer is recommended at the rate of 500 to 800 pounds per acre. However, experiments would indicate that where manure is not applied or where only a light application is made, the potash and possibly the nitrogen could be increased to advantage. Likewise, where the potash level in the soil is low, more potash could be used to advantage. A 4-8-10 fertilizer is recommended in such cases.

The nitrogen portion of the fertilizer is usually supplied from several materials. Experiments definitely indicate that at least a quarter of the nitrogen should be supplied from plant or animal organic sources, such as from dried blood, high-grade tankage, soybean meal, or cottonseed meal. This portion of the nitrogen becomes available to the plant at a rather slow rate. Tests also show that nitrate of soda is an exceptionally good source of water-soluble nitrogen. The recommendation made is that at least one-quarter of the nitrogen be derived from plant or animal organic sources as listed above, one-quarter from nitrate of soda, and the remainder of the nitrogen from other standard water-soluble materials. This general recommendation is made for all three types of tobacco in Ontario. It is recommended that the phosphoric acid be supplied from superphosphate or other easily soluble phosphates.

The source of potash is also important. While experiments have proved that a tobacco fertilizer is better if a portion of the potash is derived from muriate of potash, the amount of the potash supplied in this form must be limited to protect the burning qualities in the cured leaf. Therefore, a fertilizer is better if the potash is derived from more than one source. The general recommendation for all three types of tobacco is that potash be derived from sulphate of potash and muriate of potash or a portion from sulphate of potash magnesia or other sources of water-soluble potash. It is further recommended that care be taken not to include a larger proportion of muriate of potash than will bring the chlorine above two per cent of the total mixture.

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Tobacco Varieties

A large collection of tobacco varieties and strains was made from various sources in the United States and Canada in an effort to satisfy the growing demand for new varieties which would better suit the changing cultural practices and result in the production of higher quality tobacco in Ontario. These

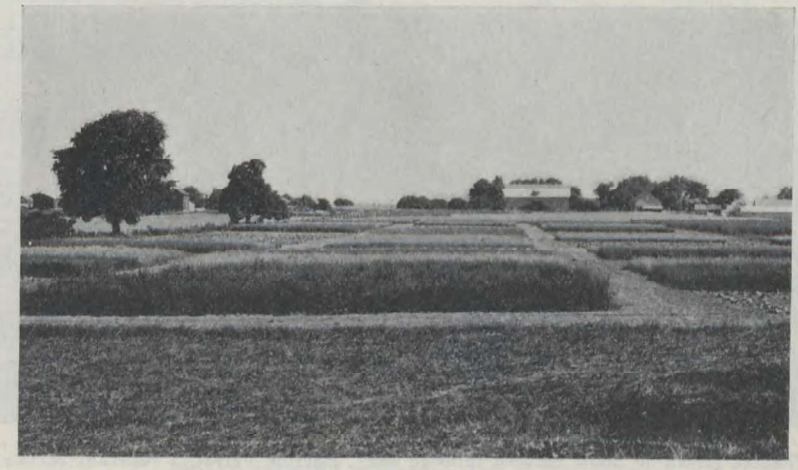
Harrow Velvet—a good cigarette type of burley tobacco.

importations were subjected to a classification study along with the varieties grown in Ontario at the time. The most promising varieties were included in comparative variety tests during the period of this report. Similar tests were conducted on the different soil types in the tobacco districts. From these tests were selected varieties which were particularly well suited for the production of the types of leaf tobacco in demand at present.

The change in method of harvesting from stalk cutting to priming eliminated the old varieties of flue-cured such as Warne, Hickory Pryor, Gold Leaf, and the like. The flue-cured varieties introduced from the United States which were particularly adapted for priming under Ontario conditions were White Mammoth, White Stem Orinoco, Bonanza, Yellow Mammoth, Gold Dollar, and Duquesne. The priming method of harvesting flue-cured tobacco has resulted in higher yields and improved quality of cured leaf. White Mammoth is one of the earliest in maturity and proved to be the outstanding variety which has a fairly wide soil adaptation over the medium flue-cured soils in the district. Yellow Mammoth is not the same as White Mammoth except where it has become mixed in the district. Yellow Mammoth is later in maturity, produces

a somewhat heavier-bodied leaf, and is particularly adapted to the lightest flue-cured soils. Furthermore, Yellow Mammoth appears subject to a crop effect disease known as brown root-rot, whereas White Mammoth has not suffered as much from this trouble. Bonanza is also one of the earliest-maturing varieties and it has a wide soil adaptation, but it is particularly adapted to the more productive flue-cured soils, especially the fine sandy loams. The early strain of White Stem Orinoco produces very bright leaf under good management. It is particularly adapted to the medium and more productive soils. Gold Dollar and Duquesne are also good flue-cured varieties but have not become so popular as the four varieties described above.

A distinct change has also taken place in varieties of burley tobacco. The demand on the part of the domestic trade for a thinner, brighter cigarette burley has resulted in the use of new varieties as well as better varieties introduced from the United States. The old varieties of burley, such as Broadleaf, Broadleaf Resistant, Station Standup, and Standup Resistant, have practically passed



General view of some burley tobacco rotations.

from the picture except as grown to a small extent for export leaf. Harrow Velvet, a variety developed at the Harrow station during the period of this report, has become the outstanding cigarette burley grown in the district, comprising nearly half of the burley acreage at present. Harrow Velvet will produce the best of cigarette burley under good management, but is sensitive to poor handling. Harrow Velvet is also very resistant to black root-rot; it starts growth quickest of any burley variety and matures early. Halley's Special and Kentucky White are also considered good cigarette burleys. The better intermediate burleys are Judy's Pride, Gay's Yellow, and Type No. 5. Various strains of Kelley predominate for export burley. All of these Kelley strains are very susceptible to black root-rot except Vimont Kelley, which possesses a degree of resistance. There is a definite demand for a truly resistant heavy-bodied export type of burley, and breeding work is under way in an effort to produce a suitable resistant variety for the export trade.

There has been little change in the dark tobacco varieties produced for export to the United Kingdom. Greenwood remains the important dark tobacco for this purpose but it is very susceptible to black root-rot. A definite effort is being made in the breeding program to produce a resistant variety of dark

tobacco with the leaf qualities of Greenwood. A special dark tobacco trade has been developed during the period of this report in South Africa and the Gold Coast. The typical or extremely narrow-leafed one-sucker is grown for this purpose and appears to be the most suitable variety.

Rotations for Tobacco

There are many angles to consider when planning a crop rotation in which tobacco may be grown successfully. The problems that appear foremost in the study of tobacco rotations are: choice of crops that will have no ill effects on the tobacco crop which follows them; the provision for an adequate supply of humus in the soil without causing an excess of organic nitrogen for certain types of tobacco, hence the maintenance of proper fertility levels; the value of other crops in the rotation in relation to soil type and land values; and the preven-

Tobacco grown on black root-rot infested soil. Harrow Velvet, a resistant variety, in the two rows on the left and Judy's Pride on the right.

tion and control of tobacco diseases. Rotations for tobacco vary greatly, depending on the type of tobacco produced and the type of soil upon which it is grown. Tobacco grown on certain of the lighter soils seems to be unusually sensitive to the effects of previous crops. Brown root-rot of tobacco is closely associated with previous crop effects. This root-rot trouble has caused considerable damage in burley and flue-cured tobaccos following corn and soybeans in particular on the light sand and sandy-loam soils. Other preceding crops have induced this trouble to a lesser extent. Therefore, neither corn nor soybeans should immediately precede tobacco on the sandy loams or lighter soils. Crop effects have not been as pronounced on the clay loams or heavier soils.

Flue-cured tobacco is the most highly specialized of the three types grown in Ontario. This type of tobacco does not fit into an ordinary crop rotation as does burley and dark tobacco. The fact that flue-cured tobacco is adapted only to the lighter soils of comparatively low nitrogen content has necessitated avoiding indiscriminate use of soil-building crops such as legumes. However, the humus content must be maintained for best results. The principal crop in the flue-cured rotation is rye, except where continuous culture is still practised in a few cases. A variety of combinations still exists in rye and tobacco rotations

from two years of tobacco followed by a crop of rye, tobacco every second year, to one crop of tobacco every three years. While a few soils will support continuous cropping for a number of years, most flue-cured soils will not stand up under such treatment even though a cover crop of rye is sown each year. Furthermore, in the majority of cases, mosaic is much more prevalent where tobacco follows tobacco, because mosaic can overwinter in the soil and increase the damage in the crop the following year. It has been demonstrated, however, that mosaic is comparatively short-lived when incorporated with the soil and that field soil will not ordinarily be a source of infection where tobacco is grown every second year. Furthermore, field experiments show that the most economical rotation for flue-cured tobacco is planting tobacco every second year with a rye crop on the land throughout the entire intervening periods.

Brown root-rot affecting tobacco following corn in the ration. The normal tobacco plot on the right followed a crop of tobacco.

This rotation of alternating tobacco with rye, besides controlling mosaic, affords a better opportunity for maintaining the humus content of the soil. The rye should be sown as soon as the tobacco crop is off and unless the soil is very productive the rye should be disked down after it ripens so that it will reseed itself and form a thick rye growth which will prevent leaching and blowing of soil during the second winter. The residue from the first crop together with the succulent growth should be ploughed under the following spring. Thus the rotation is tobacco 6 months out of 24 and rye the remaining 18 months. Fall ploughing is a poor practice on most of the flue-cured tobacco soils and is not recommended. Spring ploughing has given better results over a period of years on such soils because the rye crop on the soil during the winter months takes up and holds the plant food which otherwise would be leached out. A rye crop on the soil during the winter months also prevents much of the wind erosion on these light soils.

Burley tobacco fits better into the farm rotations which vary greatly as to crop sequence and length. The length and kind of crop rotation has been fairly well determined by the soil type and also by the class of crops peculiar to the locality. Brown root-rot has been prevalent on the lighter soils where tobacco followed corn and soybeans in the rotation during the past two years. For this

reason, tobacco should not follow corn, particularly on the lighter burley soils. If corn follows tobacco in the rotation the effect is not apparent in a rotation of at least four years duration. Corn is not recommended where a three-year tobacco rotation is practised on the lighter soils. Unless Harrow Velvet is grown, a longer rotation is safer, particularly on the heavier soils, so far as black root-rot is concerned. Harrow Velvet is the only variety of burley highly resistant to black root-rot grown in Ontario at present. Black root-rot organisms are present in practically every tobacco field, and if conditions are favourable they will increase to the extent that damage will result in the tobacco crop grown. The soil acidity, the soil temperature which is affected by the amount of rainfall, and the interval between tobacco crops will determine the amount of damage when susceptible varieties are planted. The ordinary varieties of burley and dark tobacco are usually more susceptible to black root-rot than the better known flue-cured varieties.

A test for soil acidity together with a crop history of a given field often indicates the possibilities of black root-rot causing damage. As a general rule the heavier soils harbour the black root-rot organisms in considerable numbers for a longer period of time than do the lighter soils. Since dark tobacco is confined to the heavier soils, and since suitable resistant varieties are not yet available, a long rotation is usually required for this crop.

Cultural Practices

As the conservation of organic matter or humus is one of the important problems in the management of flue-cured tobacco soils, the crop should only be cultivated sufficiently to control weeds. One or two early cultivations to start the crop properly, however, are important. Excessive cultivation destroys the humus in the soil and does not conserve moisture on the light sandy soils upon which flue-cured tobacco is principally grown. Ploughing and disking the soil more often than necessary also destroys humus. The recommended rotation of tobacco every second year with rye intervening involves ploughing the soil only once every two years. For that reason the entire recommended program of rotation and management works in harmony with prolonging the usefulness of these light sandy soils.

The best spacings for flue-cured plants appear to be 21 inches with rows 42 inches apart, and 23 inches in the row when rows are 38 to 40 inches part. The productivity of the soil, however, should influence the spacing to some extent. Medium to high topping at the time the first flower opens has given best results in the production of bright leaf. Suckering of flue-cured tobacco has been neglected too frequently in recent years. The suckers should be removed at intervals up to the time the third priming is taken. Such a practice improves the body and texture of leaf on the lower part of the plant.

The production of cigarette burley requires moderately close planting. A distance of 20 to 22 inches apart in the row with rows 40 inches apart gave the highest percentage of cigarette leaf and also a satisfactory yield. Somewhat wider spacing resulted in better leaf for export purposes. Medium topping of burley has produced the best results over a period of years. A better proportion of cigarette grades was obtained by topping such varieties as Halley's Special, Judy's Pride, and Gay's Yellow at an intermediate height of about 14 to 16 good leaves. Harrow Velvet possesses a greater number of leaves and will mature four to six more good leaves that the varieties mentioned above. Slightly lower topping produced a greater percentage of export type of leaf on varieties such as Kelley which is more suitable for this trade. Very low topping produced a heavy-bodied export leaf. An intermediate stage just before the first flowers open appears to be the most satisfactory stage for topping cigarette burley. Burley tobacco

should be suckered at least twice for best results. Neglected suckering resulted in reduced yield and impaired quality of leaf.

Planting dark tobacco (Greenwood) 28 to 30 inches apart in the row with rows 42 inches apart was found to be a satisfactory distance for optimum yields of good quality leaf. Closer planting tended toward a shorter, thinner leaf, while wider planting allowed for greater damage by wind. Low topping is essential for the development of heavy, dark wrapper-quality leaf. Dark tobacco also requires frequent suckering for the production of good leaf quality.

FORAGE CROPS

Soybeans

Preliminary work with soybeans which was started in 1924 involved the testing of all varieties and strains which could be obtained. Several of these varieties were included in a test for seed which was conducted over a period of years. In 1931 the number of varieties was reduced to the ten most promising, consideration being given to seasonal adaptation. These ten varieties have been grown in a test each year, and from them four have been recommended to meet the requirements in the sections of Ontario where soybeans are being grown. Mandarin, one of the four varieties recommended, is suited to eastern Ontario. This variety matures in about 110 days and is a good type. The variety O. A. C. 211 requires an additional week to mature and is adapted to the southwestern district of Ontario. Manchu is a medium late variety requiring about 123 days to mature and may be grown in certain sections when the season is suitable. The A. K. (Harrow) strain was developed at the Harrow station and is particularly suited to Essex county. This variety is the latest-maturing, requiring about 127 days. It is the tallest-growing and the highest-yielding of the four varieties as determined by the average of ten years results.

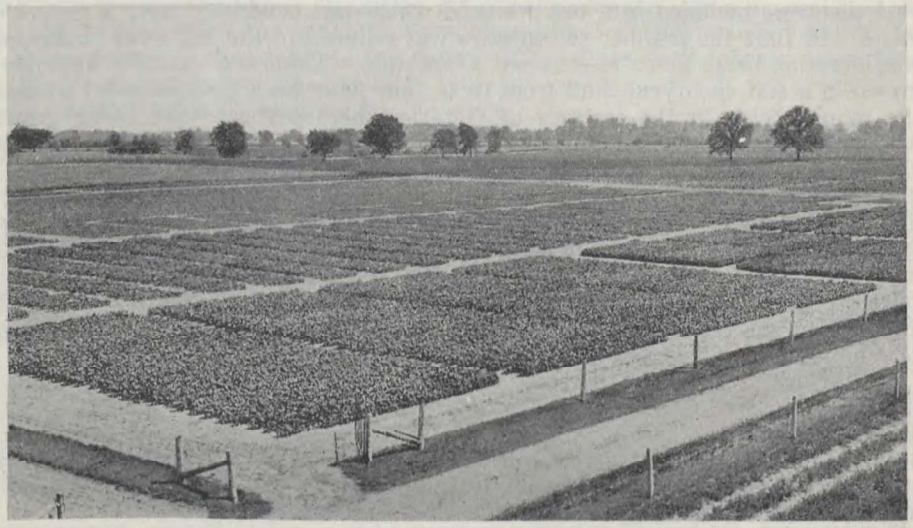
Previous to 1933 only the variety O. A. C. 211 was eligible for registration by the Canadian Seed Growers' Association. In that year, however, the two strains Mandarin (Ottawa) and A. K. (Harrow) were accepted. Since that time it has been the practice at the Harrow station to produce Elite stock seed of the A. K. strain in sufficient quantities to supply the demand. The demand for this seed was not large, however, until 1936.

In addition to the test of varieties for seed production, the same varieties have been tested for yields of hay. The rate of yield recorded has been as high as three tons per acre of cured hay. In the matter of varieties for this purpose the same recommendations as for seed may be followed. In the growing of soybeans for a hay crop, drilling the beans in rows seven inches apart is recommended. Soybeans should be cut for hay when the pods are about half filled. The most desirable method for curing soybean hay has been to cut it in the morning after the dew is off and rake the hay into windrows the same evening if good drying weather prevails. Curing may be completed in the windrow or in small cocks. This procedure eliminates raking when the hay is too dry, as many leaves will be lost under such conditions.

The time of planting soybeans has also been studied. Plantings of different varieties have been made as early as April 23 in favourable seasons and continued at weekly intervals until about May 15. Under most conditions it has been found that the soil does not warm up sufficiently until about May 15, so little is to be gained by planting much before this date. In one instance the plants which were up in the planting made on May 1 were completely frozen on May 10 when a severe frost occurred. Young soybean plants will stand some frost, but plant growth is checked to some extent, and a severe frost will ruin the crop. It is therefore reasonable to suppose that by delaying the time of

planting until the soil is warm enough for rapid growth without any setback, better plants and larger yields will result. On the other hand, in Essex and Kent counties particularly, where late-maturing varieties such as A.K. (Harrow) are being grown, it is necessary that the crop be planted in good time to ensure maturing of the seed in the fall. Under average conditions the most suitable time for planting soybeans is between May 15 and 20.

During the past five years tests have been conducted with soybeans to determine the most desirable spacing of the rows for seed production. In these tests the rows were spaced from 7 inches to 36 inches apart. Results obtained showed that yield of seed is increased when the rows are 28 to 30 inches apart as compared with the yield in 7-inch row spacing. In the 1935 tests this increase amounted to 8·8 bushels per acre in favour of the 30-inch spacing. In addition, a larger bean was produced in the 30-inch rows. Another advantage of planting the rows far enough apart to permit cultivation is more satisfactory control of



A general view of the soybean test plots in 1936.

weeds. Once weeds become established in the narrow rows where cultivation is not feasible, controlling them is practically impossible. The wider rows not only allow cultivation for the control of weeds but they are found to be beneficial in producing a good crop of high-quality seed.

Since the soybean crop has been gaining in prominence in recent years, the necessity for new strains possessing improved plant characters has become apparent. The recommended varieties do not entirely fulfil the requirements of the districts in Canada where soybeans might be grown. Consequently a program of soybean improvement has been in progress for the past few years. The object of this work is to produce improved strains with maturity periods suited to various localities, together with a desirable type of plant. The desired type of plant may be described as one having sufficient height to enable it to be harvested easily with a grain binder. The plant should grow strongly upright with branches which do not break. It is desirable that no bean pods be borne within a few inches of the ground. Other considerations are the colour of the seed for oil extraction purposes, resistance to disease and yielding ability.

Two methods have been used in obtaining strains that will conform with the above requirements. New introductions have been subjected to individual plant selection. This has been continued for several years until uniformly improved lots have resulted. In addition, numerous crosses between varieties and strains have been made. The strains resulting from such crosses are grown through several generations and subjected to careful selection to obtain, if possible, new and improved pure lines. Considerable improvement has been noted in the selections already obtained both with respect to maturity and plant type. Further testing will be necessary to determine their true value.

Analyses of beans for oil and protein content have been made on the varieties and strains of soybeans under test. Considerable variation in analysis between strains shows that this is a factor to be considered. From the grower's standpoint these results will also be useful in selecting a better strain to grow as a feed for live stock.

Field Corn

Experiments with field corn during the past five years have included the testing of varieties, dates of planting to escape corn borer damage, the testing of local strains of corn, and breeding.

Since the severe outbreak of the corn borer, which threatened to eliminate the growing of this crop in southwestern Ontario some ten years ago, there has been a fluctuation of infestation each year but the corn acreage gradually increased until 1935. Several corn varieties have been planted at three different dates ranging from May 24 to June 10 to determine the effect that date of planting has on corn borer infestation. A considerable reduction in corn borer infestation was obtained in all varieties included in the test by delaying the date of planting until about June 1. Further delay in planting will give an additional reduction in number of borers, but planting at such a late date is very apt to result in immature corn in the fall if a late-maturing strain is grown. This hazard would be overcome to some extent by the use of an early-maturing strain. Under conditions of severe corn borer infestation, delaying the date of planting medium early-maturing strains of corn until about June 1 will result in a considerable reduction in corn borer damage.

A note on the corn borer infestations during the past few years may be of interest at this time. Corn borer counts have been made in the test of dates of planting corn from year to year. By means of averaging the number of borers found in all stalks examined, including the three dates of planting, a figure is obtained which designates the number of borers per stalk for the entire test in that year. The fluctuation in degree of infestation during the past seven years may be seen from the following figures: 1930, ·64; 1931, ·85; 1932, 1·33; 1933, 2·83; 1934, ·16; 1935, ·63; and 1936, 1·66. The rate of increase from ·16 in 1934 to 1·66 in 1936 is worthy of mention since this is the most rapid of any three years in the above period. It should also be mentioned that in 1936 damage from corn borers was much more noticeable than for some time previous. If this rate of increase should continue during the next two years there is little question that very severe damage will result. With the possibility of the infestation becoming worse, nothing should be left undone in the way of taking precautions to control this insect.

Since the corn borer has invaded this district, considerable change has taken place in the character of the corn being grown. This is particularly true in the yellow dent class of corn. The change has principally come about through the mixing of strains, and an attempt on the part of the growers to produce strains which could be planted a week or so later than normal and still mature before frost. Yellow dent is the type of corn most commonly grown and a considerable number of strains of this type are being produced in the district. During

the past few years, an attempt has been made to obtain as many as possible of these strains in order to test them for yield. Under the direction of the Corn Improvement Committee, a number of local strains were collected and included in a comparative test. Complete notes were taken on important plant characters and considerable variation was found to exist between the strains tested. Information secured from these tests was made available to the Canadian Seed Growers' Association and was found very useful by that organization when the registration of certain varieties was under consideration. In 1935 a further test was conducted by the Harrow station in which the Essex County Farm Bureau obtained samples of seed of all the known strains of yellow dent corn in the district that were considered to possess superior yielding ability. In 1936 a test similar to that of 1935 was conducted at three different points in Essex county. The results secured gave a good indication of the respective values of the strains now being grown in the district.

Some corn hybrids produced at the Harrow station in 1932

A program of breeding work has been carried on since the inception of field corn work at Harrow. This has met with considerable difficulty on account of the corn borer activity and the exceptionally hot weather at time of pollination in some years. A number of inbred strains of the various types of corn have been obtained by selfing the best of the local varieties and certain adapted introduced varieties. Hybrids have been produced from these strains and tested for yield.

At the present time an attempt is being made to advance the maturity of some of the commonly grown varieties by selective pollination. Such varieties as Canada Golden Glow, Wisconsin No. 7 and White Cap Yellow Dent are included in this project and it is hoped that within two or three years the maturity dates of these varieties will have been advanced from seven to ten days and that their present type and ability to yield will not have been affected by the shortening of the maturity period.

Sugar Beets

Experiments with sugar beets have been confined to the testing of varieties and strains. For the most part this work has been done on farms away from the station in order to conduct the test on typical sugar beet soil. While about 40 varieties and strains have been tested over a period of years, the test has recently been modified to include only 14 of the best. The findings of these tests are of assistance in indicating the best varieties and strains available for the production of the beet crop.

Nursery

A forage crop nursery was started in 1935. It included the more important grasses and clovers and in addition certain forage crop introductions which it was believed might have some value in the district. The object of the nursery is to observe the behaviour of the various crops under local conditions. At the present time 44 perennials, 9 biennials, and 37 annuals are being observed. While it is somewhat early to make any definite recommendations, two perennial grasses, namely, crested wheat grass and reed canary grass, have appeared promising. Among the annuals Sudan grass has given good results and its use as a pasture grass for the hot dry summer months is increasing in this district. The possibilities of this grass for pasture in poultry paddocks has been investigated and good results have been obtained on the station.

CEREAL CROPS

Oats

Oat variety tests conducted at Harrow over a period of years show that the early-maturing varieties have outyielded the late varieties, particularly on the lighter soils in the district. The early varieties are usually far enough advanced to escape injury from the heat wave which occurs each season. Furthermore, the early oats mature sufficiently early so that they may be threshed at the same time as winter wheat, which is an additional feature in their favour. Alaska stood at the top of the list in yield over a seven-year period. The Alaska oat with all its advantages has won much favour in the district and the acreage planted to this variety has increased rapidly during the past few years.

Winter Wheat

A large number of varieties have been tested at the Harrow station, which serves the largest winter wheat growing area in the Dominion. These tests conducted over a period of years indicate definitely that the popularity of Dawson's Golden Chaff is well warranted as a pastry flour wheat. Dawson's Golden Chaff and Junior No. 6 are regarded as the most suitable varieties for most of the pastry, biscuit, and cake trade for which Ontario wheat is used almost exclusively. Dawson's Golden Chaff and Junior No. 6 are also two of the highest-yielding varieties tested. These are both beardless, stiff-strawed, large white-grained varieties, particularly low in gluten. Milling and baking tests conducted at the Cereal Division, Ottawa, on wheat from test plots at Harrow show that these two varieties scored highest both in cake baking tests and in percentage of straight grade flour. These results should be of interest to the wheat growers of Southwestern Ontario where a more uniform product is desired.

HORTICULTURAL CROPS

Early Tomatoes

Variety tests including a number of commercial varieties as well as new varieties and strains developed at the Division of Horticulture, Ottawa, were conducted each year during the period of this report. Judged on a basis of earliness, quality, and yield per acre, some of the new varieties show considerable promise. The variety Abel is very early, prolific, and possesses very firm fruit, but is somewhat smaller in size than most varieties. For this reason Abel has not become popular with the growers in the district even though it has been near the top in the test each year. The two varieties Bestal and Globonnie have had very favourable ratings in the tests. These varieties are of high quality; they grade well and have a mild flavour. Herald has been one of the heaviest yielders but the fruit is somewhat rough. A number of the newer selections which have only been tested for a year or two also appear promising. The Penn. State Earliana variety and some of the other Earliana strains produced in the district are true to type and good yielders but are not so smooth and free from cracks as some of the new strains tested.

Preliminary fertilizer tests on early tomatoes indicate that a 3-12-4 fertilizer is best suited for the lighter sandy soils on the Harrow station. Where the nitrogen levels of early tomato soils in the district are higher, a 2-12-6 fertilizer may be better suited to the needs of this crop. Likewise where the potash levels in the soil are low, benefit would result from increasing the potash in the fertilizer formula. These tests also definitely indicated that nitrate of soda was superior to sulphate of ammonia as a source of nitrogen for tomatoes on acid soils.

Asparagus

A marked increase has occurred in the acreage devoted to asparagus during recent years and as a result some preliminary investigations on fertilizer requirements were undertaken at Harrow. These tests indicated that a 6-6-10 fertilizer is well adapted to the production of asparagus on the lighter soils. On soil which is low in fertility, an application of 1,000 pounds per acre gave better results than lighter applications. Soils with higher fertility may not produce sufficient response above a 500-pound application, particularly where manure is applied. Asparagus responds well to applications of barnyard manure. Where manure was applied in addition to commercial fertilizer a 20 per cent increase in returns resulted. An application of ten tons of manure in conjunction with a 6-6-10 fertilizer appears to be better than either fertilizer or manure alone.

Sweet Corn

The sweet corn trials at Harrow have included a number of early and late varieties, mostly from commercial sources, but there have also been some promising varieties developed at the Division of Horticulture, Ottawa, which were included in this test. One of the best of these varieties for the early market garden is the variety Dorinny. It is an eight-rowed variety with a very sweet, fine textured kernel. This variety produced corn ready for table use in 60 days. Among the commercial varieties, Golden Bantam (Moore) and Select Golden Bantam (McDonald) have proved very prolific and of uniform type with high quality.

Strawberries

A number of new varieties of strawberries originated in the Division of Horticulture were tested during the latter part of the period covered by this report. Notes have been taken on these varieties for two years only. It may

be rather soon to make any definite recommendations, but the following have shown consistently good points during both seasons of production.

John is early, firm, of excellent quality, though it is only a fair producer. Ralph is early, firm, medium sized, possesses excellent flavour, and is a good producer. Dick resembles Ralph considerably, although it is a smaller berry. Clare is early, medium sized, firm, of good flavour, and is an excellent producer. Carl has all the good points of Clare with one exception—it is a poor producer. John, Ralph, Dick, and Carl produced somewhat smaller fruit than commercial varieties, while Clare exceeded them in size of fruit. As these plants were grown on a light sandy-loam soil and were not watered, the fruits might have sized better had they been irrigated, particularly during the 1934 season.

Raspberries

The Cuthbert, Newman, Viking, Latham, Herbert, and Adams 87 varieties of raspberries were planted in 1934. The results obtained show that Viking produced remarkably well both as to size and flavour. Latham is a good producer of large firm fruit, but appears somewhat lacking in quality. Cuthbert, Newman, and Herbert are of good quality but as grown on the station would not make very satisfactory shipping varieties. Adams 87 was very disappointing and was removed in the spring of 1936. This variety might be excellent under different cultural conditions, but here it does not compare favourably with other varieties mentioned. Chief and Newburgh were added later as they were highly recommended by several growers in the district.

Grapes

A number of grape varieties were tested during the five-year period. The varieties tested include Herbert, Winchell, Lindley, Brighton, Moore's Early, Agawam, Worden, Niagara, Fredonia, Ontario, Portland, Sheridan, Campbell's Early, Moore's Diamond, Barry, and Patricia. The grapes produced well on the slightly gravelly, sandy-loam soil where they were tested. The variety Winchell is a poor variety under conditions in the test but any of the others should prove satisfactory provided proper varieties are selected for the purposes for which they are most desirable. The varieties Diamond, Portland, Ontario, and Niagara are all green grapes of excellent quality. For dessert Herbert, Agawam, Brighton, and Barry are particularly good. Any of the blue or black varieties makes excellent jelly. During recent years the red grapes Delaware and Catawba have been in demand by the wineries. Brighton also appears to be in greater demand than Concord or other blue varieties. However, any one interested in growing grapes for the wine trade would be well advised to consult the trade before planting.

ORNAMENTAL HORTICULTURE

During recent years the interest in ornamental gardening has increased tremendously. In 1931 a considerable area was added to that already devoted to the culture of ornamental plants on the Harrow station. This addition to the landscape scheme has greatly improved the attractiveness of the station front as well as providing reliable data on the adaptability of plants to various situations. While this section of Ontario is favoured with milder winters than most other parts, there is an occasional cold period. These low temperatures often occur when there is little or no snow present, with the result that plants are subjected to more trying conditions than those grown where the temperature goes much lower but with abundant snowfall. It is also important to state that this section is also subjected to extended periods of drought during the growing season.

The soil on which the work on ornamental plants is conducted is of a sandy nature. Trees and shrubs of a deep-rooting habit do fairly well in the driest weather, but the more shallow-rooting shrubs require water or they soon appear to be suffering. Lawns and annual and perennial flowering plants also require considerable watering in some seasons. On the other hand, when conditions are favourable, almost all plants which may be grown in Canada do their best in southwestern Ontario. No attempt has been made as yet to run comparative tests with tree and shrub varieties, but a fairly representative collection of these has been used in such landscaping as has been done.

Where fast-growing trees are desired, soft maple, cut-leaf maple, Carolina poplar, Lombardy poplar, and Manitoba maple have been found satisfactory. For specimens and accent trees the following have been found effective: white cedar, red cedar, fir, Schwedler's purple maple, birch, catalpa, blue spruce, Austrian pine, Scotch pine, Lombardy poplar, and purple-leaved plum.

The successful growing of practically all plants depends greatly on the required amount of water being applied at the right time, the amount of moisture necessary for good growth varying, of course, with varieties. Among the shrubs which will grow in dry, exposed conditions are: bridal wreath spiraea, Siberian pea tree, tamarisk, wayfaring tree, snowball tree, Japanese rose, Russian olive, and lilac in variety. Although the above varieties will grow in dry places, they do much better when planted in more favourable locations. For shady locations several varieties have been found satisfactory. Among these may be mentioned shadbush, flowering currant, mock-orange in variety, kerria, Tartarian honeysuckle, weigelia, and dogwood in variety.

Japanese barberry, common privet, Siberian pea, white spruce, white cedar, and red cedar have been tested as hedges with varying degrees of success. Common privet makes an excellent clipped deciduous hedge and is much superior to Siberian pea in that the latter has a very stubby appearance when hard pruning is practised. Japanese barberry provides a very good low hedge when planted where severe pruning is not necessary. Red cedar would seem to require somewhat moister conditions than prevail at Harrow, at least during its first few years, and even when several years old it seems to suffer if protracted drought occurs. Either white spruce or white cedar hedges appear much easier to establish than a hedge of red cedar on the station.

In view of the fact that all the perennials are planted in shallow sandy soil, and are therefore more liable to injury during hot dry weather, an effort is made to grow perennials which are at their best during spring and early summer or fall, while annuals are used to fill in during the warmest weather. Perennials have proved very much more effective when planted in clumps of three or more than where single plants are used. Very little trouble has been experienced with winter-killing except during the extremely cold winter of 1933-34 when considerable damage occurred. A complete list of perennial varieties which appear to withstand all extremes in this district will be sent upon request from the experimental station at Harrow. A selection from this list will provide a very effective border and less hardy ones may be added as time is available for their special care.

Annual flowering plants have proved extremely valuable in providing bloom at various seasons. This class is comprised of hundreds of varieties, most of which are easily grown. Those classed as half-hardy annuals usually do better if started indoors and transplanted to their flowering quarters. This practice will often be found profitable in the case of hardy annuals as well because only small packets of seed are issued and all viable seeds should germinate under indoor growing conditions. A complete list of annuals that have given best results during the past five year may be obtained upon request, also a list of plants particularly suitable for rock gardens.

POULTRY HUSBANDRY

A definite breeding program was outlined at the Harrow station in 1931, but due to the large volume of data recorded on the various features involved in a comprehensive study of poultry breeding, only a brief outline of the progress made during the past five years is given in this report. Breeding by selection for the improvement of stock is a problem of vital interest to the industry and has been the major activity. When correlated problems could be studied without interfering with the main program, attention was directed to these projects as well. Conditions prevailing at this station have been best suited to a study of the breeding problem. Some results have been recorded on investigations into schedules of feeding, temperatures of different types of houses, green feeds for winter use, variations in egg weights at different seasons, date of hatching for high winter egg yields, better weight of eggs, and desirable body weights.

Breeding Work

More effective results could be gained with a single breed when dealing with a breeding project owing to the complications involved, and Barred Plymouth Rocks were selected for the work. A start was made with 1,200 baby chicks shipped from Ottawa, and from Lennoxville and La Ferme, Quebec. A number of these chicks from the Central Experimental Farm, Ottawa, were from excellent pedigreed stock.

The first year 400 pullets, flock-run and pedigreed, were trap-nested. A few cockerels that showed fair type and colour were selected from this pedigreed stock. With the object of obtaining foundation males for subsequent use, a few select pullet and cockerel matings were made in 1931. The males selected were all brothers or half-brothers of those pullets that had shown the best yield and egg size during the previous winter. The average of the full-sister or half-sister group was considered more important than an individual high record when selecting the male. In subsequent years, the young males tested for prepotency were selected on the full pullet-year record of their sisters. A male mated to at least four dams with four or more daughters from each dam would constitute a test. Since breeding by selection for the best in usefulness, vigour, and beauty is a task of many complications, culling for minor defects was reduced to a minimum in order to get an accurate estimate of the breeding value of the sire and dam in the principal economic factors—vigour, production, and egg size. When numbers permit, some consideration is given to less important characters.

The disease problem threatened to be a serious hazard in obtaining reliable information; consequently, in order to cut down the menace of communicable disease, no new blood was introduced during the five-year period. As a result, fairly close inbreeding has been practised in some matings. The healthy and vigorous condition of the present flock, the low death-rate, and the high egg yields clearly demonstrate that fairly close inbreeding may be practised for several generations, provided that it is accompanied by rigid selection for vigour and that other favourable conditions prevail.

The higher standard of the breeding dams used year by year is a good indication of the progress made, and table 1 clearly demonstrates this feature. As the flock improved and the number of desirable dams increased, full-sister dam groups became available, ensuring offspring from certain blood lines.

TABLE 1.—IMPROVEMENT IN STANDARD OF DAMS USED FOR BREEDING DURING THE FIVE-YEAR PERIOD 1932-36

Dams	1932	1936
	%	%
Per cent laying 150-200 eggs	12·3	2·0
" " 201-250 "	69·8	31·3
" " 251-300 "	18·9	47·3
" " 301 eggs and over	0·0	19·4

NOTE.—138 dams mated in 1932 and 150 in 1936.

Since the male contributes his influence to a far greater number of the offspring than the female, prepotency or power to transmit desirable characters to his sons is a factor of vital importance. Previous investigations have shown that production, egg weight, and body weight are hereditary factors though subject to environmental conditions. Table 2 shows the performance of the daughters of one original foundation male and the daughters of his son and the daughters of his grandson, compared with the performance of the dams involved in the matings. This table shows very definite prepotency for some characters. The pullets commenced laying at an earlier age, production improved, body weight increased, and egg weight was maintained to the third generation in this male progeny test. At the same time, some improvement has been made in type and feather colour as indicated in the illustrations. Five full sisters by the male Q17 laid 1,572 eggs in their pullet year. Every pullet in this group laid over 300 eggs with an average for the group of 314 eggs.

TABLE 2.—MALE PROGENY TEST (THREE GENERATIONS)

—	O420 out of ♂433 ♀M314		Q17 out of ♂O420 ♀O5		R8 out of ♂Q17 ♀P8	
	Dams	Daughters	Dams	Daughters	Dams	Daughters
Average Age at 1st egg (days)	188·8	188·2	202·5	172·6	196·0	160·0
Average Egg Yield (average)	248·8	234·8	241·5	255·6	249·7	259·5
Average Egg Weight (grams)	59·1	60·3	56·7	60·6	57·8	59·8
Body Weight (lb.)	6·4	6·0	6·3	6·3	5·7	6·6
Number of Daughters	.....	43	.....	56	.....	28

In the course of these investigations correlated data in considerable detail have been gathered on vitality, body type, colour and texture of egg shell, and feather and shank colour.

HOUSES

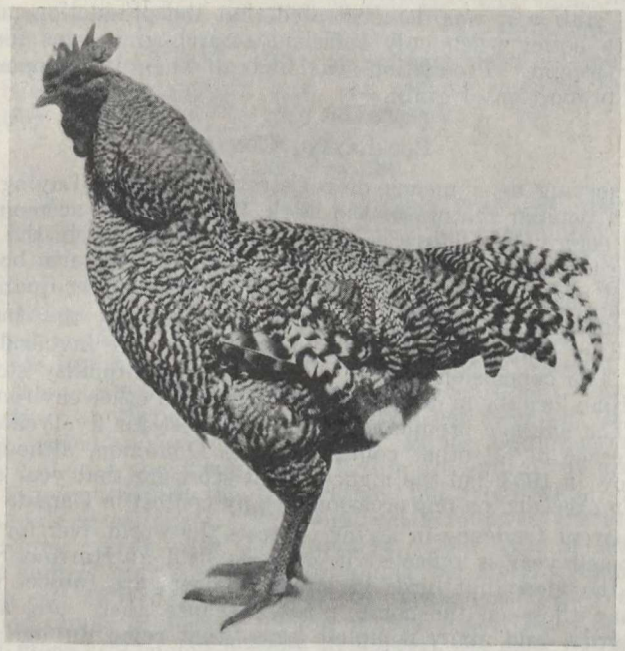
The poultry house 20 feet deep with cotton-front ventilation generally is better and warmer in winter than a house of similar construction only 16 feet deep.

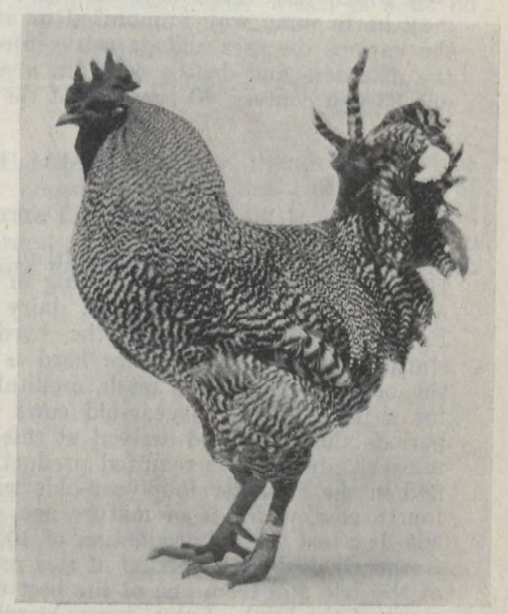
COST OF PRODUCING EGGS

Investigations in costs of production distinctly indicated that superior-bred stock brought high egg yields with higher production at the season of peak prices, and that these were the principal factors in lowering cost of production.

FEEDING

Experiments in feeding different greens for winter egg production included comparisons with roots, cabbage, dry alfalfa hay, and chopped alfalfa hay which had been steeped in cold water for 24 hours. The results favoured the





Selection has improved type and colour in this male line through three generations. Improved performance in this line is indicated in Table 2.

steeped alfalfa for economy, condition of birds, and egg yields. With the ration in use at this station it was demonstrated that the production and the feather condition were better when only sufficient scratch grain was fed to maintain a good body weight. Production was highest when the proportion of mash exceeded the proportion of grain.

Egg-Laying Contest

Besides serving as a means of registration the Egg-Laying Contest continues to be a popular feature of the work, the available accommodation being readily filled each year. There is a marked improvement in the quality of the birds entering the contest from year to year, if the increase in body weight and the number of eggs laid is taken as an indication of better-quality stock.

Some records made in contests at Harrow equal any that have been made in these localities that are usually considered to be more favourable to high egg production. The conclusion can be drawn that good-quality stock is of more significance than locality in determining results when other environmental factors are equal. The average production for this contest for five years is not higher than the average of all other contests in the Dominion, although the leading pen at Harrow in 1933 had the highest point score for that year and this record has only been exceeded on one occasion by any contest in Canada in any year.

The apparent tendency in laying contests the world over for the death rate to increase each year is reflected in contests held at Harrow. There is little support for the view that birds in laying contests are subject to more severe condition than those on the home plant, because there are always a good number of birds—and many complete pens—that come through a contest with a clean and healthy record. Observations and records of mortality and sickness which have been kept at this station indicate that these fortunate birds may be in some way immunized or are so constitutionally fit that they resist the various diseases and parasitic infections that surround them. The bulk of the disorders and deaths occur in a comparatively small number of pens. In one 33-pen contest, 40 per cent of the mortality occurred in five pens.

ANIMAL HUSBANDRY

Dairy Cattle

A small fully accredited herd of pure-bred Jerseys was established on the Harrow station during the spring of 1935. The herd as established consisted of six cows of good type and dairy qualities headed by the bull Brampton Favourite Hal, previously the herd sire at the Lennoxville experimental station, Quebec. The entire herd is entered in Record of Performance and the original cows have made creditable records indicating a good foundation for a herd. Three 3-year-old cows which completed their 305-day lactation periods since the herd arrived at this station made creditable records, qualifying well above their required production. These same cows have again qualified in the class for four-year-olds with very good production. In addition, a fourth cow, which is of mature age, has also fulfilled her requirements in the 365-day test with a production of 10,776 pounds of milk. None of the heifers freshened during the period of this report. A bull calf by the noted bull, Lord of the Isle and from one of the best cows, was born shortly after the establishment of the herd. Later it was learned that a full sister of this bull calf made a record as a two-year-old of 11,722 pounds of milk and 659 pounds of butter fat. This young bull is being retained as herd sire. The young stock has developed well and shows considerable promise. The herd has been regularly tested and kept free from tuberculosis and contagious abortion.

The increased production of soybeans has resulted in the question as to their value in a dairy ration. A preliminary test was undertaken whereby ground soybeans replaced oilcake in the ration. The rations were practically identical in calculated feed value. The preliminary data obtained would indicate that soybeans, a home-grown feed, can replace some of the concentrate in the feed ration of dairy cows to good advantage.

Steer Feeding

Winter feeding of steers and hogs has been practised over a period of years on the station in an effort to determine the advisability of marketing roughages and home-grown grains through the production of beef and pork. Over a period of years these feeding tests have shown that this is a sound farming practice and a profitable method of marketing low-grade grain and roughages in particular. These tests also show that it pays to procure well-bred animals for feeding and also that it pays to feed a heavy grain ration. The steers in these tests were fed all they would consume of corn fodder and alfalfa hay and up to 18 pounds of shelled corn per steer per day by the end of the feeding period. Corn was fed lightly at the beginning and gradually increased to a full feed about one month before the end of the six-month feeding period. This constitutes the feed ration, but fresh water and salt were before the animals at all times. The hogs which followed the steers were fed practically nothing except what they salvaged. This type of feeding resulted in an average gain of approximately 325 pounds per steer. Besides more than paying for the cost of feed at market prices over a period of years, the steers produced a good supply of manure for the upkeep of the land. It would appear to be a much more economical method to harvest the corn fodder and feed it along with other roughages and some of the corn produced rather than following the practice of ploughing under or burning corn fodder which is done on so many farms at present.

It is only possible in a report of this type to briefly discuss some of the many experiments in progress. It is hoped, however, that this method of presentation will provide the grower in the districts served by the Harrow and Delhi stations with some practical information and that it may encourage him to write or visit these stations for more detailed information on subjects in which he is particularly interested.

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M. P.