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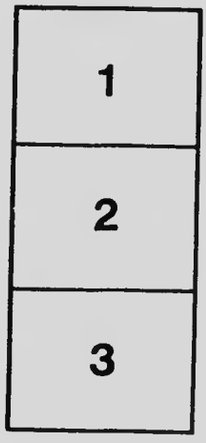

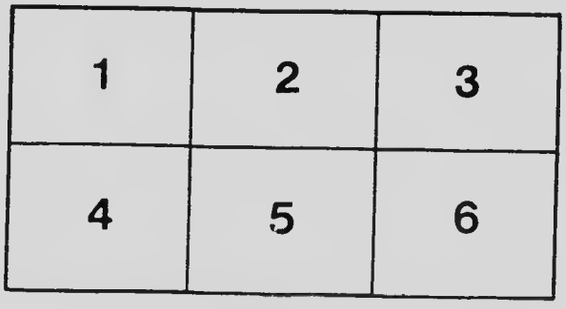

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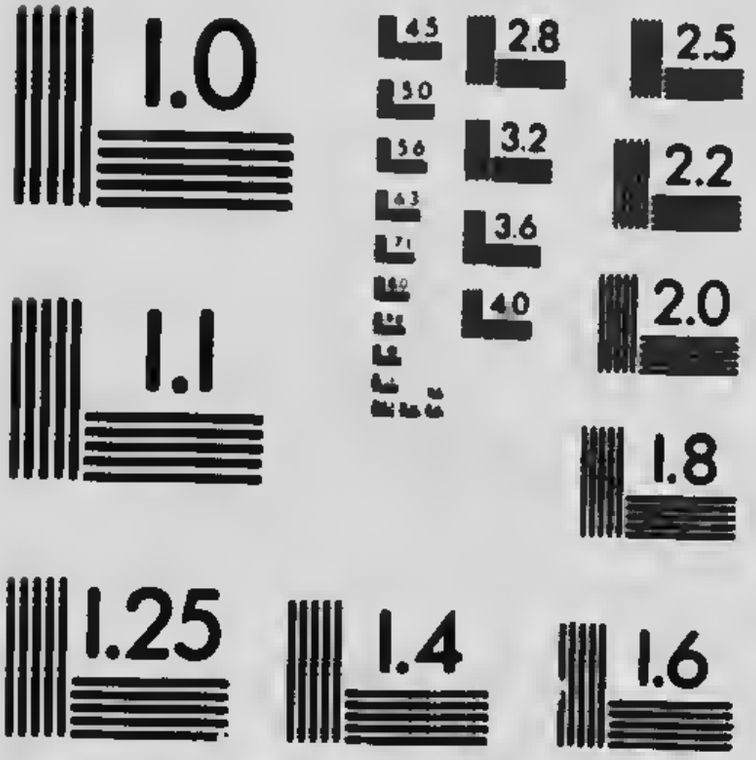

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DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

TOBACCO DIVISION

WORK

OF

EXPERIMENTAL STATIONS

IN

1909

I. Experimental stations for the growing of tobacco.
II. Work of the Tobacco Division in the province of Quebec.
III. Experimental Work on the Harrow station in 1909.

Tobacco Bulletin No. A-9

Published by order of the Hon. SYDNEY A. FISHER, Minister of Agriculture, Ottawa, Ont.

APRIL, 1910

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6862—1

To the Honourable

The Minister of Agriculture.

Sir,—I have the honour to submit herewith Bulletin No. A-9 of the series of the Tobacco Division, entitled 'Work of Experimental Stations in 1909.'

The first part of this bulletin contains a statement of the object of the experimental stations, which are devoted chiefly to the growing of tobacco, and a brief analysis of the results already achieved; the other two parts, prepared by the agents in charge of the stations, present a report of the work done and of the progress made. In these reports, the Canadian growers will find much practical information based on experimental work.

I recommend, sir, that this bulletin be printed for distribution.

I have the honour to be, sir,

Your obedient servant,

F. CHARLAN,

Chief of the Tobacco Division.

Ottawa, April, 1910.

6862—1½

PART I

EXPERIMENTAL STATIONS FOR THE GROWING OF TOBACCO.

Considering the rapid growth of tobacco culture in Canada within the last few years, and the bright prospects for the Canadian product, which will henceforth be admitted in the manufactures of the Dominion on an equal footing with its foreign competitors, the Honourable S. A. Fisher, Dominion Minister of Agriculture, decided to establish experimental tobacco growing stations in the chief districts where this industry is carried on. These stations were established in 1909.

The object of these stations is to study how tobacco culture can be made more profitable in Canada; to ascertain the value of proper methods; to create improved strains and produce seeds of such strains, for general distribution in Canada; to demonstrate agricultural methods whereby the fertility of the land and the heavy yields may be maintained, and to test new foreign varieties which might prove profitable in this country.

There are now three experimental stations. Two are in the province of Quebec—one at St. Jacques l'Achigan (county of Montcalm), the other at St. Césaire (county of Rouville). They cover about ten acres each. The third is in the province of Ontario, about a mile from Harrow (county of Essex); it covers an area of about twenty-seven acres.

These stations were placed at the centre of the different tobacco-growing districts, each under different climatic conditions. At the present time Quebec produces chiefly pipe tobaccos, of the seed leaf type, while Ontario grows pipe and chewing tobaccos, of the Burley type. Experiments with Virginia tobacco have been carried on in the county of Essex during the last few years, and special attention was given to this variety at the Harrow Station.

An account of the work done at these stations will be found in the reports of the superintendents, which are annexed to this report. The greater part of the year 1909 was devoted to their establishment and organization, but, however engrossing this preliminary work may have been, it will be seen that the purely agricultural part has not been neglected.

I.—STATIONS OF ST. JACQUES AND ST. CESAIRE.

A.—St. Jacques l'Achigan.

Tobacco culture in Canada was started in the counties north of Montreal, especially in Montcalm. The district rapidly became known, but it is only in recent years that the industry acquired some importance from a manufacturing point of view. At the present time, after long years of continuous cropping without sufficient restitution of soil fertility, the land has become partly exhausted and the yields fall far from what they should be. A reorganization of agricultural methods was necessary, and, as reported further on, plans were made for a demonstration of advanced methods at the St. Jacques Station, where the land is not in much better condition, at the present time, than that of the surrounding farms. A three-years rotation comprising

tobacco, grain and clover has been started, and we hope it will be the means of bringing back the heavy yields of yore and restoring the fertility, long considered as inexhaustible, of the lands of this beautiful region.

Special attention was given to certain practical questions of vital interest in the growing of tobacco. Thus it was shown that two things are absolutely necessary in order to ward off the attacks of diseases, so frequent in damp and cold springs, viz.: a better aeration of the seed-beds, and thinner beds. As was expected, the experiment with fertilizers has shown that good results may be obtained from the combined use of farm manure and commercial fertilizers. A new variety, which is destined to take the place of those now grown in the province of Quebec, has been introduced. It will be pretty generally grown in a year or two, as soon as the quantity of seed harvested is sufficient for general distribution throughout the province.

The hybrid Comstock x Sumatra, originated in 1908 at St. Césaire, by Mr. Chevalier, superintendent of the Quebec stations, has shown remarkable qualities. It is much larger in size and a heavier yielder than the Comstock Spanish; the leaf has a finer texture and a better shape; it is also earlier and more easily cured. This tobacco is destined to become the special type of the province of Quebec, for it seems to be adapted to a great variety of soils. On the comparatively heavy loam of the garden of St. Jacques station, the texture of the product was as fine as on the light loams of St. Césaire.

On account of vagaries of temperature, hail, &c., we have not had the same success with other varieties tried at this station. The Hazlewood, from which we expected a crop of good 'fillers,' has greatly suffered, as also our Big Ohio, whose leaves were completely torn. But the experiments with this last tobacco will be continued and we will then have in Quebec the three following types: For binders, hybrid of Comstock x Sumatra; for fillers, Hazlewood or other Cuban varieties; for cut tobaccos (pipe and cigarette), Big Ohio. Grown on suitable soils, these varieties will ensure the prosperity of our tobacco growers.

B.—St. Cesaire.

Here we are in a comparatively new district where, everything considered, the land is in better condition for the growing of tobacco than in the northern district. Summer is milder and the rainfalls appear to be more frequent and more regular. The proportion of light soils is also greater, at least in those parts where the growing of tobacco has been heretofore carried on. This new centre will soon become a dangerous competitor for the northern district, and this, we hope, will stimulate the activity of these agricultural groups.

In 1909, the varieties grown at the St. Césaire station were the Comstock Spanish, the Brewer Hybrid and the Hazlewood.

Further in this report will be found information concerning the yield of these different tobaccos, and a detailed account of observations made on the plantation. At St. Césaire the Comstock gives a slightly finer leaf than similar varieties grown in the northern counties. The Brewer Hybrid is a good yielder and, in spite of its slow growth, may be utilized to advantage on account of the fine qualities of its tissue and the shape of its leaf. If it is found impossible to secure a product suitable for wrappers, we can at least obtain a first-class 'binder' tobacco.

The rather poor yields obtained at St. Césaire this year are due to the unfavourable season, to the hasty preparation of the land—the station being established only in the spring—and, chiefly, to the growing of seed-plants which, while giving a fairly abundant crop of choice seeds, have reduced in the same proportion the yield in leaves.

II.—THE HARROW STATION (COUNTY OF ESSEX, ONT.).

The county of Essex is largely given to the growing of Burley; this is a large, heavy yielding tobacco, and rather slow in maturing. The climatic conditions of that part of Canada fulfil these requirements, and the growing of the Burley is one of the most prosperous industries in South Ontario.

A few black tobaccos (seed leaf type), are grown on a much smaller scale by a few planters. The quantity produced is insignificant, the more so because the possibility of their competing with similar tobaccos of Quebec is very uncertain. The Ontario seed leafs—at least those we have examined so far—are generally stronger than their competitors of Quebec and much less elastic.

Some hope may be entertained for the culture of the aromatic varieties, suitable for 'fillers,' and certain tobaccos of this type (Cuban, Hazelwood, Big Havana) were tested this year at our station.

But there is another very interesting variety, both on account of its relatively recent introduction and of the special curing process it requires, and whose future seems to be almost assured; we mean the Virginia.

Like the Burley, this variety demands a long and warm summer to become sufficiently ripe, but it requires an entire different soil. The soil must be sandy, or slightly gravelly, very permeable, and contain as small a proportion of lime as possible. Soils of this nature are sometimes met with in the southern part of the county of Essex, but they must be carefully selected.

The Virginia will not only give the grower as good, if not better cash returns than the Burley, but grown in a moderate scale, in place of the latter, it will enable the grower to avoid the over-production of Burley which has occurred in some years. It will fill a real want of the Canadian manufactures, and although the product obtained is sometimes only of second grade, it will nevertheless always be able to replace the same product at present imported from the Southern States.

The chief characteristic of the flue-cured Virginias is their bright colour, obtained and fixed by a special curing process. On account of the rather high temperature and the comparatively close atmosphere to which this tobacco is submitted during the curing process, the aroma is also quite characteristic and seems to be highly valued by a certain class of smokers. The yield per acre is less than that of the Burley, on account of the necessity of topping rather high and thinning rather low, practically keeping on the plant only the middle leaves, which all ripen almost at the same time. The result is a product of uniform colour whose price is much higher and may reach, for a good crop, from 15 to 25 cents per pound.

An interesting test of fertilizers has been undertaken, and it is intended to continue this experiment on a larger scale in future seasons. The question of the seed-beds has received special attention for, in spite of the comparatively favourable climatic conditions of the county of Essex, this question is more important in this part of Canada than many tobacco growers seem to think.

In the near future the hot and half-hot beds will probably replace the cold beds in general use in Ontario and which, in cold and rainy springs such as that of 1909, offer so little chance of success.

F. CHARLAN.

PART II

WORK OF THE TOBACCO DIVISION IN THE PROVINCE OF QUEBEC IN 1909.

By O. Chevalier.

The first part of this report relates to tobacco culture in general. It treats of the actual condition of this industry in the province of Quebec and of the improvements we hope to achieve, both from an agricultural and an economic point of view.

The second part, less general, is an account of the work done on our two experimental stations of St. Jacques and St. Césaire.

PART I.

Before attempting to show to what point of perfection we desire to bring the tobacco growing industry in Quebec, it may be useful to state in what condition it was found, and briefly recall the progress made since the Tobacco Division of the Department of Agriculture was organized.

The production of tobacco being profitable, the farmers rapidly enlarged their plantations, the more so as they generally considered that this plant was easily grown, and for a long time they were content, so to speak, with planting and harvesting the crop.

In many cases, however, the quality of the product was judged sufficient to justify the granting of protective duty. This protection awoke the ambition of the farmers and stimulated their desire to improve the product, so as to make it more suitable for the Canadian manufacturing industry. To help them in this work the Tobacco Division was established.

That a considerable change had taken place was apparent at my first inspection in the province of Quebec. To-day the farmers know that tobacco requires considerable care and is very exacting in fertilizers. They give greater care to the selection of their soils, to the choice of varieties and they are familiar with the various agricultural processes necessary for a plant which reaches so great a development in so short a time.

The success of the tests and the rapidity of the progress are largely due to the care with which the different varieties were localized; for instance, the Comstock Spanish (a light tobacco), was grown at St. Jacques and St. Césaire, and Canelle (a strong tobacco), at St. Alexis, county of Montcalm, and especially in the county of Two Mountains. Ligh' varieties are now planted much closer than formerly, and it has been shown, on a farm of St. Césaire, that it was possible, by planting 18 inches x 30 inches apart, to obtain a well developed and very thin leaf, and a yield of 1,700 pounds per acre, or 800 pounds more than the old average yield. Several farmers are beginning to produce their own seeds; as a rule they know how to select their seed-plants, they are aware of the dangers of cross-fertilization and degenerescence of species, and they avoid these two drawbacks by covering the seed-plants with bags.

Under these improved conditions we are able to undertake a series of experiments of a more definite character, and consequently to go deeper into the details of the subject. The work done during the season of 1909 may be summed up as follows:—

1. Unification of the methods followed by the different growers.
2. Experiments with commercial fertilizers, either singly, or with farm manure.
3. Improvement in the shape and size of the varieties now grown in the province of Quebec.

A. UNIFICATION OF METHODS.

Thinking that a knowledge of the methods followed by the growers would be useful, we have prepared a complete series of questions covering all the operations from the establishment of the beds to the delivery of the product to the manufacturer and asking in each case for a justification of the methods followed. The statements will moreover be verified by frequent visits to the farms.

In addition to the advantages that such statistics may have in regulating the market, it has been thought that, owing to their official character, they would stimulate the zeal of the growers of each parish, just as competition does. The average obtained by each planter being known, nothing will be easier than to determine the average yield of a given variety in the different parishes. The publication of these results will stimulate the competition between parishes, to the great advantage of tobacco culture. These statistics, of interest to all growers, will be the necessary complement of the district exhibitions where the only competitors are those who expect to win prizes. They will moreover be the means of establishing a regular correspondence between the growers and our division, which will be a distinct improvement. Finally, by their answers to these questions, the farmers will become known to us individually, and we will thus be enabled to go deeper into details with each of them and to complete the general advice already given in publications and lectures.

The schedule of questions follows:—

Parish. . . . .

Name and surname of grower. . . . .

Variety grown. . . . . Area. . . . .

Nature of preceding crops and yield obtained—

1st year. . . . .

2nd year. . . . .

Nature and preparation of beds—

Thickness of seeding. . . . .

Hot or cold. . . . .

Frames, glass or cotton. . . . .

Nature of seed—

Origin. . . . . .

Age. . . . . .

Price. . . . . .

Date of sowing. . . . . Quantity of seed used. . . . . .

Seeding—

1. Dry seed. . . . . .

2. Germinated seed. . . . . Method of germination. . . . . .

Number of days required for the seed to come up. . . . . .

At what time were the seedlings ready for setting out. . . . . .

Diseases observed. . . . . .

Special remarks. . . . . .

Date of setting out. . . . . Distances. . . . . .

Approximate number of dead plants. (Causes; means of prevention). . . . . .

Cultivation of the crop: Number of harrowings, etc. . . . . .

Date of topping—How many leaves and why that number. . . . . .

Thinning. . . . . .

Suckering. . . . . .

Cleaning. . . . . .

Special remarks*. . . . . .

Date of harvest. . . . . Mode of harvesting. . . . . .

Degree of maturity. . . . . Date put in curing shed. . . . . .

Description of curing shed—

Length. . . . . Width. . . . . Height. . . . . .

Nature of foundation. . . . . .

Number and location of openings. . . . . .

How was the curing done? . . . . . .

How do you prepare your tobacco for sale? . . . . . .

What do you do with the stalks? . . . . . .

Yield per acre. . . . . .

Preparation of the land. . . . . .

* Give full details regarding peculiarities that may have been observed.

1. Fall work—

Ploughing. . . . . .

Depth. . . . . .

Farm manure—

Composition. . . . . .

Condition. . . . . .

Quantity used. . . . . .

2. Spring work—

Ploughing, harrowing, etc. . . . . .

Farm manure. . . . . .

Fertilizers—

Nature. . . . . .

Origin. . . . . .

Quantity used. . . . . .

Mode of spreading. . . . . .

Special remarks*. . . . . .

. . . . . .

B.—INCREASE OF YIELDS.

Our Canadian growers are as yet little given to the use of commercial fertilizers, and even the use of farm manure is far from being general. Those who use it do so so sparing. that the effects are scarcely apparent; they hardly give back to the soil the elements removed with the crops. Under such conditions, it is easily understood why the yields increase so slowly and sometimes remain stationary. This question is so important that we have dealt with it in a special bulletin (No. A-5 of the Tobacco Division). Wishing the farmers to secure hesvier yields, we have continually insisted on the necessity of a thorough knowledge of the nature of the soil and endeavoured to generalize the combined use of commercial fertilizers and farm yard manure. With this end in view, a fairly conclusive experiment was conducted on Mr. Leduc's farm at St. Césaire. The results of this experiment are given in Part III of Bulletin No. A-6 entitled: 'Experimental work in 1908.'

A similar experiment was undertaken in 1909 at St. Jacques experimental station; the results will be found in Part II of this bulletin.

We intend to repeat these experiments on a larger scale, so as to get a thorough knowledge of the soil and ascertain what results may be expected. The land giving

* Give fullest details regarding peculiarities that may have been observed.

the highest yields as well as the best product will be chosen as the standard. Its composition will be determined by an analysis, and the soils which come nearest to it, or which may easily be brought nearest to the standard without too much outlay will be selected for the growing of tobacco. Our work will thus be more rational and all useless tests will be avoided.

The standard soil has now been chosen. We consider Mr. Leduc's farm, at St. Césaire, which has given an average yield of 1,435 lbs. of fine Comstock per acre, as being, provisionally, the best type of tobacco soil in the province of Quebec.

C.—IMPROVING THE SHAPE AND SIZE OF THE LEAVES.

The experiment included only one variety, the Comstock Spanish, the best adapted to this country. By continued selection, the leaf of this variety has been improved until it has now a very good shape. The thinness and large size of the leaf have been maintained and the pointed end has been replaced by a comparatively rounded point. Several years of work are necessary for such improvements. Great care must be exercised in selecting seed plants offering the characteristics that are to be kept or improved. Finally, the nature of the soils must be carefully studied, for it plays in this work a part little understood as yet, but very important.

Our experimental plot was selected in 1908 on the farm of Mr. Arpin, at St. Césaire. It is an alluvial soil, formed by successive deposits left by the annual overflowings of the Yamaska river. The first selection of seed plants, made the year previous, had already given encouraging results; but in 1908 the improvement in the shape of the leaf was so marked that a large quantity of plants were reserved for seed production. In order to keep the work entirely into our hands, the seed was bought from the grower at $8 per lb. All phases of the fertilization process (which took place entirely under bags), and the formation and maturing of the seeds were very closely watched. Although the floral clusters were carefully cleaned, the number of capsules per plant was from 65 to 75, giving a total production of 8 lbs. of seed.

In order to show the progress from year to year, drawings were made of ordinary and improved leaves. These drawings are reproduced in one of the cuts annexed to this report. (The hatchings represent the increase in size in the improved Comstock over the ordinary Comstock.)

The seeds gathered in 1908 were sown in 1909 at St. Césaire, and the crop showed the characteristics which it was desired to fix. Part of this seed was also tested in another district, at St. Jacques de l'Achigan. There also, but to a less extent, the rounded shape of the leaf was maintained. On a number of plants this roundness was even slightly more pronounced, especially on Mr. Melançon's farm, where we have continued the selection by reserving 3 lbs. of seed.

The manufacturers show a marked preference for the leaves with a rounded point. This preference may be explained in this way: In a leaf of ordinary Comstock the manufacturer, in order to cut two binders on each side of the central rib, must sacrifice a great part of the point, which is a considerable waste. With the improved Comstock this waste is considerably reduced on account of the special shape of the point of the leaf, and two additional binders may often be cut from one leaf. This

is probably one of the reasons of the increase in price of some Comstocks in 1908 and 1909, when, from 8 and 10 cents, the price soared to 12, 13 and even 15 cents at St. Césaire and St. Jacques.

The results obtained in 1908 being favourable, the work of improving the shape and size of the Comstock Spanish was continued at St. Césaire. A plantation of Sumatra was established, but without much hope of success. However, the results, although not of the best, have been fairly encouraging. This plantation gave a good, even stand in 85 days, which shows that Sumatra is later in ripening than any other variety. Few accidents occurred during the growth, and the plant has produced a fairly wide and very thin leaf from which eight or ten wrappers could generally be cut, but these wrappers were of inferior quality. The only serious defects observed are the rather strong ribs and the corrugated appearance of the leaf. Moreover, the growing and curing of Sumatra demand continuous care, considerable work and skilled workmen. Finally, the curing process is very slow, and the early frosts of our Canadian climate are to be feared. For these reasons it is impossible for us to recommend the growing of Sumatra in Canada.

This comparative success led us to think of a hybrid (Comstock x Sumatra). On account of the great difference between the flowering seasons of the Sumatra and the Comstock, comparatively few flowers could be artificially fertilized. Nevertheless, well formed and perfectly ripe capsules were obtained from 80 per cent of the fertilized flowers.

This Comstock x Sumatra hybrid has been tested in 1909 at our experimental station of St. Jacques l'Achigan. Without being too optimistic, we think that there is a great future in store for this new variety.

In the second part of this report, in a special chapter on the growing of the Comstock x Sumatra hybrid, it will be seen that this new variety is much earlier than the Comstock, that it gives a much heavier yield, and that the main features of the leaf —shape, size, appearance, distribution of ribs, texture and pliability—reach a degree of perfection that the Comstock will probably never attain. We do not wish to anticipate, the less so because a small area only has been planted, but we hope the growing of this new variety will be most profitable to the planters. Samples have been distributed to several manufacturers who have stated they were ready to pay as high as 20 cents a lb. for this tobacco. We must remember that the highest price offered for Comstock is 15 cents per lb.

Needless to say that the greatest possible quantity of seeds of this new variety have been kept, so that it may be grown on a larger scale next year.

We hope that the fine qualities observed this year will be maintained. This will be ascertained by comparing the plant grown from the hybrid seed sown in 1909, with that grown from the seed of the Comstock x Sumatra hybrid.

These encouraging results led us to undertake further experiments. The hybrid grown in 1909 received a new infusion of Sumatra blood. We have thus a second hybrid (Comstock x Sumatra x Sumatra) which will be grown next year and which, we hope, will come nearer to perfection.

In conclusion to the first part of this report are given a few economic considerations concerning the growing and manufacture of tobacco. Two questions have drawn our particular attention: growers' associations and the trade in damaged tobaccos.

Tobacco Growers' Associations.

As already stated, we are endeavouring to localize the different varieties now grown in the province of Quebec. When each variety is grown in the district for which it is best suited, progress will be more rapid, and a special and uniform market may be created for each district. Under such conditions the individual interest of each grower becomes subordinate to the general interest, and growers' associations become necessary. The first association of this kind is that of the tobacco growers of the district of Joliette, which numbers about 150 members. Its results, both from agricultural and economic standpoints, have been most satisfactory. The growers of St. Césaire have recently followed this example and organized an association of the growers of Yamaska valley. To those who have consulted us, our advice was to establish an association composed exclusively of tobacco growers, and we hope that its board of directors will act in the best interest of all concerned by unifying the methods. The use of chemical fertilizers will spread through these associations, as by giving their orders in common they will secure the best conditions of price and transportation. They will cope successfully with the delays and neglects of their members. If need be, they will adopt special measures, such as setting aside a crop for the production of seed, another for a test of fertilizers, &c. Finally, they will be a strong factor in the fight against the sale of damaged tobaccos and contribute materially in establishing the reputation of Canadian tobacco.

Damaged Tobaccos.

The difficulties that had to be overcome in establishing the reputation of Canadian tobacco are well known. For a long time the market was closed against all Canadian tobaccos. This systematic rejection was to a certain extent justified and may be attributed to the faulty methods of culture and of curing and to the lack of fermentation. Canadians have taken a long time to understand that unfermented tobacco is unfit for use. Canadian tobacco, both from poor cultivation and lack of preparation, gave an ill-burning product, of disagreeable aroma.

This state of things necessitated an immediate remedy, striking at the very root of the evil. Varieties and soils were carefully selected, the proximity of all things that could taint the aroma was avoided, curing in stables was abandoned and a preference was given to well built and well located curing-sheds; and finally dangerous fertilizers such as human excrement and swine manure were rejected. The improvement was soon felt, but Canadian tobacco had yet to overcome its bad reputation. This has to-day become a regrettable prejudice, and foreign tobaccos still keep their foothold in the Dominion.

Alarmed at this situation, the government, by a recent amendment establishing the uniformity of stamps, gave to Canadian tobacco the rank to which it was entitled. There is now no exterior sign by which an *a priori* distinction can be made between foreign and Canadian tobaccos, so that the home product has now its fair share of the country's trade.

Unfortunately, this state of affairs cannot long subsist under the present conditions. The good effects of the stamp law are being nullified by a deplorable and general practice, the sale of damaged tobaccos, comprising completely torn leaves and

tobaccos frozen when hung up for curing. Whatever care be exercised, tobacco cannot always be kept from freezing in the curing-shed; after freezing it becomes black, gives off a bad odour and is in fact nothing else but vegetable matter in a state of latent decomposition. When the product is more or less affected in this way, the grower has but one desire: to get rid without delay and at any price of the damaged crop. Thus it is that merchants and even manufacturers buy these products, which are tobacco in name only, at the derisive price of one or two cents a pound.

The trade in damaged tobaccos is more important than may appear at first sight. To give one instance only: in 1908, from the railway station of an important centre, no less than 350,000 lbs. of damaged tobaccos were shipped. In buying such products unscrupulous manufacturers realize large profits and are therefore deeply interested in the continuance of this trade. Is not this the main obstacle to the end we have in view, viz.: To place Canadian tobacco on an equal footing with its competitors and to make it a fit product for export or at least for general use in Canada?

The tobacco growers have been warned against the dangers of such a trade and have been shown that the sale of damaged tobaccos was displacing on the market an equal quantity of good tobacco. Particular stress was laid on this point in a lecture given at St. Jacques, on January 14, 1909, and in which the farmers were told that it would be infinitely better to use damaged tobaccos as a fertilizer than as a marketable product. All our representations, however, have been useless, and the trade in damaged tobaccos continues as before.

To check this evil we recommend the use of early varieties which, ripening earlier, are less exposed to frosts, and also the cutting off of the three or four lower leaves. We hope the associations will follow our lead and will heartily contribute to this work. They have promised to include in their regulations strict provisions against the sale of damaged tobaccos. However, without being too pessimistic, we do not think this trade can be completely suppressed with the means at our disposal, for this reason only that our collaborators are themselves growers who may have damaged tobaccos and be tempted to dispose of them without delay. It would probably be preferable to resort to more rigorous measures, and it might perhaps be expedient for our legislators to deal with the matter.

II.—DETAIL OF THE WORK DONE AT THE EXPERIMENTAL STATIONS OF ST. JACQUES AND ST. CESAIRE.

A.—St. Jacques Experimental Station.

In accordance with the plan of operations outlined in bulletin No. A-5 of the tobacco series, the area of the St. Jacques station was divided into three equal lots, of three acres each, and a three year's rotation was at once started. The total area of the station being ten acres, the remaining acre will be put in tobacco year after year in order to demonstrate, by comparison, the advantages of a good rotation.

Establishment of Seed Beds.

Owing to the unfavourable atmospheric conditions of the spring of 1909 the work had to be delayed until the 17th of April.

The seed was sown on six beds 21 feet x 5 feet each, a total area of 630 square feet. The six beds, five of which were hot beds and one a cold bed, were prepared in the following manner:

Hot beds Nos. 1, 2, 3, 4 and 6—

10 inches of horse manure well packed down.
6 inches of vegetable earth (mould).
¼ to ½ inch of forest soil finely pulverized.

Cold bed, No. 5—

1 layer of tobacco stems.
1 layer of straw, rather thin.
6 inches of vegetable earth.
1 inch of forest soil.

Compelled as we were by special circumstances to hasten the establishment of the experimental station, we could not make a very discriminate selection of the vegetable earth or mould. We had to apply to a dozen grower e we could collect the needed quantity of mould. It is evident that under these c itions the moulds were vastly different in nature and that the final mixture was of rather inferior quality. Moreover, these moulds contained a great quantity of weed seeds, and of clover seeds which, as is well known, are very injurious to seed beds on account of the rapid development of the roots of this plant.

Sowing.

All the beds were dry-seeded:

(1) Comstock Spanish. Three beds (Nos. 4, 5 and 6) were sown on April 20. Bed No. 4 was sown at the rate of ½ of an ounce per 100 square feet; bed No. 6, ⅓ of an ounce per 100 square feet; bed No. 5 (cold) ¼ of an ounce per 100 square feet.

On beds 5 and 6 a special fertilizer, called Eureka, was tested. On bed No. 6 it was spread evenly over the soil at the rate of $\frac{1}{16}$ of a pound per square foot, before the forest mould was added.

On the cold bed (No. 5) different quantities of the Eureka fertilizer were applied. This bed was divided into four equal plots to which were respectively applied:—

Plot 1. Eureka, ¼ lb per square foot.
" 2. " ⅛ " "
" 3. " $\frac{1}{16}$ " "
" 4. Check plot (no fertilizer).

On June 7 the following observations were made on bed No. 5:

Plot No. 3 had the best seedlings, more tender and earlier, and with more abundant root-hair than those of the other plots. It is obvious therefore that the Eureka

fertilizer gives the best results when applied at the rate of one-sixteenth of a pound per square foot. The results are much less satisfactory when this fertilizer is applied at the rate of one-eight of a pound per square foot, while one-quarter of a pound per square foot is certainly too much and blights the plants. Very few seedlings grew on lot No. 1.

(2). Big Ohio. Bed No. 2, sown on April 21, at the rate of one-seventh of an ounce per hundred square feet. One-sixteenth of a pound of the Eureka fertilizer, carefully mixed with the fine surface soil, was applied.

(3). Cuban. Two-thirds of bed No. 3, sown on April 26, at the rate of one-sixth of an ounce per hundred square feet.

(4). Sumatra. One-sixth of bed No. 3 sown at the rate of one-seventh of an ounce on April 21.

(5). Comstock x Sumatra hybrid. One-sixth of bed No. 3 sown at the rate of one-seventh of an ounce, on April 21.

(6). Hazlewood. Bed No. 1, sown on April 27, at the rate of one-seventh of an ounce per hundred square feet.

All these beds were sown with dry seed. Until the plant came up the frames were kept hermetically closed and covered with tarpaulins during the night, so as to prevent loss of heat by radiation. During this period, special care was taken to keep the temperature below 85 degrees F. The frames were always uncovered during the day, late in the morning, and covered again at sunset, on account of the exceptionally low temperature. In fact, on April 25, 1909, there was a snow fall of 10 inches and there was a frost every night up to May 2. On April 30 snow fell to the depth of 1 foot, accompanied by a very cold wind, so that on this day, at ten o'clock in the morning the temperature of the cold beds fell to 35°F., and that of the hot beds to 48° and 50° F. only.

The temperature of the hot beds never fell below 45° F.; the lowest temperature for the cold beds was observed on the first of May, at six o'clock in the morning (32° F.)

Such extremely unfavourable atmospheric conditions killed a great number of seedlings; the beds of several growers were completely destroyed and they were obliged to sow again.

The beds were very frequently watered, but very lightly, only so that the soil might feel damp to the touch. The sprinklings were made with water at the same temperature as that of the beds, and sometimes, but at the beginning only, with water 2 or 4 degrees higher in temperature. Sprinklings must be light or the fertilizer will be carried away and the young plants uprooted.

Putty was applied to the interior joints of the glazed frames so as to prevent the fall on the beds of the drops of water formed by condensation. This process facilitates the running away of these drops of water and can be recommended.

Stand.—On April 28, eight days after sowing, the Comstock seedlings came up. During these eight days the sun shone twice only and but for a few hours. The germs can hardly be seen in the cold bed.

On April 28 the Big Ohio also came up, nine days after sowing. The seedlings then appeared to remain stationary up to May 9, when the first two leaves appeared distinctly on a certain number of plants.

On May 3 the Sumatra, as well as the Comstock x Sumatra hybrid, had two leaves.

The stand is fairly even, with the exception of the cold bed where it is very uneven. The temperature is far from improving, and in the case of certain growers, who had sown germinated seeds on cold beds, the gemmule did not become distinctly apparent before the tenth day. It was only on May 10 that the beds sown with Cuban and Hazlewood showed two-leaved seedlings.

Weeding.—Weeding operations were begun on May 6 on the Comstock bed. This work was very hard on account of the poor quality of the soil. It was impossible to begin weeding earlier, owing to the damp and cold weather, and up to May 6 the seedlings had grown so little that there was danger of uprooting them while weeding. Each bed was weeded three times; which shows the poor quality of the soil. Clover and thistle grew in abundance and were a great hindrance to the seedlings. Moreover a great number of young plants were inevitably destroyed by the pulling out of those weeds.

Condition of the Beds on May 20, 1909.

The beds of Comstock, especially the cold bed, show many empty spaces. However, there is no trace of disease. The seedling is sound and hardy. The empty spaces are probably due to the cold weather, which has killed the germs.

The seedlings of Big Ohio have made better progress and are in very good condition, considering the season. Their rapid growth is probably due to the influence of the Eureka fertilizer. Judging by the appearance of bed No. 6 it is certainly better to mix the fertilizer with the fine surface soil than to mix it with the mould and spread the fine surface soil over it.

The seedlings on bed No. 2 are evidently making quicker use of the chemical fertilizer.

The Hazelwood and the Cuban, which were sown very late, are little forward. The growth of the Hazlewood seems to be particularly slow. The Cuban is making better progress, but unfortunately it has a tendency to elongate.

The Sumatra and the Comstock x Sumatra hybrid are very satisfactory and give good promise.

In a general way the slow development of the seedlings is the most apparent defect of the beds. This is due to the excessive cooling caused by the necessary aeration in a particularly cold season.

We endeavoured to force the seedlings by sprinklings of solutions of fowl manure and Eureka fertilizer. This last fertilizer gave excellent results. The seedlings were much benefited by these sprinklings and grew so rapidly that between the 1st and 15th of June some of them were ready for setting out.

The following observations were suggested to us by a close study of our seed beds, and of those of various growers:

Germinated and Dry Seed.

The cold bed, which can be prepared much quicker than the hot bed and which, on this account, is becoming more and more popular, compels the grower to sow germinated seeds. Under such conditions the work on the seed beds is greatly simpli-

fied, but it is possible that the growers have valued too highly the advantages of sowing germinated seeds.

The artificial germination of the seed is done in the dark. It is a well known fact that light has a considerable influence on germination, for the percentage of germinated seeds is always higher when the germination takes place in daylight than when it takes place in the dark. Moreover, as soon as the seed has used up its food reserve, it is nourished by assimilation of carbon, which is performed by the green parts of the plant. Consequently, the object must be to stimulate as much as possible the development of these green parts, and it is only under full sunlight that this development can take place. When the seeds have germinated the growers generally mix them with sand before sowing. It is evident that delicate organs like the gemmules are always more or less bruised by contact with such a hard body as sand. These bruises are all the more easily inflicted when the growers—as the majority of them do—delay their sowing until the germ is over-developed. Such bruises are an open door for microbes and diseases. Beds sown with germinated seeds have greatly suffered from rotting of the roots while this evil has seldom been observed on the beds sown with dry seeds.

It is quite true that, when using germinated seeds, the seedlings have a start of three or four days in the bed, but there is no difference at the time of setting out; on the contrary, the plant grown from dry seed is more vigorous and is seldom affected by disease in normal years.

Such are the reasons against the practice of sowing germinated seeds on cold beds in the province of Quebec. It may be objected that by merely bursting the tegument of the seed without mixing it with sand the grower may perfectly succeed in a normal year. This is true, but it may be well to state here that the spring of 1908 was not normal and that snow fell to the depth of 1 foot on May 1, 1909. Dry seed better withstands cold, and its germ is more easily acclimatized than a germinated seed whose plantule has been artificially developed, and suddenly transplanted into an unsuitable soil. Finally, we may state that hot beds were ready eleven days before the cold bed.

Thickness of seeding.

After a careful study of this question we have come to the conclusion that the best quantity of seed to use is ⅛ of an ounce per 100 square feet. An experiment to this effect was carried on at both experimental stations of St. Jacques and St. Césaire, where the following quantities of seed were tried: ½, ¼, ⅛, ¼ of an ounce per 100 square feet of bed.

With ⅛ of an ounce of seed we have obtained a bed of sufficient thickness, considering that 10,000 seedlings of good quality were taken from bed No. 6.

Thin beds have numerous advantages:

First, the seelings do not become elongated, and the air circulating freely between the plants, they are seldom attacked by rot. Finally, each plant having more food at its disposal, grows rapidly while remaining very tender, and the roots, not being too close, have abundant hair, which is one of the essential conditions for a good recovery after setting out. Several plants showed roots seven inches long.

On the contrary, when the beds are thickly set, the seedlings are smothered, so to speak. The growth is all lengthwise, the foliated organ is very weak and the roots

have little or no hair. Moreover, the air does not circulate freely between the seedlings and rot soon appears. Finally, the long, tough and hairless seedling is a long time in taking root.

On our field of Comstock 3½ per cent only of the transplanted seedlings had to be replaced, and 3 per cent of these on account of attacks of cut-worms and wire-worms. It is true that a thin bed presents a poor appearance at the beginning, but the empty spaces are soon filled up. Some growers who thought our beds too thin took from them as many as 10,000 seedlings.

Many growers have been persuaded, but a few are still obstinate and continue to sow their beds too thickly, and are compelled to resort to nurseries. This method cannot be recommended, for the digging up of the best plants to reset them in the nursery injures the bed. Moreover, the young seedlings transplanted in the open always suffer from the sudden change of conditions. Thus, in the nursery the seedlings are placed twice under unfavourable conditions.

Should the bed be covered immediately after sowing?

Many growers cover the surface of the beds with bags as soon as the sowing is done. In this case the germination and growth of the germ take place in the dark, or at least under diffused light. The disadvantages of this process have been described above. Unfortunately the bags are often left too long, and a great number of germs get entangled in the loose mesh and are destroyed when the bags are removed. The remaining seedlings, grown almost in the dark and in a vitiated atmosphere, are deprived of light and oxygen. It is better to use a white cotton cover, moderately stretched, not over the frames, but immediately underneath. The system has been tested at St. Césaire with excellent results. The conditions as to aeration, light and heat are satisfactory and the sashes can be removed much sooner. Finally, these cotton covers facilitate the running away of the water of condensation and protect the surface of the bed.

Preparation of the soil and planting.

Work could not be started on the land before June 2. Up to that date the soil was too damp and twelve consecutive days of fair weather were required before the spring work could begin. The station had been roughly ploughed in the fall before our arrival, but the ploughing being perpendicular with the slope of the land, had greatly hindered the draining of the water from the rains and melting snow. In the low parts particularly, in spite of the most careful tillage, it was found impossible to loosen the soil as it should be. Our crop has greatly suffered from this excess of water, especially in the low parts, where the plants remained small and weak.

After spreading a layer of manure with the machine, at the rate of 15 tons to the acre, the land was cultivated as follows:—

1. Ploughing.
2. Harrowing with disc harrow.
3. Harrowing with ordinary harrow.
4. Rolling.
5. Harrowing (twice).
6. Rolling.
7. Planting.

To ascertain the nature of the soil, one acre was reserved for the test of the fertilizers mentioned in bulletin No. A-6 of the tobacco series. The results of this test are given in a special chapter of the present report.

Planting.

The planting of the Comstock was begun on June 8 and completed on the 12th. This was done by machine; the plants were set at distances of 18 inches x 30 inches.

The Big Ohio was planted on the 10th and 12th of June, at distances of 3 feet x 3 feet, but the Cuban and Hazlewood could not be set out before June 21; these were set at distances of 30 inches x 30 inches. It will be shown further that it would have been better to plant these varieties at the ordinary distance, 18 inches x 30 inches.

Finally, on June 10, on a small plot of poor and badly prepared soil, 160 seedlings of Comstock x Sumatra hybrid, and 200 seedlings of Sumatra were planted for a test, both at distances of 30 inches x 30 inches.

These two varieties were planted by hand and on the same day, so that their growth might be watched and compared.

The work of setting out the seedlings was carefully done. The seedlings were pulled up in the morning after a copious sprinkling. Only sound, tender and well-rooted seedlings were chosen. They were carefully placed in a box whose bottom was covered with a layer of grass always kept moist. Care was taken to spread Paris green after replacing the plants that had been poorly set. The recovery was almost perfect and was completed by the shower of June 14. The replacing of dead or wilted plants was begun immediately after the rain.

Owing to the perfect condition of our beds, which remained sound until the end, with the exception of a slight yellowing on the Hazlewood and Sumatra bed, good seedlings could easily be found to fill up the empty spaces.

Up to June 17 only two per cent of the plants had to be replaced and most of the failures were due to cut-worms and wire-worms. Then the wire-worms began to attack the Big Ohio which had to be almost completely reset three times. Moreover, the Big Ohio plantation was overrun with weeds, and on June 24 it had already been weeded twice, once with the horse-weeder and once with the hoe.

Up to this date the progress of the plantation was very slow. The temperature was most unfavourable and the snowfall of June 18 seems to have checked vegetation. The Big Ohio was even taking an alarming appearance. We knew already that the crop of this new variety would not be up to our expectations, as it suffered too much delay both in the planting and the recovery after transplanting.

The recovery of the Cuban and Hazlewood was fairly satisfactory, hardly more than 5½ per cent of the plants having to be replaced. As these varieties were planted late, the cut-worms and wire-worms were about to enter the pupa stage and caused comparatively little injury.

On June 25 the Comstock x Sumatra hybrid has the best appearance both on the plantation and on the seed bed. At that date the leaf development of the hybrid was double that of the Sumatra and ⅓ as great as that of the Comstock.

On July 5 the whole plantation had been twice cultivated by machine and by hand, but it was only after the warm and abundant rain of July 10 that it made rapid progress. Finally, the rain of July 12, followed by four days of great heat, brought

the plantation into excellent condition, considering the general condition of the season.

Thinning and hilling.

This special work, little practised as yet by our growers, was started on July 17. It consists in the removal of the three or four lower leaves of the plant and hilling up by hand or with the plough around each plant. These lower leaves, necessarily soiled by contact with the earth and always more or less torn by rain and wind, are of poor quality and simply increase the quantity of waste products. It is therefore better to remove them. Far from causing a reduction in weight, as many growers think, the thinning, on the contrary, increases the yield, since the leaves of good quality that are left on the stem profit largely by the nutritive elements which would have been utilized by the useless product.

The object of hilling is to consolidate the plant so that it may offer better resistance to the wind. Moreover it favours the development of adventitious roots and, when done at the proper time, reduces to a large extent the evaporation of soil moisture, which is very helpful in periods of dry weather. To ascertain the advantages of hilling, it is sufficient to compare alternate rows of hilled up and unhilled plants.

Topping.

After a careful selection of the seed-plants, which was completed on July 20, the topping was proceeded with. The different varieties were topped at the following dates:—

Comstock: (12 to 14 leaves) July 22.

Big Ohio: August 18. (The stand being very uneven it was impossible to determine the uniform number of leaves to be left.)

Cuban: August 14.

Hazlewood: August 14.

Sumatra: August 14.

The Comstock x Sumatra hybrid was topped on July 14; 16, 17 and 18 leaves were left on the plant. As will be seen, this variety, by far the first to be topped, has proven to be very early.

The topping was followed by a careful pruning. This operation was normal, save for the Big Ohio, whose immense leaf development renders this work very difficult.

Although very late, the crop was making rapid progress. Unfortunately, the hail storm of August 19 greatly endangered the success. On account of the large dimension of its leaf, the Big Ohio suffered greatly. All the leaves were perforated and many of them completely torn. The Cuban and Hazlewood varieties, which grow to a considerable height and the leaves of which are of a rather brittle texture, suffered still more severely. From this date the crop of Cuban and Hazlewood may be considered as a complete loss, as it will give nothing but waste products.

The Comstock suffered less, probably on account of the great flexibility of the leaves. This storm, which lasted a quarter of an hour only, has nevertheless done severe damage; a certain grower of Ste. Marie Salomé estimates his loss at $500.

By a fortunate chance the Sumatra and the Comstock x Sumatra hybrid were completely spared.

Crop and yield.

Harvesting was started as soon as the first signs of maturity appeared. The tobacco cut in the morning, as soon as the dew was off, was not taken in before the afternoon, after a few hours wilting. It was hauled to the curing-shed in a cart of special build, whose model is shown further. The dates of harvesting and the yield per acre of the different varieties are given in the following table:—

Varieties.	Date of harvest.	Yields per acre.
Comstock*	From Sept. 6 to 18	980 lbs.
Big Ohio	" 20 to 23	Could not yet be stripped.
Cuban	" 24 to 27	500 lbs.
Hazelwood	" 24 to 27	650 "
Sumatra**	" 16 to 27	875 "
Hybrid***	August 25	1,875 "

*See further the results of the test of chemical fertilizers.
**This is the estimated yield.
***This is the estimated yield.

Before discussing the question of curing, which, properly speaking, is not an agricultural process, we would like to call the attention of growers to certain special phases.

Winter and spring ploughing.

Good ploughing is an important factor in the success of the crop. The tobacco plant requires a great deal of moisture, but it easily suffers from an excess of it. It is evident therefore that poor ploughing, such as, for instance, ploughing perpendicularly to the slope of the land, is a bad practise. The water, after the melting of the snow, does not run off and disappears very slowly. Consequently, the low lands contain an excess of moisture which hinders the cultivation of the soil, so that the tobacco planted on such hard and cloddy land cannot develop normally. This was observed this year at St. Jacques, where on the low parts and at the bottom of the lands the plant barely reached half its normal size.

Even on level soil the bottom of the lands generally remains too moist. It would perhaps be better to replace the present 12-foot lanes by 18-foot lanes, more rounded. In this case no plants would be set at the bottom of the lands where their development is generally poor. We think this method would be more advantageous than the other, both from the point of view of yield and that of uniformity of the crop.

Cultivation.

Many growers forget that this operation serves a dual purpose: the destruction of weeds and the conservation of moisture. Thus by frequent cultivation—the more frequent when the drought is prolonged—the capillarity of the soil is destroyed and evaporation lessened. A very simple experiment may convince the incredulous: Powdered sugar and a lump of sugar are both placed over a small quantity of water; it will be readily seen that the water rises more quickly in the lump than in the powdered sugar.

Resetting plants.

Too little care is generally given to the resetting of plants. A hole is dug in which the new plant is set without any care, or the hole is dug with a planting tool which packs the earth so tightly around the tender roots that they are squeezed and cannot spread properly. We have tried another process which has insured an almost perfect recovery. This consists in digging with the hand, or with any implement, a small trench which is then filled with water; the plant is set in the water and the soil is gently put back around it. As will be seen, the work is done in exactly the same way as with the planting machine.

Hauling to the curing-shed.

We would like to see the present system of hauling replaced by a better one. An ordinary wagon is used in which the laths are loaded; it would be better to use a special wagon fitted with a rack and in which the tobacco could be hung, just as in the curing-shed. The waste that results from friction and crushing would thus be reduced to a minimum.

Results of an Experiment with Chemical Fertilizers.

This experiment, whose object was to determine the fertility of the soil at our St. Jacques station, was carried on an acre of Comstock. The field was divided into six lots which were treated in the following manner:—

Lot No. 1. No manure or fertilizer.

Lot No. 2. Farm manure: 15 tons per acre.

Lot No. 3. Sulphate of ammonia: 500 lbs. per acre (84 lbs.)
Sulphate of potash: 300 lbs. per acre (50 lbs.).
Superphosphate: 300 lbs. per acre (50 lbs.).
Farm manure: 15 tons to the acre.

Lot No. 4. Farm manure: 15 tons to the acre.
Sulphate of potash: 300 lbs. per acre (50 lbs.).
Superphosphate: 300 lbs per acre (50 lbs.).

Lot No. 5. Farm manure: 15 tons per acre.
Sulphate of ammonia: 500 lbs. per acre (84 lbs.).
Superphosphate: 300 lbs. per acre (50 lbs.).

Lot No. 6. Farm manure: 15 tons per acre.
Sulphate of ammonia: 500 lbs. per acre (84 lbs.).
Sulphate of potash: 300 lbs. per acre. (50 lbs.).

The chemical fertilizers were spread with the machine and mixed with the soil by harrowing both ways.

The six lots were planted on the same day. On July 1 the following observations were made: Lot No. 3 is the earliest, closely followed by lots Nos. 4, 5, and 6. Lots 1 and 2 are very late, especially lot No. 1 which is not half as well developed as lot No. 3. From this we may conclude that the soil is poor and needs heavy manuring.

Yields.

The yields are shown in the following table:—

Lot.	Weight of the crop.	Yield per acre.
No. 1.	99	594
No. 2.	131	786
No. 3.	188	1,128
No. 4.	162	972
No. 5.	163	978
No. 6.	171	1,026

Conclusions.

The yield of 99 lbs. on lot No. 1 shows that the soil is rather poor, a single application of manure having already increased the yield by 32 lbs. The yield of 188 lbs. of lot No. 3, by far the highest obtained and double that of lot No. 1, shows the benefit derived from the use of chemical fertilizers. The results obtained on lots Nos. 4, 5 and 6, show that the soil is lacking in chemical elements, nitrogen, phosphate and potash. Nitrogen is the most important as shown by the results on lot No. 4, to which no sulphate of ammonia had been applied, and whose yield was 162 lbs., or 26 lbs. less than that of lot No. 3; lot No. 6, on the contrary, received an application of sulphate of ammonia and its yield comes closer to that of lot No. 3, which confirms our observations. Finally the results of lot No. 5 indicate that the potash is also necessary.

In short, the fertilizers that seem most necessary are sulphate of ammonia and sulphate of potash; the phosphoric element is the least required.

NOTES ON THE VARIETIES GROWN.

Comstock x Sumatra Hybrid.

In the course of our work, we have had an opportunity to study the merits of a new variety: the Comstock x Sumatra hybrid, produced at St. Césaire in 1908. Although grown on a small scale there—only 160 plants—the prospects are of the brightest and it was decided to grow it on a much larger scale in 1910.

The chief merits of this hybrid are its earliness, its abundant yield and its fine qualities for manufacturing purposes.

Thus, in spite of a most unfavourable season the seedlings were ready for setting out forty-five days after sowing. Harvesting took place seventy-five days later, while the Comstock ripened only ninety-five days after setting out.

The Comstock-Sumatra hybrid is easily topped at 16, 17 and 18 leaves, while it is often difficult to top the Comstock at 14. Moreover, the leaf of the hybrid has the rounded shape of the extremity of the Sumatra leaf and is better developed than the Comstock, as shown in the following table:—

Comstock—

Average 15 leaves: length, 18·21 inches; width, 9·37 inches.

Hybrid—

Average 15 leaves: length, 9·93 inches; width, 11·91 inches.

Finally, the ribs are placed in a very advantageous position. They are almost perpendicular to the main rib, widely spaced and very fine.

Average space between the ribs (calculated from 10 leaves):—

Comstock	1·75 inches.
Hybrid	2·19 "

Being early, this new variety cures very easily, even in an unfavourable season. The product is very thin, very elastic, and the colour is good. It furnishes a large quantity of wrappers, as the ribs once dry, are remarkably fine. The hybrid was set at distances of 30 inches by 30 inches, but could be easily planted at distances of 19 inches by 30 inches. There is no doubt that in the last case the tissue would have been thinner still. The following method was followed in computing the yield per acre: the plants of three separate lots were left with 16, 17, and 18 leaves respectively. The yield of each was weighed separately and gave the following results:—

16 leaves	3·75 ounces.
17 "	4·12 "
18 "	4·25 "

an average of 4·40 ounces per plant.

This gives four plants to the pound. If the average thickness of the stand were 7,500 plants per acre, the average yield per acre would be $\frac{7500}{4}$=1,875 pounds.

The weight of 130 plants was 30·25 lbs., which is evidently 4 plants to the lb. This figure speaks for itself. It is still more striking when compared to the yield of Comstock which seldom reaches 1,300 lbs. The manufacturers to whom samples were submitted were very enthusiastic about this new product, and they were prepared to pay as high as 20 to 25 cents, and even from 30 to 40 cents a pound, if properly fermented.

It is probable therefore that we have here a very interesting variety, to whose study we will give our best attention.

Big Ohio.

This is a heavy yielder which will be the object of a further test in the province of Quebec. The unfavourable climatic conditions of the year 1909 and the occurrence of hail storms have compromised the results. Harvesting being very late, we were compelled to have recourse to artificial curing. However, there is no need to despair, as the same variety, in normal years, was grown with success at the Central Experimental Farm, and yielded over 2,000 pounds per acre.

Cuban and Hazlewood.

These two varieties, which were being tested as fillers, were also a failure this year, the crop being destroyed by hail. However, it was possible to ascertain that they are rather late and that their acclimatization will take some time.

These varieties form a large number of suckers, low down, and their leaves are of a rather brittle texture, but of good shape however, and comparatively easy to cure.

The work on the St. Jacques station, in 1909, was completed by fall ploughing

The land reserved for the crop of 1910 was manured and ploughed from the 16th to the 19th of October. Farm manure was applied at the rate of fifteen tons per acre over a two-years clover crop and buried by a narrow ploughing, 6 to 8 inches deep.

B.—EXPERIMENTAL STATION AT ST. CESAIRE.

The rotation followed at St. Césaire, is of three years' duration, as at St. Jacques station. The area of seven acres was divided into four lots, three of two acres each, where tobacco will be grown every three years only, and one of one acre only where tobacco will be grown continuously. The climate of St. Césaire being slightly warmer than at St. Jacques, two new and rather tender varieties, the Brewer hybrid and the Hazlewood, were tested besides the Comstock.

Seed Beds.

1. *Comstock.*—Three hot beds of 12 feet by 5 feet were sown on April 20 at the rate of ¼ of an ounce per hundred square feet of bed. Save for a few bare spots due to cold weather—for the frames had to be opened early to avoid rotting of the seedlings—the stand was uniform. On the first of May the plant was hardy and sound, but late. Setting out could not be started before June 7.

2. *Hazlewood.*—Two beds 12 feet x 5 feet, sown on April 20 at the rate of ¼ of an ounce. This imported seed has shown itself tardy and very tender; cold weather and root rot have killed a large number of plants. It may be necessary to disinfect the moulds in 1910. The plant is slow in development and has a tendency to elongate. Sprinklings with solutions of fowl manure had to be resorted to to help the plants. It was ready for planting on June 12.

3. *Brewer hybrid.*—Two beds of 12 feet x 5 feet sown on April 24 at the same rate as the preceding lots. Vegetation slow at the start, but at the date of setting out, on June 17, the beds were covered with vigorous and sound seedlings, with plenty of root hair. The most notable fact about this bed was the extremely slow start, followed by a rapid growth.

The plants were set out after spring ploughing and manuring, on land well kept and well tilled.

Transplanting:—

1 acre of Comstock, 18 inches x 30 inches, June 7.
1 acre of Hazlewood, 18 inches x 30 inches, June 12.
1 acre of Brewer, 18 inches x 30 inches, June 17.

The seedlings took well, and the insects doing practically no injury, the crop gave promise of being successful and uniform.

The Comstock, which is acclimatized in our country, had a start over the other variety. Of the two new varieties, the Brewer appears to be the slowest.

The alternate rains and heat were very favourable to the growth, but the drought of August delayed the growth somewhat. The ill-effects of the drought were checked by frequent cultivation.

Harvesting.

The three varieties were harvested on the following dates: Comstock, September 6; Hazlewood, September 16; Brewer, September 19.

The yields are as follows:—

Comstock	974 lbs. per acre.
Hazelwood	875 "
Brewer	1,202 "

GENERAL OBSERVATIONS.

Harvest.

It was most gratifying to note this year that a great many growers began to harvest their tobacco as soon as the first signs of maturity appeared. Great care should be taken in all seasons to ascertain the proper stage of maturity, especially in such a dry season as tho last one. The drought having checked assimilation, so to speak, the leaves looked ripe about August 25; but these signs disappeared with the rains of the last days of August, and the growth started with renewed vigour.

No set rules can be laid down for harvesting, but this operation requires the greatest care. Nevertheless it is easy enough to determine the proper time for harvesting. The leaves show a tendency to curve inwards and give out a characteristic dry crackling when bent between the fingers. But the clearest sign of maturity is perhaps the apparition of small markings, of greenish yellow colour, on the tips of the leaves. These markings are sometimes rather difficult to detect, but they are clearly perceptible when looking through the leaf.

It is rather difficult to distinguish between prematurity and real maturity. However a careful observation reveals that in the case of prematurity the leaves may be marked but there is no sound of crackling when bent. This condition is due to the drought which checks assimilation, while evaporation continues. On account of the lack of moisture the gummy and resinous matters of the tobacco are over-saturated, and, as a result, the leaves have a remarkable flexibility; in fact, it is observed that the leaves prematurely ripened are much more gummy to the touch than leaves really ripe.

The results obtained this year have shown once more the advantages of an early crop. The curing process, which is much easier with early crops, gives a uniform product of perfect colour and remarkable fineness. This is the only method that ensures light products, and it is therefore the necessary complement of the almost general practice of thick-setting employed to-day.

Finally, an early crop, insuring rapid curing, protects the growers against frost when the tobacco is hanging in the curing shed. Early crops are the most efficient means of putting a stop to the trade in damaged tobacco.

As to the time of harvesting, our opinion has been opposed recently and the arguments put forward by our opponents have caused certain growers to hesitate.

Thus, it has been stated that maturity in the tobacco leaf was the same as maturity in the leaves of a tree. To this we merely answered that there is a distinction between a living leaf and a dead leaf. As in fruit there are two stages in the ripening of the tobacco plant; the physiological maturity and the commercial maturity, if we may thus describe it, and it is most evident that, for tobacco, this last stage is the one in which we are interested.

New Method of Harvesting.

The main object of this method is to prevent all contact of the tobacco plants with the soil when cutting, and to avoid the perforation of the bottom leaves when the plants are speared on the laths. The mode of operation is as follows:

As the stalks are being cut, they are hung up on nails driven into the laths. The laths loaded with tobacco, and numbering from 60 to 70, are then placed on two cross-bars sustained by two racks. The tobacco is left out to wilt for a few hours before it is hauled into the curing-house. This method of harvesting is more expeditious than the one generally employed and presents the following advantages:—

1. The tobacco which is suspended on the lath immediately after cutting does not touch the ground, and, consequently, the leaves are neither soiled nor damaged by contact with the earth and the injury is reduced to a minimum.

2. The tobacco stalks being hung on the nails by their inferior extremity, there is no risk of the bottom leaves being perforated, as is generally the case when they are speared upon the lath. In short, no method could be devised that would reduce to a greater extent the handling of the crop during harvesting, and, finally, this method of harvesting is very rapid. It was feared at the outset that nails would not be strong enough to hold the plants, but our fears were not verified; on the contrary the laths were easier to handle.

Tobacco Stalks.

The waste from stripping, including as it does the tobacco stalks, is quite a valuable product. The grower gets rid of this waste in any manner, without thinking of the large quantity of nutritive elements he thus loses. We have seen tobacco stalks left in the yards, on highways, in the ditches, &c. This is a very wasteful practice; it should be remembered that tobacco stalks contain from 11 to 13 per cent of mineral matters consisting in sulphate of potash, carbonate of potash, silica, oxides of iron and manganese, phosphate of lime and carbonate of lime. One can appreciate

therefore the great loss that results from the throwing away of the waste product after stripping.

What would be the most practical means of utilizing the fertilizing value of this waste product? True, tobacco stalks, on account of their very nature, decompose slowly, and they cannot be returned at once to the field or even put on the manure pile; they would still be almost intact when the manure is ready to be applied.

The best way would be to make a compost of the stalks. The stalks could be used, a few at a time, as litter under the cattle, which will crush them, and then they could be put in a water-tight pit dug in the ground. This pit would be filled with alternate layers of crushed stalks and manure or ditch cleanings. If the fermenting mass be occasionally sprinkled with liquid manure, it will soon change into a rich mould. A year at least is necessary for this transformation.

This mould—which can be obtained with very little labour—will make a valuable supplement for the lack of manure. Lastly, in the houses where wood is used as fuel, the ashes should be carefully collected and mixed with the compost. This addition of potash, mainly as carbonates, will be most beneficial. But sprinklings with liquid manure are necessary to secure a good compost, for they furnish the elements and bacteria by which fermentation is started and regulated. There are very few farms in Quebec where liquid manure is collected. It is considered as useless, and the farmers get rid of it as soon as possible, either by facilitating its absorption into the soil or by sending it into the nearest ditches. This is a very poor practice that should be immediately abandoned. Some farmers were surprised when we told them about the high value of liquid manure. It is therefore our intention to make this question the subject of a special lecture, insisting on the necessity of collecting liquid manure; first from an agricultural point of view, in order to reduce the loss of fertilizing elements, and, secondly, for hygienic reasons, since its infiltration in the soil may contaminate drinking water.

The saving of the waste product, the collection of liquid manure, the digging of a pit for compost will certainly necessitate more labour, but this will be amply made up by the increase in the yields of the crops and by greater cleanliness of the farm. This is a question which concerns general agriculture, not tobacco culture alone, but we thought it was worth mentioning here.

Appreciation of varieties.

Brewer hybrid.—Great hopes are entertained for this new variety. In the year 1909, which was far from being favourable to tobacco culture, the Brewer hybrid yielded 1,202 lbs. per acre. The product is comparatively light, of good colour, and the shape is suitable for cigar manufacturers. Although a tender variety, it gives promise of becoming acclimatized in a fairly short time in the province of Quebec, if well grown.

The seed beds require special attention. Great care must also be given to the setting out, as the seedlings are slow in taking root. Finally, the soil must be in perfect tilth and frequently cultivated, for this variety offers little resistance to drought. However, we think the Brewer hybrid is an excellent tobacco for binders.

Hazlewood.—This variety is also very tender. Its greatest defect is the brittle-

ness of the leaves, which are damaged by the least wind. A light hailstorm may destroy the crop almost completely, as happened at St. Jacques in August, 1909.

The suckering requires careful attention, as this variety forms a great quantity of suckers, especially at the foot of the plant.

Like the Brewer, the Hazlewood appears to become fairly rapidly acclimatized. It is worth further experimenting, as it gave 875 pounds of tobacco to the acre. The product is of good quality, probably very aromatic, and might become one of our best cigar tobaccos, for 'fillers.'

PART III

EXPERIMENTAL WORK CARRIED ON IN 1909.

By W. A. Barnet, B.S.A., Manager Dominion Exp. Station, Harrow, Essex County.

The Experimental Farm was established at Harrow, Essex county, in the spring of 1909. The object of the work undertaken was: to make a systematic test of the best rotation of crops to follow, to make a study of and an experiment with the best types and varieties of tobacco to be grown on the various soils of the two counties of Essex and Kent; to make a practical test of Virginia tobacco and the flue curing process; to begin a series of experiments with a view to finding out the surest and best method of rearing strong healthy plants; to find out the most economical means of increasing the yield and restoring the wanted fertility of soils that are adapted to growing Burley, through the use of clover and the application of farmyard manure and commercial fertilizer.

The farm comprises an area of 25 acres of arable land. The soil consists of a grey sandy loam, friable, with good natural drainage, and is well adapted to such crops as corn, tobacco, wheat, &c. The rotation adopted is as follows: Cereals, clover, corn and tobacco. The latter two crops may be alternated as we see fit. It is intended that the tobacco ground shall receive an application of manure. While this rotation will not apply to the whole farm of the average grower, since he can not have one-fourth of the land in tobacco, still it is advisable that some such arrangement be adopted on that part of the farm where tobacco is to be grown. Such a practice will avoid having any 'Burley sick' land.

CORN AND OAT EXPERIMENTS.

While tobacco was the principal crop experimented with, corn and oats were tested on a smaller scale. Six of the leading varieties of corn were tried on plots 1/100 of an acre in size. Reid's Yellow Dent, a yellow corn, was the largest yielder. It gave very promising results particularly in the general crop where it yielded over 135 bushels per acre. This variety had fairly large fodder, was extra well eared up, and was well matured considering the late season. The White Cap Yellow Dent, Essex Dent and Improved Leaming, also gave good results.

A seeding with clover just before the last cultivation of the corn is being tested. It has been claimed that this is one of the surest methods of getting a close, uniform stand.

The following varieties of oats: Daubeney, Siberian, Liberty, Danette, Banner and Early Ripe, were tested on plots 1/100 of an acre in size. In strength and length of straw, yield and freedom from disease, the Banner stood foremost this season.

The general crop of oats was sown with pedigreed seed of the Ligowo variety, this particular strain being selected by hand for five years. This work in registered seed grain was undertaken in co-operation with the Canadian Seed Growers' Association.

Since oats were not well adapted to the soil, the area for cereals was sown with registered seed of the Dawson's Golden chaff variety of fall wheat. Then again it was much easier to get a thick catch of clover with wheat as a nurse crop, and it was imperative that clovers form an important part in the rotation.

PLANT BED EXPERIMENTS.

Preliminary Note.

Too many growers do not realize that the nourishment in the small tobacco seed is very limited, and the young seedling is early called upon to rely on the food from the soil of the seed-bed. The potential supply of food stored up in the seed and required to nourish the young embryo is very small compared with that stored, for example, in wheat or corn. Consequently the grower sometimes fails to realize the importance of having all conditions of heat, moisture, and food supply agreeable to the exacting needs of this delicate plant. The soil may not be sufficiently pulverized; there may be an excess of moisture due to overwatering, or, if a very sandy soil, there may not be a sufficient supply, the bed may not be warm enough and perhaps, most important of all, the soil may not be sufficiently rich in humus and the leading elements of plant food, namely, potash, nitrogen and phosphoric acid.

The strongest and thriftiest plants I have seen grown were produced in the bush, without even a cotton covering. However many farmers have not a wood lot even within reasonable distance of their buildings, hence this method is out of the question.

A fairly reliable method, which we are testing at the present time, is as follows: In the fall plow the soil and thoroughly disk up to a fine state of tilth, apply a thick coating of well rotted manure, preferably a mixture of cattle, horse, and hog manure, and allow it to leach down through the soil till spring. In the winter or early spring, finely cut tobacco stalks or a dressing of hen manure might be added. When the ground has warmed up the manure is thoroughly mixed with the soil by discing or spading it up. If there is not sufficient humus in the surface soil, a thin layer of bush virgin soil might be applied. If the plants do not make the desired growth, a weak solution of nitrate of soda, or better still a solution of the liquid from the stems and stalks could be used in watering. The latter practice gave good results on our beds last season; this was the general method being practised and did not include the experiments outlined later in this report.

However, I believe that no small percentage of the failures in growing plants may be attributed to the seed used. Too frequently the grower has relied on the old seed supply of his neighbour, or a seed firm which is not too careful in its methods of selection or, probably, from his own seed supply which was gathered from a plant regardless of its individual charseteristics and regardless of the possibility of its having been mixed with some other variety or a nondescript plant.

Seed should be secured from a well known, reliable source, preferably from your own seed plants, and its germinative powers tested before sowing. This is a safe guide. A further treatise on this subject will be presented later

Experiments with beds.

The object of this experimental work was to begin a series of experiments with a view to finding out the most successful method of raising healthy, stalky plants.

Necessity for the work.

The cold, wet, backward spring of 1909 caused many tobacco beds to be sown too late, and further hindered the rapid, uniform growth we like to see after the seed is sown. Here there was a great scarcity of plants at planting time, and the majority of the farmers could get no seedlings, even at the high prices offered. Such experiences, together with the large number of failures reported annually, indicated the necessity for more information on the subject.

Owing to our planting some eight different varieties, the area in beds was greater than that required to plant the same amount of land with one variety. There was 825 square feet of beds. We had plenty of plants, consequently a large number of some varieties was not needed. However some difficulty was experienced in getting a sufficient number to plant a plot one acre in size, with a single variety, at one time.

Construction of beds.

The bed area consisted not of one continuous long bed, but of several movable sections, each section being 14 feet long and 5 feet wide. (See illustration.) The frame was constructed so that it could be easily lifted and placed under cover when the plants were pulled. It was built with a slope of 1 inch to every foot, the back being 5 inches higher than the front. The total cost of the frame, four sash 3½ feet wide by 5½ feet long, at $3.25 each, and the work connected therewith, was $14.75. This was quite an outlay, but it was a permanent equipment that will last for many years. The ordinary man who is handy with tools could reduce this cost greatly by doing the carpenter work himself, by using lighter material in the sash, and priming and glazing it. Sash made of 1¼-inch lumber would answer as well as 1½-inch material and the former would be lighter to handle.

The kinds of beds.

Beds were established according to the following methods: Hot bed covered with glass; cold bed with glass covering, cold bed with cotton cover top; cold bed with different proportions of plant bed fertilizer applied; the same kind of cold bed with glass covering but without any fertilizer. All the beds received the same care, were sown April 16 and 17, while the soil did not vary in physical composition.

Table I.

No. 1.—Hot bed, no fertilizer, 1 to 2 inches of black mould on the surface of the ordinary soil; sown with dry seed; Big Havana variety, April 16.

No. 2.—Cold bed, fertilized with a special plant bed fertilizer, Victor guano, at ⅓ lb. per sq. foot; black mould on the surface; sown with dry seed, Hazlewood variety, April 16.

No. 3.—Cold bed, fertilized with special plant bed fertilizer, Gold Dust, at ⅓ lb. per sq. foot; black mould on the surface; sown with Cuban variety, dry seed, April 16.

No. 4.—Cold bed, fertilized with Gold Dust at 1/10 lb. per sq. foot; 1 to 2 inches black mould on the surface; sown with dry seed of Comstock-Spanish variety, April 16.

No. 5.—Cold bed, fertilized at ½ lb. per sq. foot with Gold dust on the surface of the ordinary soil; no black mould used; sown with dry seed of Improved Broad Leaf Burley, April 17.

No. 5.—Cold bed, fertilized at ½ lb. per sq. foot with Victor Guano on the surface of the ordinary soil; no black mould used; sown with dry seed of Little Oronoko variety, April 17.

No. 7.—Cold bed, no fertilizer, black mould used on the surface, watered all the time with a solution of nitrate of soda; sown with dry seed of Yellow Oronoko variety, April 17.

NOTE.—All the above beds were covered with glass.

No. 8.—Cold bed, cotton covering, fertilized with Gold Dust ½ lb. per sq. foot on the surface of the black mould; sown with swollen seed of Improved Burley, April 17.

No. 9.—Cold bed, cotton covering, fertilized with Victor guano ½ lb. per sq. foot; black mould on the surface of the ordinary soil; sown with swollen seed of Improved Burley, April 17.

General Observations.

The beds were examined on the following dates and observations made:—

April 25.—A little swollen seed, sown under glass but not mentioned in above table, was up nicely on above date, eight days from date of sowing. The first seed to show germination.

April 30.—Dry seed sown under glass was coming up a little, while No.1, the hot bed, was showing up more than the others. None of the seed sown under cotton had germinated yet while the same swollen seed under glass was growing well. Up to this date, the temperature ranged from 60° to 75° F. The weather was cold and stormy.

May 3.—Seed sown under cotton, made its first appearance of germination to-day. No. 1, the hot bed, was making most rapid growth at present. Comstock-Spanish showed a good stand. The Cuban was not doing well. No 1 bed, where no fertilizer was applied, was up as well as any of the beds receiving fertilizer The temperature ranged as follows: bed No. 1, 81° F.; No. 5, 76°; No. 9, 46°.

NOTE.—The Burley seed of a neighbour's bed under cotton and sown for 20 days was just beginning to germinate. This indicated the backwardness of the season.

May 5.—The beds were watered for the first time. The temperature was 6° higher under the glass than under the cotton. The same variation was noted on May 6. There was a nice even stand of plants under the cotton. This was the first indication of any growth.

May 7.—The temperature ranged from 90° in bed No. 6 and 85° in bed No. 1, to 70° in bed No. 9. The first weeding was done to-day.

May 12.—The variation in temperature in the different beds was as follows:—

8 a.m.—Bed No. 1.	.....72° F.;	6 p.m.—Bed No. 1.	.....72° F.
" 5.	.....84° F.;	" 5.	.....90° F.
" 6.	.....75° F.;	" 6.	.....79° F.
" 8.	.....63° F.;	" 8.	.....63° F.
" 9.	.....61° F.;	" 9.	.....63° F.

This table indicates that on this da e the temperature increased during the day under the glass while it was stationary under the cotton and remained from 16° to 27° lower. No. 1, the hot bed, did not show any rise in temperature and maintained a lower degree of heat. This was owing to the fact that this bed was too wet, being situated on the lowest part of the ground. Nos. 2 and 4 sown with cigar varieties, were making the most rapid growth, many plants having 6 leaves. The Cuban seed was giving a very thin stand. A thick greasy form of mouldiness has formed on the bed where the fertilizer was applied to the surface of the ordinary soil, but it did not interfere with the subsequent growth of the plants.

May 20.—A large number of cigar plants had eight leaves. The plants under cotton were doing well, quite a number having four leaves. There was not so much variation in temperature now between the beds under cotton and those under glass. The difference was 9° F. in favour of the glass. Began watering with nitrate of soda, using a teaspoonful in four gallons of water. No. 1, the hot bed, which made the most rapid growth at the start, was doing the poorest of any due to the setback from the excessive moisture in the bed.

May 26.—Burley under cotton was doing well. Hazlewood and Comstock-Spanish under glass were growing most rapidly. In the morning the temperature was 9° higher under the glass as compared with the cotton, in the evening 15° to 18° F. higher. The beds were being watered with a solution of nitrate of soda, using a large handful to four gallons of water.

May 29.—Comstock and Hazlewood varieties were ready to set out. The glass had been removed entirely from these beds during the greater part of the day, allowing the plants to harden up.

June 5.—The first planting was from the Comstock and Hazlewood beds. There was not much difference in the stand in these two beds although the Hazlewood plants were rather larger and thriftier, owing possibly to the fact that this bed received a heavier application of fertilizer. No signs of disease were observed. At this time, nitrate of soda at the rate of one to two handfuls in four gallons of water was being used every third day in order to force the Virginia type plants. These latter grew slower than any other variety. The plants receiving the stronger solution of soda were making the most rapid growth, as shown by the large dark green leafage. The Little Oronoko variety in No. 6 bed was now ready to set.

June 8.—Beds numbered 2 and 3 were again showing an excellent growth. In short, the earliest and strongest plants were obtained from these beds, possibly due to the cigar variety characteristics of rapidity and strength of growth rather than the special merits of the fertilizer or the method of establishment would have made.

June 12.—In watering, a solution of nitrate of soda at the rate of ¾ lb. in four gallons of water was used every other day. The effects were very noticeable on some beds, particularly on the Virginia leaf plants which were very slow growers. Small spots on some of the beds were turning yellow, due either to an excess of moisture or to the thickness of the stand. Replanting was begun to-day.

The observations may be summarized as follows:—

1. The cigar tobacco varieties were ready for transplanting five to eight days earlier than the other kinds.

2. The plants grown under glass were ten days to two weeks earlier than those grown under cotton. Some of the Virginia type beds had to be changed from cotton to glass covering, to ensure the plants maturing in due season.

For slow growing varieties during a wet, cold, backward spring like that of 1909, the glass covering was the surest and most successful method.

4. There was no appreciable difference in the thrift and robustness of the plants under glass or under cotton.

5. The nitrate of soda gave very successful results as a stimulator of plant growth. It must be used cautiously.

6. Where the heavier application of fertilizer was given, the plants grew faster in the final stages of growth, but there was no benefit as to the rate of germination.

7. The temperature ranged from 9° F. higher in the morning to as much as 27° F. higher in the evening, under glass, as compared with the cotton.

8. The elevated position with good natural drainage was preferable for the location of the bed.

Preparation of the Tobacco Ground.

The type of soil.—The soil consisted of a gray sandy loam containing a trace of fine gravel and particles of very fine sand. It contained a very moderate amount of organic matter or humus.

Part of the area for tobacco was ploughed early, about 5 inches deep, 10 to 12 loads of farmyard manure applied, and disced in a few days before setting. Another portion of the tobacco ground was first manured at the same rate, ploughed and disced. No appreciable difference in the ultimate yields of the crop were noted. The manure that was disced in, was easily decomposed and seemed to be thoroughly incorporated with the soil, due no doubt to the moist season and the frequent subsequent cultivation given. When the manure is ploughed in shallow, either method should give good results, although the season has a marked influence.

General Care of the Crop.

Replanting was begun as soon after the first planting as the blanks were found. The cut-worm did considerable damage, particularly in the area of Virginia leaf tobacco which was replanted three times.

Cultivation.—The crop was cultivated about every week or ten days with a two-horse combination tobacco and corn cultivator, which was operated by two men when cultivating tobacco. This implement was used until there was danger of damaging the leaves and the roots spread out too much between the rows, when shallow cultivation with the single cultivator was adopted. The tobacco required hoeing but once, owing to the splendid work done by this special cultivator.

Just at this point, the writer wishes to emphasize the importance of frequent thorough cultivation, rather deep in the early part of the season, and gradually becoming shallower, thus not allowing the weeds to get a start. Thorough cultivation aerates the soil, favouring bacterial action and rendering the plant food more available. It maintains a surface blanket of loose soil, thereby avoiding evaporation and incidentally conserving the moisture which is so essential to a large crop. In no small degree do we attribute the yields of our different crops to cultivation. There are probably no other crops grown on the farm that respond more to good cultivation than corn and tobacco.

Spraying with Paris green.—About the latter part of July the tobacco worms became so numerous on the plantation that spraying with Paris green was resorted to. This practice was quite effectual in keeping down the insect and practically all the 9½ acres was sprayed once and some of it twice.

The two problems experienced in its effective use were: First, the difficulty of obtaining a solution of the proper strength—not too concentrated to burn the leaf, and not too weak to be effective; second, the undue reliance on the complete extermination of the worms ultimating in an increased damage to the crop. The proper strength will be decided upon next season.

Where hand picking alone, was resorted to, it was very difficult to keep the hornworm in check. A very effective agent which we purpose trying in the combating of this insect is the duck. I have noticed that on the 230 acre plantation of the Walker Company ducks gathered practically all the worms.

Field tests of the different varieties.

The following varieties of cigar tobacco were tested: Comstock-Spanish—for binder purposes—planted June 5, at 3 feet between the row, 17 inches in the row. Also a portion of the acre was planted 3 feet by 21 inches; Hazlewood—for cigar filler purposes—planted June 5, ½ acre, 3 feet by 17 inches, ½ acre, 3 feet by 21 inches; Cuban—filler type—planted June 11, 3 feet by 21 inches.

Big Havana—filler type—½ acre planted June 11, 3 feet by 17 inches. The Cuban and Hazlewood were topped at 10 to 14 leaves. The leaf was quite small, was placed far apart on the stalk and the yield was likewise light, being 875 lbs. per acre. The Hazlewood was considerably diseased or calicoed but the tissue was not materially affected. The Cuban was badly blighted and made a poor growth in the field. The Big Havana made the best showing of the filler types, it being little affected with the mosaic disease. The yield for this season was 1,600 lbs. per acre. The Comstock-Spanish was considerably blighted although its commercial value was not reduced. It was topped at 12 to 14 leaves, depending on the growth and size of the plant. Altogether, it was a very uniform crop having a good shaped leaf; the yield was 1,000 lbs. per acre. It was well adapted to the soil so far as the field observations and the colour of the cured leaf would indicate.

Other cigar varieties tested on a smaller scale were Connecticut Broad Leaf, Connecticut Havana, and Big Ohio.

The Big Ohio and Connecticut Broad Leaf made an excellent growth and seemed to be well adapted to the soil and climatic conditions.

Any grower who wishes a large yielding tobacco would do well to try either of these two last mentioned varieties. Where a farmer has a dark soil containing a large amount of black muck, the Big Ohio might be tried. since, it being a dark type tobacco, should give better results than the Burley so far as colour is concerned. Agsin, a farmer who has a suitable piece of tobacco soil that has been growing Burley for several years snd might now be termed 'Burley Sick,' should plant either of these two varieties if a large yield is aimed at. The reason for this condition of affairs is that the demands on the soil of these cigar varieties are different from the Burley. They will give handsome returns on a soil that will not grow this variety.

After being set out, the Cuban variety took root extremely well and made a rapid growth for the first two or three weeks after planting, but blight very soon set in, due, possibly to the cold dry period in the first part of July, which was followed by heavy rains during the latter part of the month. At all events, the growth was retarded and the leaf developed a rough, leathery appearance. The upper surface became very uneven, and turned a marked yellow, motley colour, from which it never recovered.

It would appear that, with this year's experience in view, later planting. possibly not till June 20, would be preferable for the Cuban and Hazlewood. Since these varieties matured in 75 days, there would be plenty of time for the full maturity to be reached and the curing perfected. However we cannot recommend either of these varieties to the grower. Fuller information will be given after the fermentation process is reported on by the manufacturer.

Harvesting.

Three weeks after topping, the Comstock-Spanish showed signs of ripening. Of course all the plants did not ripen at the same time, but no attempt was made to single out the riper ones. Harvesting was completed August 23, just when the top leaves were showing the yellowish green spots. Much of the success in curing and final sweating will depend upon knowing when the plants are ready for harvesting. The Big Havana was harvested a little riper than the Comstock, while the Cuban and Hazlewood were allowed to become still riper before being cut. In the latter two cases the leaf was quite thick and heavy as compared with the Comstock-Spanish which had a thin textured tissue.

Curing and grading.

All the above varieties were cured in the ordinary air-curing barn. (See illustration.) The barn was kept rather tightly closed during the first stage to prevent too rapid drying out of the leaf. When the yellow cast followed by the brown colour appeared, the ventilation was increased and the humidity decreased by the opening of the ventilators. Thus a rather slow curing was followed during the first stage while the leaf was dried out rather rapidly during the last part of the process.

It is possible that, judging from the extremely open appearance of some barns, a few growers dry out the leaf so rapidly during the first few days as not to allow those changes to take place which are essential to good curing. It is true that we must avoid pole sweat, and ventilation at the proper time is the only means of avoiding it, but some go to the other extreme. By following the above method we had but

a very slight trace of pole burn in the centre of the barn, and the cigar varieties, particularly the Comstock-Spanish, have air-cured a very uniform clear colour. A spiral ventilator on the top of the barn removed the foul air by suction. For the Burley the writer would recommend plenty of ventilation.

Grading.

The cigar varieties have been stripped and graded. The sorting was done as the leaves were removed from the stalk. The first grade known as 'binders' included the best leaves, all damaged and discoloured ones being kept out of this pile. The second grade known as 'fillers' comprised all the top leaves and small sound specimens not mentioned in the first class. The third grade included the sand leaves and all dsmaged members not contained in the above classes.

FERTILIZER EXPERIMENTS WITH IMPROVED BROAD LEAF BURLEY.

Introductory Note.

In a vast number of cases the Essex county farmer has found that the yield of Burley is either remaining stationary or decreasing, or, in a few cases, the soil is actually 'Burley sick'—a successful crop of this variety cannot be grown. This problem of how to increase the yield with a rational amount of outlay is facing many of the tobacco growers to-day. Heavy applications of manure, however beneficial they may be, or the frequent use of leguminous crops, however large an amount of nitrogen or potash they may restore to the soil, are not sufficient in themselves to meet all the demands of the crop. Such manures need to be supplemented with commercial fertilizers, particularly if several consecutive tobacco crops are intended to be grown in a short rotation, and the largest yields are looked for. Of course there are exceptions to the above conditions; some farmers have adopted a systematic rotation of crops, have ploughed under clover frequently, have employed all the farmyard manure that they could produce or purchase, and with the use of a little fertilizer have maintained good yields.

With a view to finding out how to maintain and increase the present yields, a series of experiments with different combinations of single fertilizers was undertsken. The soil on which the experiment was conducted had grown a successful crop of corn in 1908 and in previous years had been cultivsted and manured in the ordinary manner.

The intention was to prove that on such a soil—a first-class tobacco soil—the yield could be materially increased. It will be seen further that despite the unfavourable season, we had very good success.

One acre was divided into six plots of equal size. The soil of each plot was of like texture, was prepared in the ordinary manner, and planted June 9 with the same type of plants. The distance of planting was the same on all plots—3 feet 4 inches by 32 inches.

Three simple fertilizers namely: Sulphate of potash, sulphate of ammonia, and superphosphate besides barnyard manure, were used in this experiment. To each plot different combinations of the above fertilizers were applied with and without manure. One plot which did not receive any fertilizer, served as a check plot. The chemical manures were applied broadcast to the different plots as follows:

Table 2.

No. 1 Plot.—Barnyard manure—15 tons per acre. Complete fertilizer—
625 lbs. per acre, sulphate of ammonia.
375 " " potash.
375 " superphosphate.

No. 2 Plot.—Barnyard manure—10 tons per acre.

" 3 " —Check plot; no manure; no fertilizer.

" 4 " —Sulphate of potash, 375 lbs per acre.
" ammonia, 625 lbs. per acre.

" 5 " —Sulphate of potash, 375 lbs. per acre.
Superphosphate, 375 lbs. per acre.

" 6 " —Sulphate of ammonia, 625 lbs. per acre.
Superphosphate, 375 lbs. per acre.

As shown above the experiment was planned to find out:—

First.—The necessity of using barnyard manure.

Second.—The influence of chemical fertilizers.

Third.—The particular element or elements lacking in the soil and the demands of the crop.

General Observations.

The information to be gathered from the field observations was as follows—

September 1.—No. 1: The manure and complete fertilizer plot was more advanced than Nos. 5 and 6 which had received nothing but fertilizer or than No. 2, which received only barnyard manure. (See illustration.) Between Nos. 1 and 4 the difference in growth was not very marked, but comparing these two plots with Nos. 2, 3, 5 and 6, the difference was very striking. Between Nos. 5 and 6 there was not such a pronounced margin, but on this date No. 6 was beginning to spot up with white blotches. Plot 5, although not presenting the dark rich green noted in plot 4, indicated a very fair yield.

September 17.—To sum up: Plots 1 and 4 always were ahead and there was very little difference on the date of harvesting. No. 4 indicated that the Burley plant required a large supply of the two elements, potash and nitrogen, and that the soil was deficient in them. Quite a large number of leaves on this plot measured over 40 inches in length. No. 1 gave a very heavy yield. The close observer could scarcely detect any advantage in this plot over No. 4. The manure plot gave better results than the check plot, indicating that the soil required manure. No. 5 gave a better

leaf than No. 6, indicating that potash was a very essential ingredient in the production of a successful crop of Burley.

The yields per acre, the value of the crop computed at 15 cents per lb., the prevailing market price, the cost of the fertilizer, and the net receipts obtained from the six plots, are given in the following table. The cost of the single fertilizers was calculated according to the prevailing prices quoted by a leading fertilizer company. Sulphate of ammonia, $52 per ton; sulphate of potash, $52 per ton, and superphosphate. $17 per ton. Farmyard manure was valued at $1 per ton.

Number of Lot.	Quantity in lbs. of fertilizer per acre.	Yield per acre.	Value of crop per acre.	Cost of fertilizer per acre.	Cost of manure per acre.	Net value of crop per acre.
		lbs.	$ c.	$ c.	$ c.	$ c.
1	625 sulphate of ammonia, 375 sulphate of potash, 375 superphosphate, 15 tons of manure	2,424	363 60	29 18	15 00	319 20
2	10 tons of manure	1,724	258 30		10 00	248 30
3	No manure. No fertilizer	1,188	178 20			178 20
4	375 sulphate of potash, 625 sulphate of ammonia	2,328	349 20	26 00		323 20
5	375 sulphate of potash, 375 superphosphates	1,416	211 40	12 93		208 47
6	625 sulphate of ammonia, 375 superphosphates	1,434	215 10	19 43		205 67

Comments.

As shown by the table, plot 1, which had received an aplication of manure and complete fertilizer, gave a yield of 2,424 lbs. per acre, (see illustration) the highest yield of any of the plots. Plot 4, receiving the sulphate of potash and sulphate of ammonia, but no msnure, was a very close second with 2,328 lbs. per acre. These two yields were exceptionally high and they exceeded the expectation in the field. The former yield was actually more than double that obtained on the check plot. This latter mentioned plot where no outlay was expended in manure or fertilizer, yielded 1,188 lbs. per acre, with a gross receipt of $178.20. This was the smallest net return obtained from any of the plots. Plots 2 and 3 showed the advantage of using barnyard manure, an increase of 534 lbs. per acre being obtained through its use. An increase of 702 lbs. per acre in plot 1 over 2 indicated the necessity of using commercial fertilizer to obtain maximum results. This was due almost directly to the fertilizer, although plot 1 had a slight advantage in that the quantity of manure applied was more than on plot 2.

The small difference of 18 lbs. between the yield of plot 5, fertilized with sulphate of potash and superphosphate, and plot 6, fertilized with sulphate of ammonia and superphosphate, is worthy of note. Comparing the net receipts, No. 1, the lsrgest yielding plot did not give as large a net income by about $3, as plot No. 4. This latter fact was but a single instance of the monetary value of testing simple fertilizers, to find out which ones give the best economical returns, and which the soil required. A comparison of plots 5 and 1 indicated the effect of the nitrogenous msnure, sulphate of ammonia. Nitrate of soda, a more easily soluble form of fertilizer, would have had the same effect. Plots 6 and 1 indicated the effect produced

by the potash manure, sulphate of potash. The difference in yield in these two cases being about on a par, indicated that both potash and nitrogen were demanded by the Burley plant and that this particular soil was lacking in both. Again, the differences in both cases being about equal, indicated that the one was needed as badly as the other; they were inseparable if the best results were to be obtained. This latter statement was strongly emphasized by the heavy yield obtained on No. 4, which plot gave the largest net return of any of the combinations, although the yield was not as large as in the case of No. 1. (See illustration.)

Conclusions and Recommendations.

First.—To get the largest results in growing Burley farmyard manure should be supplemented with a moderate application of commercial fertilizer. While a complete fertilizer might give good returns on some farms, it cannot be used upon all soils with the same degree of success, owing to the great variation in the composition of the latter. Frequently it might contain an element which was already in sufficient quantity in the soil.

Second.—An application of good manure was a necessary paying investment, being the most economical method of adding humus and plant food to the soil. Ten tons per acre increased the yield 534 lbs.

Third.—An application of sulphate of potash and sulphate of ammonia gave the largest net returns ($323.20 per acre) after paying for the fertilizer, while sulphate of ammonia was used; nitrate of soda would answer just as well and is in a more available form. Whereas 1,000 lbs. of these two fertilizers was used economically, still 250 lbs. nitrate of soda and 300 lbs. sulphate of potash, in conjunction with a liberal application of barnyard manure, might be tried to advantage on the average soil.

Fourth.—The Burley crop required potash and nitrogen, and this soil was lacking in these elements, as shown by the increase in yield of 1,140 lbs. per acre in the potash and nitrogen plot over No. 3, the check plot. This data is in compliance with the investigations of Prof. Voorhees, one of the leading chemical authorities, who has stated 'that a crop yielding 1,000 lbs. of cured leaf will contain or remove from the soil 67 lbs. of nitrogen, 9 of phosphoric acid and 85 of potash.'

Fifth.—Final conclusions must not be drawn from a single experiment. The tobacco grower should experiment for himself, using the above data as a guide. This will save him any needless expense. Buy the simple fertilizers, mix them at home on an earth floor, using the above proportions, and apply broadcast or in a shallow furrow, which can be filled in before planting. If a very small amount is applied, mix with the soil around the plant after setting.

Flue Curing Experiments.

Preliminary note.—The yellow or Virginia type tobacco can be successfully grown only on light sandy soils. The importance of the character of the soil is well illustrated by the fact that small areas on a farm might produce a bright yellow leaf of the finest quality, while certain portions of the same farm would produce only the

second or cheaper grades. However, the season, the distribution of the rainfall, or a cold backward period in early spring retarding growth, have a very important bearing on the final product.

Equally as important as the nature of the soil, is the handling of the curing process. No other type of tobacco demands so much skill, experience, and good judgment in the curing. A little misjudgment in maintaining a certain temperature for too long or too short a period, will largely lessen the value of the product. Slight differences in shades of colour may mean large margins in the selling price. If the colour of a bright wrapper leaf be injured for that purpose, the value of the crop may be reduced from 50 to 75 per cent.

The introduction of Virginia leaf was undertaken with two main objects in view:—

First.—To develop the production of this type on suitable soils in order to replace a certain amount of the Burley produced, thereby avoiding the possibility of an overproduction such as was experienced in 1905-6.

Second.—To stimulate the growth of this type of tobacco on adaptable soils, thereby meeting the demand of some ten million pounds—the amount annually imported from Virginia and the Carolinas for the purpose of pipe smoking, cigarettes, plug fillers, and wrappers. There is no plausible reason why this tobacco cannot be grown on a particular area of light sandy soil bordering on Lake Erie where possibly a successful crop of Burley could not be produced.

For the purpose of introducing the Virginia type tobacco on a practical and scientific basis a competent expert was obtained from Virginia to grow the crop according to the most approved methods and to superintend the curing process.

Area in the Virginia leaf.—Three and one-half acres were planted from June 9 to 18, with three of the leading varieties, namely: Little Oronoko, Yellow Oronoko and Warne. (See illustration.) The soil chosen was a grey sandy loam, while some spots tended to be gravelly in nature. No manure was applied but a portion of the area received a light application of commercial fertilizer, to hasten maturity.

Fertilizers used.—On one acre a special tobacco fertilizer was drilled in with the attachment on the planter at the rate of 400 lbs. per acre. On another acre of Warne, a home mixed complete fertilizer was applied at 375 lbs. per acre in a furrow 3 inches deep, the latter being filled in again before planting.

The increase in yield was not noticeable in the field. Undoubtedly the method of application and the excessive drouth in the early part of the growing season had a marked influence, by not allowing the fertilizer to become dissolved and incorporated with the soil when the plant needed it most.

Date of planting.—The Little Oronoko was planted June 9, 3½ feet by 32 inches. This variety was characterized by a small narrow leaf and this fact together with the cool dry weather during its growing season, produced a leaf much too narrow and rough. The curing revealed a very rich, oily, heavy bodied leaf, too dark to classify in the best grades.

The Warne and Yellow Oronoko planted a week later gave much better results owing to the fact that the very dry cool weather in the first ten days of July, did not

affect these varieties so much, and the heavy rains in the last few days of the month stimulated a growth before the final priming and topping was completed. When cured quite a large percentage of the best coloured grades were obtained.

Notwithstanding this year's experience relative to the date of planting, it is the intention to begin planting the 1910 crop not later than May 24 in order to have it mature as early as possible, thereby avoiding frost and the damage from high winds in the latter part of September. This season's experience was contrary to the general rule that early planting was necessary to give the best colour.

Hence we would recommend that any farmer contemplating the growing of this tobacco, should make provision for a supply of early plants. It is preferable to have seedlings ready not later than May 24, so if favourable weather prevailed planting might be commenced. To this end the glass sashes are preferable for forcing the young plants.

The importance of early planting, for at least a portion of the crop, will be realized when we mention the absolute necessity of having a plant thoroughly ripe before harvesting, if we hope to obtain the ideal colour. Then, too, the season, generally speaking, is none too long for this type of tobacco. Further the farmer who cures three acres of a good crop in the ordinary sized kiln will find that at least a part of the crop must ripen early in order to handle it expeditiously and avoid loss from allowing it to stand on the field too long. Because, the kiln will hold but one acre at a curing, and in all probability one week will elapse from the time the barn is filled till it is again ready for refilling.

Field Culture and Harvesting.

When the button began to appear, the plant was first 'primed,' that is, the bottom and sand leaves were removed so that nothing but sound leaves remained. Then the topping was done in the ordinary manner. The plant was topped at 9 to 12 leaves, the average bearing ten. This operation required a delicate sense of judgment together with an alert mind to sum up quickly the future possibilities of a plant. Following this, the soil was brought up around the plant either by hand hoeing, which is the preferable method, or, through the manipulation of the special tobacco cultivator. This was termed 'laying by' the crop, that is, there was no more cultivation or hoeing during that season.

The Virginia tobacco should be riper before cutting, than is the case with almost any other tobacco. The entire plant should have a yellowish green cast and every leaf show marked yellow spots on the upper surface. To ensure the best colour requires that the leaf be harvested at the right stage of maturity.

Harvesting.

The entire plant method of harvesting was adopted. The plant was first split from the top down to near the bottom leaves, and then cut off at the ground. This operation was done with a special hooked blade type of knife. The plant was then inverted and placed over the lath using the forefinger and thumb of the left hand. This operation required a boy to hold the lath in a horizontal position and lay it down when full and the plants had been evenly spaced. The tobacco was then loaded on the waggon and hauled to the kilns before wilting.

Curing.

The special feature connected with this tobacco, was the method of curing. The object was to develop a lemon yellow colour, and yet damage the texture and elasticity as little as possible. The ideal leaf, in addition to the colour, has a rich oily appearance, a fine texture and is not too prominent in the veins, in short a bright wrapper for plug purposes.

Kilns.

Special barns or kilns were required for the curing. They must not be so large that they cannot be filled in one day for the tobacco in any one barn should not be in different stages of greenness.

The kilns were built in two sizes, one 20 feet by 20 feet, and the other 16 feet by 16 feet. (See illustration). The first mentioned contained five sets of tiers horizontally, and five sets of tiers to the eaves, the first set being about 8 feet from the ground and each succeeding set was 3 feet 3 inches higher. The smaller one contained 4 sets of tiers horizontally and the same number vertically as the former kilns. Two brick furnaces, 6 feet in length with a 12 inches galvanized iron pipe connected to each, distributed the heat evenly throughout the building, the smoke being transmitted to the open air. (See illustration.) The furnaces were placed so that the four lengths of iron piping were equal distance from each other, while the outside lengths were of equal distances from the wall. Each furnace was 16 inches x 24 inches, inside measurement and was fitted with iron grating, so that either coal or wood could be used as fuel. A 5-foot cement wall was built under each barn to avoid any danger from fires. The barns were constructed as tightly as possible, with two adjustable ventilators in the gable ends. They should be located in a sheltered spot, as a strong wind would cause the temperature to lower on the windward side, and thus prevent an even curing.

Curing Yellow Tobacco.

The curing process was completed in from three to five days, through the use of artificial heat. The degree of heat developed inside the kiln, varied with the stage of the curing, the condition of the tobacco and the climatic conditions prevailing. It is sufficient to state that the same method cannot apply successfully in every particular curing. One of the principal reasons for this is that all these formulas are based solely on the temperature. However the condition of the tobacco must be watched as closely as the thermometer.

The following is a summary account of the method used in two of the curings. The variety under test was the Warne:

Tuesday, 9 a.m., till 12 p.m., 85- Fah.	15 hours.
" 12 p.m., till Wednesday, 12 a.m., 85°-90° F. . . .	12 "
Wednesday, 12 p.m., till 6 p.m., 90°-105° Fah.	6 "
" 6 p.m., till 12 p.m., 105°-110° Fah.	6 "
Total.	39 hours.

NOTE.—This was known as the 'Yellowing process.' The ventilators were kept closed.

Wednesday, 12 p.m., till Thursday, 6 a.m., 110°–125° F...	6	hours.
Thursday 6 a.m., till 8 a.m., 130° F...	2	"
" 8 a.m., till 12 a.m., 135°–140° F...	4	"
Total...	12	hours.

NOTE.—This process was known as 'Fixing the colour.' The ventilators were open till 12 a.m., Friday.

Thursday, 12 a.m., till 12 p.m., 140°–175° Fah...	12	hours.
" 12 p.m., till 6 a.m., Friday, 175°–190° Fah...	6	"
Friday, 6 a.m., till 8 p.m., 190° Fah...	14	"
" 8 p.m., till 10 p.m., 195°–200° Fah...	2	"
" 10 p.m., till 2 a.m., Saturdsy, 210°–215° Fah.	4	"
Totsl...	38	"

It will be noted that this curing lasted from 9 a.m., Tuesday, till 2.m., Saturday. —89 hours.

The time required was longer than ordinary, owing to the fact that great trouble was experienced with the coke in the firing. It was impossible to reach the higher temperstures with this fuel.

As a summary statement regarding the tobscco in this kiln we would say that the colour was the best obtsined from any of the curings. The high temperature in the final process had a tendency to give it a more uniform shade and drive out the green cast.

The following is a summary of the curing in the small kiln, that was fired at the same time as the former:—

Monday, 9 a.m., till 6 p.m., 80°–85°F...	9	hours.

NOTE.—The ground tier 'sapped out' instead of yellowing. Monday night and all day Tuesday, no fire. Trying to get the tobacco to yellow.

Wednesdsy, 7 a.m., till 7 p.m., 90°–95° F...	12	hours.
" 7 p.m., till 7 a.m., Thursday 100°–105°F...	12	"

The tobacco was yellow at above temperature. One ventilator was open.

Thursday, 7 a.m., till 12 a.m., 115°–120° F...	5	hours.

The ventilation was closed at 9 a.m.,

Thursday, 12 p.m., till 9 p.m., 125°–130° F...	9	hours.
" 9 p.m., till 6 a. m., Friday 135°–140° F...	9	"
Fridsy, 6 a.m., till 7 p.m., 140°–155° F...	13	"
" 7 p.m., till 7 a.m., Saturday, 155°–170° F...	12	"
Saturday, 7 a.m., till 4 p.m., 170°–185° F...	9	"
Total...	90	hours.

NOTE.—Occasionally the temperature reached 200° F.

It will be noted that this curing was even a longer time than the first mentioned, although the total number of hours firing was about the same—90 hours. This was owing to the trouble experienced in getting the tobacco to yellow in the first stage of the process. Probably this was due to the condition of the tobacco, it being too green to yellow properly.

The Flue Curing of the Burley.

On September 13 the large kiln was filled with Improved Broadleaf Burley. Owing to the fact that the tobacco presented such a yellow appearance in the field, it was thought that it would be an interesting experiment to test it in the kilns.

The following is a summary of the temperatnres at the different periods:—

Tuesday, 10.30 a.m., till 4 p.m., 90°–95° F.. .. .. 5½ hours.
" 4 p.m., till 8 p.m., gradual rise from 95°–115° F. 4 "

This was known as 'fixing the colour.'

Wednesday—Drying the leaf:—temperature was 130°–140° F.

Thursday—Drying the stem:—temperatnre was 150°–180° F.

Thursday—Drying the stalk:—8 p.m., till Friday, 1 a.m.
—temperature was 200°–220° F.. .. .. 5 hours.

It will be noted that this kiln was cured in the comparatively short period of 62½ hours. This was ten hours less than three days. The reason was that over ten hours was saved in the yellowing process, this tobacco having the yellow cast when put in the kiln. However, it was found that the leaf was quite tender, and on this account did not take the heat as quickly as it was applied; some of it 'scalded.'

Nevertheless, as a general summary, we are pleased to state that the colour was a uniform lemon yellow. The leaf was, however, quite thin and papery, lacking in body. There was also a deficiency of oil and gum, the tissue presenting a rather lifeless appearance. Had the tobacco been thoroughly ripe and the leaf thicker, a very attractive product would have resulted; as the colour was about ideal, the best of all the curings. When smoked the flavour was comparatively mild. I might add that some of the manufacturers were much interested in this flue cured Burley, and some interesting developments may result.

Formula for curing.

The following formula was the one given by the expert in charge:—

Yellowing the leaf..	80° F.	for 24	hours.
" "	90°–100° F.	" 6	"
Sapping the leaf..	110° F.	" 15	"
Setting the colour..	120° F.	" 16	"
Drying the leaf..	130°.	" 6	"
" "	140° F.	" 12	"
Drying the stem..	150°–160° F.	" 12	"
Drying the stalk..	180°–200° F.	" 12	"

However, this formula must serve as a guide only. The condition of the tobacco must be watched as closely as the thermometer. If the temperature of the barn be

increased too rapidly, the sap will be dried into the leaf, and a greenish black discolouration will be noted. This is known as 'scalding.' On the other hand, if insufficient heat is supplied or, more important still, if there is not sufficient ventilation to remove the moisture as quickly as it is given off by the leaf, the latter will 'sponge,' or become red in spots. These troubles will occur during 'the fixing of the colour' which is the most critical period and requires the closest attention.

As soon as the leaf was cured, the fires were let down and the doors and ventilators opened. As a general rule the moisture of the air will soon bring the tobacco 'in case'—in condition for handling. If the weather be wet, the barn should not be opened. Sometimes the weather may be so dry and cool that it is necessary to turn steam into the kiln to bring the tobacco in order. Dampened straw or water on the barn floor will generally help very materially.

When the tobacco was in condition, it was bulked down, without being removed from the lath, and the barn refilled again. A few days in the bulk improved the appearance and straightened out the leaves. Sometimes it was hung up closely on the lath.

Later in the season the crop was taken down, stripped and graded. The longer it was left the better the colour obtained, as the greenish cast disappeared. After grading, the leaf was rebulked, care being taken that it did not become too moist, as this condition would darken the colour and likely cause mould.

Quite a large percentage of the best grades were obtained from the different curings. The following classes were made: First—'Wrappers'—consisting of the most perfect leaves, subdivided into bright lemon yellow, bright red and dark red; second—'Tips or cutters,'—leaves deficient in colour and inferior in quality to wrappers; third—'Lugs'—divided into bright and dark grades. This class, also known as smokers, included the sand leaves and all those which were bruised, torn or lighter in body than the first two grades.

The results obtained this season were quite encouraging. The gross return per acre was $210. The cost for fuel, including coke, lump coal and rails, besides the cost of the fertilizer used, amounted to $10 per acre. No manure was applied as it would have stimulated too rank a growth and retarded the date of maturity.

Seed Selection in 1909.

About 500 typical plants from the different varieties were selected and a light paper bag placed over each flower just when it was beginning to open. (See illustration.) This prevented cross-fertilization of the different varieties and at the same time prevented the intercrossing of flowers of a good plant with those of a poor one.

The bags were pulled up on the flower head two to three times to allow the flower to develop. When sufficient pods had developed seed, all immature capsules and late flowers were destroyed and the bag was removed. Thus, nothing but large self-fertilized capsules were allowed to ripen in the open air. By this method of selection the flower received plenty of light and a free circulation of air.

In saving the seed plants, the leaves were allowed to remain till after the harvesting of the general crop. When it was thought that the seed would not ripen or brown up entirely, the leaves were removed.

Had the season been longer, the leaves would have been left on for an extended period. The writer would recommend this method of seed selection in the light of two successful years experience.

The importance of obtaining reliable seed.

Large plump seed will produce strong stalky plants, which are more valuable for planting. Light seed will tend to give an irregular stand. It has been found by experiment that crops raised from heavy plump seed were almost entirely free from calicoed plants, while crops raised from light seed of the same variety showed 15 to 40 per cent of calico plants. In addition, heavy seed will germinate more rapidly, and produce earlier and more uniform plants. Practical experience haa taught many farmers thc necessity of sowing reliable seed of all grains, legumes and grasses. Why not select the largest and best developed tobacco seed.

We cannot pay too much attention to the question of obtaining pure reliable seed. Undoubtedly, unless we have a large heavy sample, obtained from a known relisble source, we cannot hope to have uniform disease-resistant plants, and the safest method to get such seed is individual seed sele .ion from your own plantation.

Free distribution of seed.

When the above seed is cleaned, graded and a fair sample tested by germination, it will be ready for general distribution to the growers. It will be distributed free on application to the Tobacco Division, Ottawa, Ont., or the Dominion Experimental Station, Harrow, Ont.

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I. Plantation of Comstock x Sumatra.

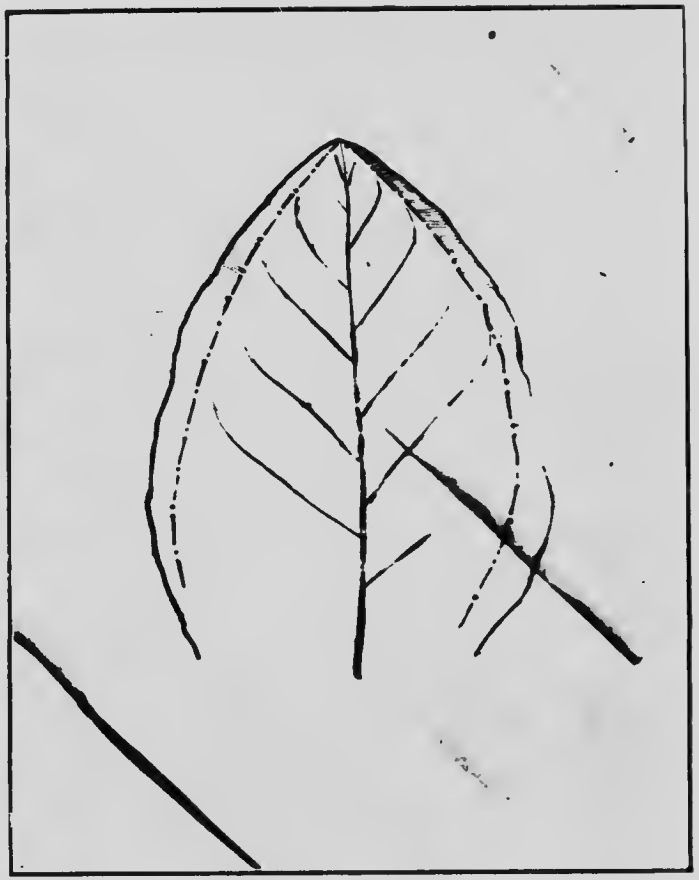

PLATE I.

II. – A comparison between the shape of the ordinary Comstock and that of the improved Comstock. (The inside leaf is that of the ordinary Comstock.)

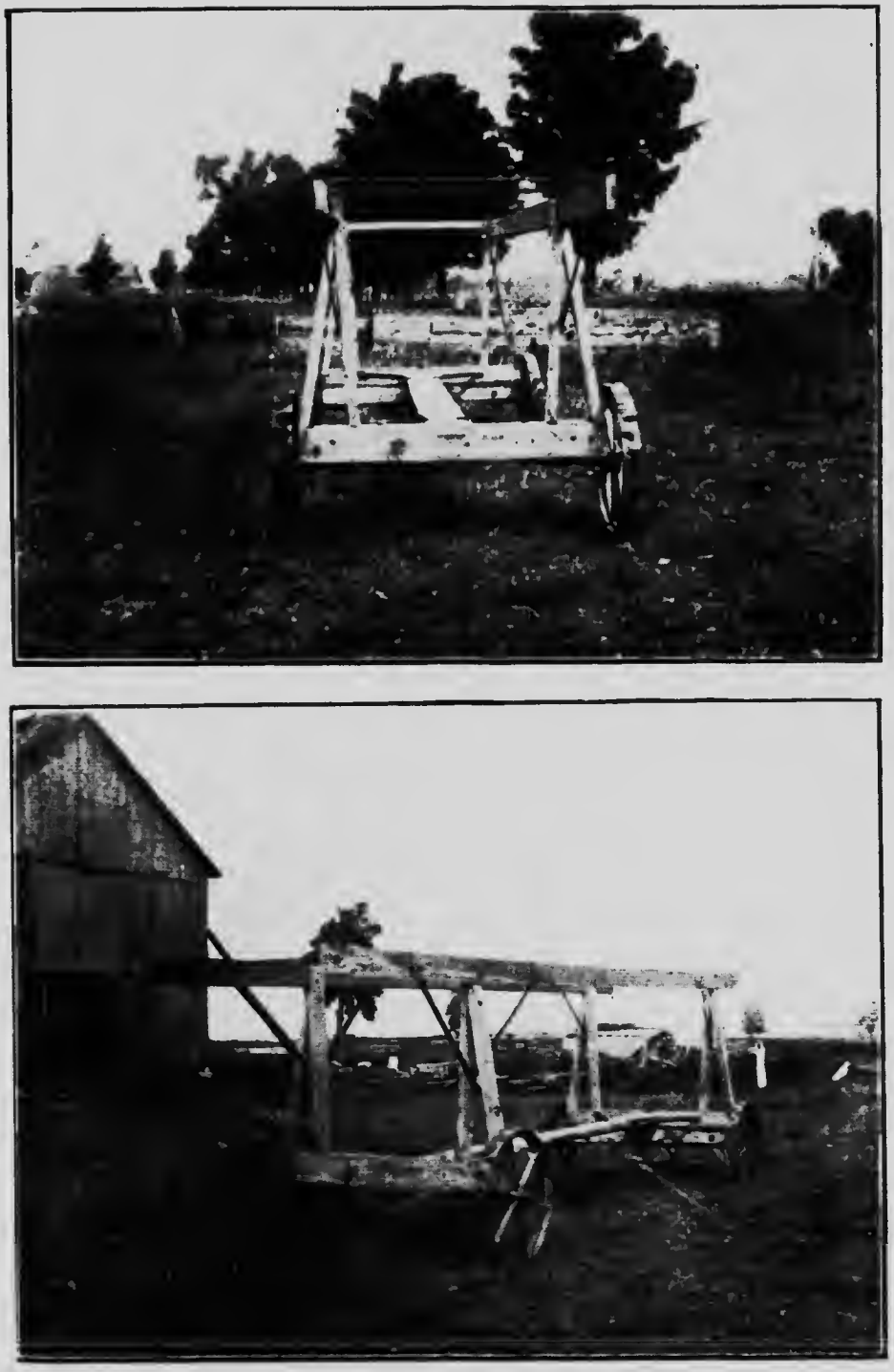

PLATE II.—Special waggon for hauling tobacco from the field to the curing-shed.

A.—General view of the seed-beds. Harrow Experimental Station, 1909.

B.—Curing-shed of the Harrow Experimental Station. (Built on a stone foundation containing store and stables.)

PLATE IV. Field of Barley.—(Fertilized with sulphate of potash and sulphate of ammonia.) Gave the best yield. Seed plants in the background.

PLATE V. Burley treated with fertilizers. To the left part was applied a complete fertilizer and farm manure; the yield was 2424 lbs. per acre. To the right part farm manure only was applied; the yield was 1724 lbs. per acre.

PLATE VI. Field of Yellow Oronoco. (One of the varieties of Virginia tobacco tested at the Harrow station in 1909.)

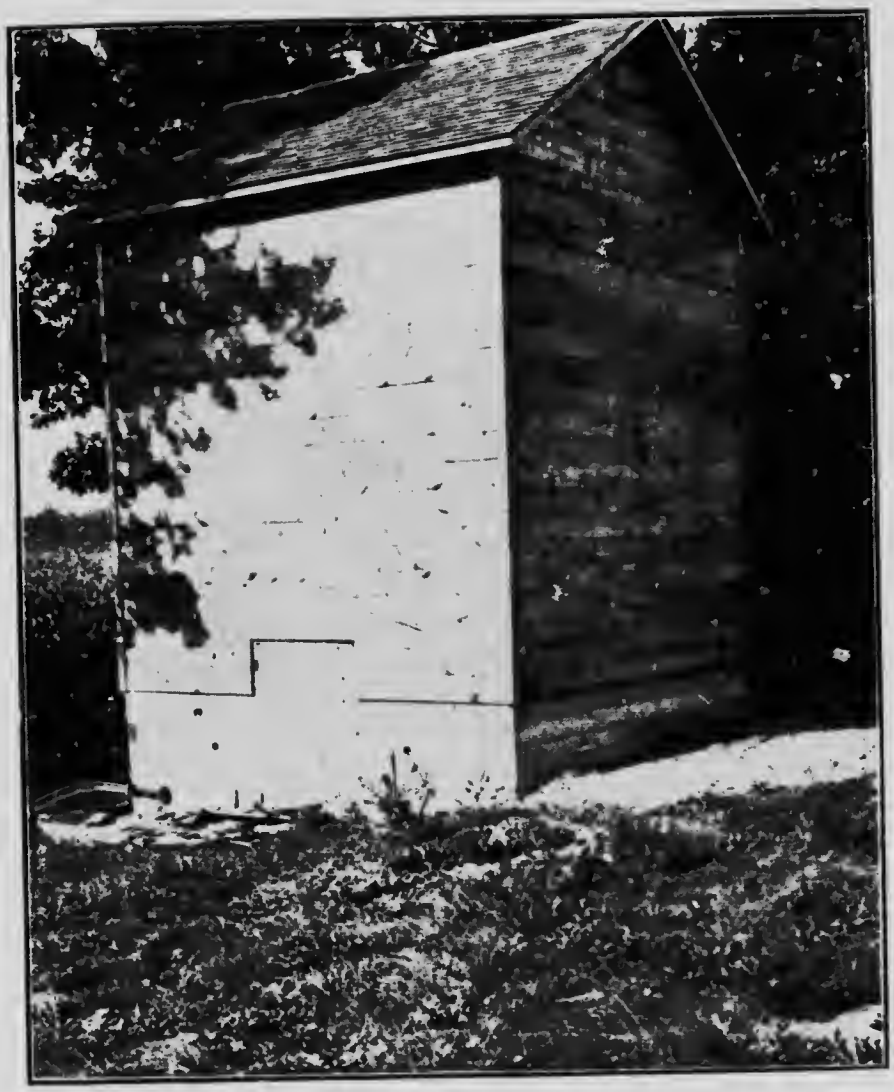

PLATE VII. – Kiln for the flue curing of bright Virginias.

PLATE VIII. Kiln for the flue-curing of bright Virginias. (Showing the exterior arrangement of fireplaces.)

PLATE IX.—A typical Virginia curing-shed.

PLATE X. Seed plant, ready to be covered by the protecting bag.

PLATE XI. Seed plants covered by the protecting bag to prevent cross-fertilization.

PLATE XII. Seed plant after cleaning. (The bag has been removed, the top leaves and the secondary shoots have been cut out and the lower leaves thinned out.)

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