CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

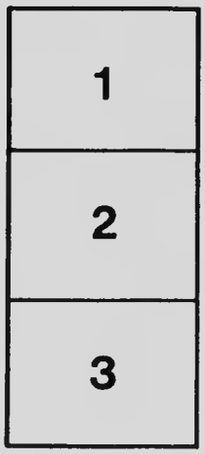
- [x] Coloured covers / Couverture de couleur
- [ ] Covers damaged / Couverture endommagée
- [ ] Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- [ ] Cover title missing / Le titre de couverture manque
- [ ] Coloured maps / Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- [ ] Bound with other material / Relié avec d'autres documents
- [ ] Only edition available / Seule édition disponible
- [ ] Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- [ ] Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments / Commentaires supplémentaires:

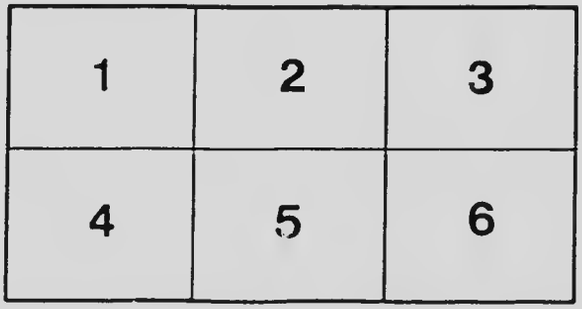
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [ ] Coloured pages / Pages de couleur
- [ ] Pages damaged / Pages endommagées
- [ ] Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- [ ] Pages detached / Pages détachées
- [x] Showthrough / Transparence
- [ ] Quality of print varies / Qualité inégale de l'impression
- [ ] Includes supplementary material / Comprend du matériel supplémentaire
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- [ ] Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

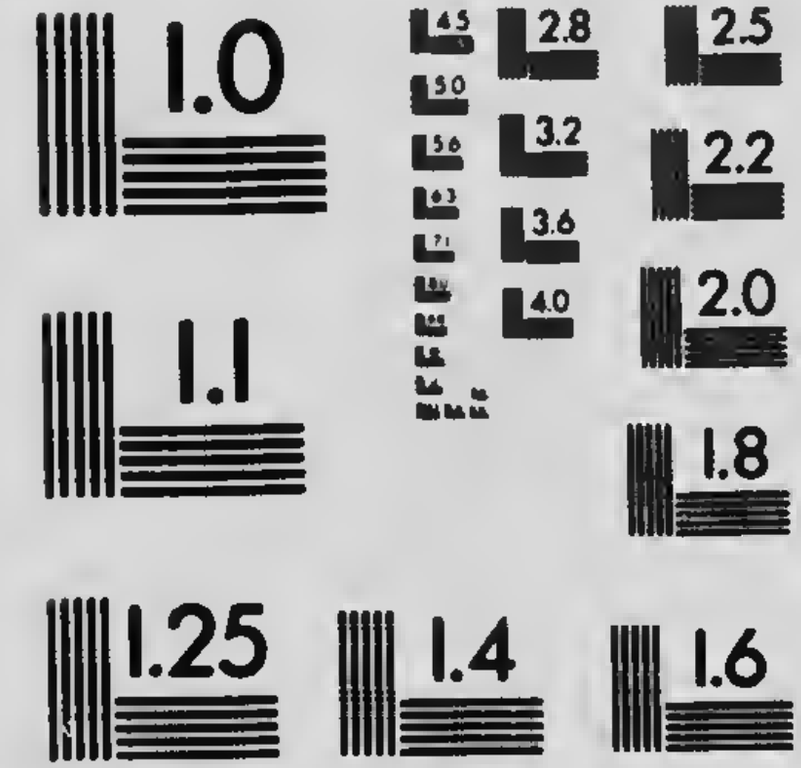
10x	12x	14x	16x	18x	20x	22x	24x	26x	28x	30x	32x
								√			





MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

DOMINION DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

TOBACCO DIVISION

REPORT FOR THE YEAR 1910

Tobacco Bulletin No. A-12

Published under instructions of the Hon. Sydney Fisher, Minister of Agriculture, Ottawa, Ont.

APRIL, 1911

DOMINION DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

TOBACCO DIVISION

REPORT FOR THE YEAR 1910

Tobacco Bulletin No. A-12

Published under instructions of the Hon. Sydney Fisher, Minister of Agriculture, Ottawa, Ont.

APRIL, 1911

4876—1

OTTAWA, April 18, 1911.

The Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit herewith Bulletin No. A-12, series of the Tobacco Division, entitled 'Report for the year 1910.' This bulletin contains a report of the work done at our various experimental stations during the season 1910-11.

An article on the nature of the work performed by our Division is given as an appendix.

I beg to recommend that this bulletin be printed for distribution.

I have the honour to be, Sir,
Your obedient servant,

F. CHARLAN,
Chief of the Tobacco Division.

I.

OTTAWA EXPERIMENTAL FARM

During the season of 1910, the following varieties were grown on the tobacco experimental field of the Central Farm, Ottawa: Comstock Spanish, Canelle, Vérel and Montmélian. The two first varieties were grown chiefly for the production of seed; the other two—the Vérel and Montmélian—imported from France, were tested with a view of producing pipe tobacco.

Sowing was done in the usual manner. The beds were treated with formalin, sown on the 20th of April, at the rate of ½ of an ounce per 100 square feet, and a large number of strong, healthy seedlings, with plenty of root hair, were obtained, and these were ready to be set out by the end of May.

Setting out was started on May 30 and completed on June 1. The weather was damp, which facilitated the recovery of the seedlings but caused the soil to become quite firm. The worms did a great deal of damage, especially on that part of the field which has been pastured during the two previous years; on the other half, which had been in hay the year before, the damage was not quite so great. On account of the rainy weather, several applications of Paris green had to be made: it was mixed with bran, in the proportion of one part of Paris green to fifty parts of bran. However, the insects were held in check and all dead seedlings systematically reset, a very even stand was obtained.

During the night of June 4 a heavy frost very nearly destroyed the whole of our crop. Fortunately the heart of the young tobacco plants was, to some extent, protected by the partially grown leaves (the recovery of the seedlings not being complete the leaves were yet a little wilted). The leaves died, but the majority of the seedlings recovered, apparently at least.

This heavy frost of June 4 accounts, we think, for the comparatively large proportion of plants affected with mosaic disease that were observed later on our experimental plot. It was certainly the cause of the unhealthy condition of a number of plants.

On account of this accident, the proportion of plants that had at first been set aside for seed production had to be considerably reduced. By successive selections it was finally cut down to one-third of the original number, which was barely sufficient to meet the demand for seed in March, 1911.

The Comstock variety grown on this experimental field came from seed produced the year before at St. Jacques l'Achigan. The leaf is large, of a good width, with thin ribs, and quite suitable for 'binder' purposes. Although carefully selected for two years, it still varies slightly from the type which we are endeavouring to fix, and some care will be necessary during the next season in order to fix this type definitely.

A different strain of Comstock was grown on another part of the experimental field, the seed of which had been obtained two years before, from a British Columbia grower, Mr. Holman, in the course of a trip in the Kelowna valley.

This Comstock appeared to be of a larger size than the Quebec Comstocks, and with more prominent ribs. However, when grown at Ottawa, no great difference was

observed between the products of this Comstock, and those of the Comstock that came from seed obtained in Wisconsin and which had been acclimatized in Quebec. The two varieties had a common origin and, when grown on the same plot, they presented the same characteristics. It may therefore be stated that the differences in shape and texture—differences quite noticeable—that exist between the Kelowna and Quebec Comstocks are entirely due to the difference in the physical composition of soils. The large proportion of lime and the finer texture of Kelowna soils account for the large size of the Kelowna Comstocks; and the more rapid growth is responsible for the larger width of the leaf. Tobacco grows more rapidly in Kelowna, in spite of the drier atmosphere, because nitrification is more active.

A good crop was obtained with the Vérel and Montmélian varieties.

These tobaccos may be grown as far apart as the Comstock (30 inches x 18 inches). They require the same care as this variety; they are topped in the usual way and harvested at the usual time.

The leaf of these varieties, and particularly that of the Vérel, is thicker and of a darker green than that of the Comstock. The indications are that the product obtained will not burn quite as fast and burn more regularly than the Comstock tobacco. After curing, the Montmélian was judged the best of the two: the Vérel was found a little too strong.

The main object in growing these varieties was to secure a sufficient quantity of seed to experiment on a large scale next year; however the results obtained so far are satisfactory: good burning quality, large leaf, strong but not coarse texture, yield nearly one ton per acre.

It would be impossible to give the exact yield per acre obtained on the experimental farm plot this year.

The crop was in normal condition, rather forward, and completely topped, when it was attacked at the end of July by a small but very active insect, the 'Tarnished plant bug.' The injuries, not very apparent at first, were not noticed by the men who looked after the crop. It was only when the majority of the top leaves gave evidence of distortion, resulting from bites of the insect, and which, soon after, caused the splitting of the tissues, that the damage was observed, and some time was necessary to discover the cause. The presence of a field of turnips in close proximity to the tobacco field accounts for this invasion.

All that could be done was to remove the affected leaves, which were the top ones, more tender and more easily attacked. The number of leaves left on the plants after this cleaning process was only ½ to ⅔ of the number which they should have carried under normal conditions; therefore the yield in weight was considerably below that which could have been anticipated from the appearance of the crop at the start, and tho leaves were coarser.

This insect was identified by Mr. Hewitt, the Dominion Entomologist, and it is hoped that with Mr. Hewitt's co-operation we will be able to find efficient means of control next year.

We may, however, at this time, advise against the growing of tobacco on a plot on which turnips have been grown the previous year; proximity to the latter should also be avoided.

F. CHARLAN.

II.

THE QUEBEC TOBACCO EXPERIMENTAL STATIONS.

(Report of the Assistant in charge.)

SIR,—I have the honour to submit herewith a report on the work done during the season of 1910 at the Tobacco Experimental Stations of St. Jacques l'Achigan and St. Césaire, in the province of Quebec.

ST. JACQUES STATION.

The season opened very early in 1910, and the majority of the growers, who felt inclined to plant more tobacco than usual, started work at the beginning of April. At first, all went well, and a heavy crop was looked for owing to the large amount of seeding done. Unfortunately, this year, as usual, this hope was frustrated. A very heavy frost on the 13th of April, followed by a period of damp and cold weather, and, finally by seventeen days of almost continuous rain, when the seedlings were ready to be set out, did a great deal of damage. Practically one-third of the seedlings were destroyed during this period. In short, the season of 1910 was a bad one for the tobacco growers; those who were new in the industry were rather discouraged, and it must be admitted that few years have been so unfavourable as this one.

EXPERIMENTS WITH VARIETIES.

As previously stated (we gave the preference this year to the hybrid Comstock Sumatra. Of five beds, 21 feet x 5 feet, two were sown with this new variety. The Comstock-Spanish was grown exclusively for seed production, this variety being now sufficiently well known to make further experiments with it unnecessary. Some Cuban, directly imported, was again grown as it was desired to ascertain what advantage this variety might offer for the production of 'fillers.' Another hybrid strain, the big Ohio x Sumatra, was submitted to careful experiments. This hybrid was originated with the object of improving the earliness and the texture of the Big Ohio. The Big Ohio is a heavy yielder, but, unfortunately, a slow grower. Last year it could not be cured during the normal curing season, and could not be taken down from the hooks before the spring.

Several other varieties had also to be tested, viz:—

1. The hybrid Comstock x Sumatra, originated last year, and tested for purposes of comparison with the strain that has already been grown for two years.

2. The hybrid Comstock x Sumatra x Sumatra.

3. The big Ohio, for purposes of comparison with the hybrid Big Ohio x Sumatra previously mentioned, in order to ascertain the quality or the defects of the latter.

SOWING.

Sowing was started on April 13, nine days earlier than the preceding year. The beds had been ready for four days. All were hot-beds, with the exception of one that might be called half hot or warm bed and about which more will be said further on.

Bed No. 1. Hot bed.—Hybrid Comstock x Sumatra; seed germinated, but the tegument is only cracked; thickness of seeding: ½ of an ounce per 100 square feet of bed; Victor fertilizer; treated with nitrate of soda in solution.

Bed No. 2. Hot bed.—Hybrid Comstock x Sumatra; dry seed; thickness of seeding: ½ of an ounce; Victor fertilizer carefully mixed with the top part of soil. The Victor fertilizer was used at the rate of 1/15 of a pound per square foot of bed, or 7 pounds on 105 square feet.

Bed No. 3. Warm bed.—Comstock Spanish; germinated seed; thickness of seeding: ½ of an ounce; Victor fertilizer, 1/15 of a pound per square foot.

Bed No. 4. Hot bed.—Cuban; ¼ of an ounce (on account of the poor germinating power of the seed); dry seed, without any special treatment.

Bed No. 5. Hot bed.—Big Ohio; dry seed, ½ of an ounce; Victor fertilizer and nitrate of soda in solution.

Bed No. 6. Hot bed.—(*a*) Hybrid Big Ohio x Sumatra.
(*b*) " Comstock x Sumatra.
(*c*) " Comstock x Sumatra x Sumatra.

As will be seen, the object of this treatment was to ascertain the effect of Victor fertilizer and nitrate of soda, separately or in combination, on beds sown with dry seeds and germinated seeds.

All plants were up on the 22nd of April, nine days after sowing. Bed No. 1, sown with germinated seeds, was a great deal earlier than the others. In spite of the rather cold weather, with frost every morning, we were able to keep the temperature of the beds at from 7 to 10 degrees Centigrade during the night. The lowest temperature, 7 degrees Centigrade, was observed on Bed No. 1, on the 19th of April, in the morning. There was no manure in this bed, but it had been carefully surrounded with a layer of manure 2 feet thick. The same day 10 degrees Centigrade (32° Fahr.) was observed in the cold beds of a number of growers; in some cases ice was seen. The stand was fairly uniform, with the exception of the Cuban variety, and there were no injuries, save for the mushrooms which appeared on the bed sown with Big Ohio. The stand of the Big Ohio x Sumatra and Comstock x Sumatra x Sumatra was remarkably uniform.

The temperature never rose above 85 degrees Fahr. On the 25th of April, the third leaf appeared on the seedlings, and weeding was started. On the 4th of May there were four distinct leaves.

Treatment with nitrate of soda was then started. At first a proportion of ¼ of a pound to the gallon of water was used, but this seemed too strong and the solution was subsequently reduced to ¼ of a pound in two gallons of water; the beds were sprinkled with this solution twice a day. On the 8th of May, the beds were well forward, and the action of nitrate of soda quite marked. Bed No. 1, which had been treated with both nitrate of soda and the Victor fertilizer was the earliest. Bed No. 5, which had received the same treatment, was also very early; therefore it may be concluded once more that there is no advantage in germinating the seeds before seeding. The application of a solution of Victor fertilizer and nitrate of soda on the beds appears to have a very good effect.

On May 10, exactly four weeks after seeding, some seedlings were ready for setting out. On the 20th of May, some few hundreds of seedlings were ready in every bed, and particularly on the beds sown with Comstock and hybrid Comstock x Sumatra. The seedlings were robust, quite healthy and provided with abundant root hair. Everything was ready for transplanting.

NOTES ON MAKING OF BEDS.

It cannot be doubted that the success of the crop depends largely on the success of the beds. Therefore great care should be exercised in the making and management of the latter. Many growers are very careful in this respect, but there are others who seem to think that it does not matter very much how beds are made. For instance we have met growers who had a very queer conception of the making of seed beds, especially in Montcalm county. This is how they proceed: In wooden frames, placed generally in ill selected spots, they put a layer of ordinary earth, and on the top of this a layer of finer earth, mixed sometimes with a little chemical fertilizer, and then a thin layer of earth, finer still, in which the seed is sown. These beds are built once for all; they are ploughed when the seedlings have been taken out, and are supposed to be ready for seeding the next spring. They are left the whole winter in this condition and what takes place may be readily imagined: the frost, working freely on the beds all winter, the grower finds the following spring a solid cake of ice, which is not entirely melted when seeding time has come. Germinated seeds are sown, and it is easy to understand that in such a poor soil, the germs are soon destroyed. This is what the growers call a 'cold bed' and this designation is certainly correct. As a general rule, such beds give a very uneven stand, with numerous bare spots, on which no seedlings ever appear. The few seedlings that succeed in coming out are very weak, yellow and soon make spindlings. Cold beds of this kind are a prey to diseases which cause much injury. A large number of the seedlings are destroyed by rot and the few that remain require constant care, as they would surely be killed by the least sunstroke. It is obvious that seedlings growing in such conditions, that is in an atmosphere always saturated with moisture and necessarily foul—ventilation being avoided for fear of cooling the beds—do not thrive when set out; the success of the crop is therefore very problematic.

Up to the present hot beds have the advantage, and we have strongly recommended them as they are sure to give the best results in the province of Quebec. However, there is another bed called 'half hot' or 'warm,' which also gives very satisfactory results.

The chief difference between the hot bed and the warm bed is that the latter does not contain any hot manure, but like the former it is also worked over every spring. A thin layer of tobacco stems and straw is used in place of manure. It is advisable to make the warm bed early in the spring and leave it exposed to the sun during ten days or so before sowing. By so doing the earth will warm up, many weed seeds will germinate and will be easily destroyed before sowing. Earth of good quality only should be used, and it will be found profitable to mix the top part of the soil with chemical fertilizers (such as Victor fertilizer). The whole should then be covered with a good layer of vegetable earth, ½ of an inch deep, on which seed very lightly germinated will be sown.

If the warm bed has been carefully made and well managed, very good seedlings will be secured, not quite as good perhaps as those from hot beds, but they will cost far less, and furthermore no mushrooms are to be feared. Perhaps the warm beds will entirely take the place of the hot bed and there can be no objection to this. As to the cold bed, or at least such as some growers understand it, it should certainly be dropped without the least hesitation.

QUALITY OF THE SOIL.

We have seen that warm beds give good results in a normal year. But one thing is essential: good soil must be used. First of all, the soil should be light, and it should contain as much plant food as possible and be free from weed seeds. The importance of the three things is evident when one considers that the tobacco seed, being extremely small, contains only a very small quantity of nutritive elements and is soon compelled to draw its food from the surrounding soil.

With careful weeding and more or less time, the soil may be freed of the weed seeds which it contains, especially if an interval of ten days or so has elapsed between the making of the bed and seeding time. Under these conditions the action of the sun will cause a fairly large quantity of weed seeds to germinate, which will be easily removed. However, weeding is always more or less dangerous, and it is not always possible to make the beds ten days before sowing, therefore it is recommended to treat the soil with heat or steam. For the description of this method the reader is referred to Bulletin No. A-8.

In order to secure rich and fine soil the following method is recommended: Take a sufficient quantity of light earth from a clover sod, sift it carefully, treat it with heat or steam, then mix it as thoroughly as possible with a chemical fertilizer made up as follows:—

Potash	8 per cent.
Nitrogen	5 "
Phosphoric acid	10 "

Ten pounds of this fertilizer may be added to a quantity of soil sufficient to make 150 square yards of bed. The bulk of the bed is made up of this soil. A top layer of fine earth will be necessary to receive the seed. For this, some pieces of sod about 1½ inches in thickness should be cut from old meadows, edges of ditches, etc., piled in heaps, and left until the vegetable matter is entirely decomposed, which may take two years or so. This will make a very fine soil, very rich in humus, and which, after being carefully sifted, may be used as a top layer for the bed. A nitrogen fertilizer, such as guano Victor for instance, should be mixed with this soil at the rate of 1/15 of a pound per square foot of bed. When the seedlings are out, the frames should be taken off, the soil carefully mixed and piled up in the open air. This heap of soil should be turned over several times before the following spring and sprinkled occasionally with liquid manure.

MUSHROOMS AND INJURIOUS INSECTS.

Hot beds are often infested with mushrooms, especially when they contain a great deal of horse manure. These mushrooms, which belong to the psalliote genus, grow

extremely fast and cause much injury. It is very hard to get rid of them, and in order to save his seedlings from complete destruction the grower is compelled to remove them one by one, morning and evening, which causes a great loss of time. Only preventive remedies can be suggested against this pest:

1. An excess of horse manure should be avoided.

2. A thin layer of ordinary salt, or a layer of vegetable ash about one-fourth of an inch deep, should be spread on the layer of manure before applying the soil. Salt and ashes prevent the growth of the mycelium of the mushroom. The use of thick sheets of cardboard and even wooden boards between the manure and the soil has also been tried, but as cardboard and wood rot very quickly, they have to be replaced every year, and this means of prevention is very costly.

3. The exposure of the soil to the winter frost, or treatment with steam will kill the spores of the mushrooms.

4. Lastly, warm beds, where no manure is used inside the frames, may be used instead of hot beds.

The insects most often met with in beds are the aphis and sometimes very small caterpillars. Being very tender, the young seedlings suffer greatly from their attacks. These pests can be destroyed by a light sprinkling of a solution of lead arsenate, two pounds of lead arsenate in 25 gallons of water. A solution of ¼ of a pound of Paris green in 50 gallons of water will serve the same purpose. There is another insecticide not so well known: the nicotine oxalate, which gives very satisfactory results. It is used as a solution of a strength of 1 part in 250 parts of water, by weight.

HOW TO HASTEN THE GROWTH OF THE SEEDLINGS.

When cold or warm beds are used instead of hot beds, the young seedlings may at first grow very slowly, and when the weather is cold or damp or remains cloudy it is often necessary to resort to artificial means to hasten the growth, so that the seedlings may be ready for setting out at the proper time. The use of nitrate of soda and hen manure may be recommended for this purpose.

We have made experiments with various solutions of nitrate of soda and found that a strength of ¼ of a pound in two gallons of water is the most effective. When it was used at the strength of ¼ pound of nitrate to one gallon of water it was found that some leaves were injured by the nitrate after the water had evaporated. It is better to water every day with a solution of ¼ of a pound of nitrate in two gallons of water than to water every other day with a solution of ¼ of a pound in one gallon of water. A good thing would be to water lightly with ordinary water after applying the solution, in order to wash off the excess of solution and prevent the deposit of salt which would injure the leaves.

The use of hen manure is quite as effective, and much less complicated. The following method may be used: Put about three bushels of hen manure in an ordinary wooden barrel, then fill with warm water and leave the whole mass to ferment for about a week. Then strain the liquid through a cloth and mix it with tepid water in the proportion of one part of liquid to ten parts of water. One application of this solution, every week, until the seedlings completely cover the bed, considerably hastens the growth. In two beds, sown the same day, one treated with hen manure and the other untreated, we have observed a difference of five days in the growth of the seedlings.

PREPARATION OF THE SOIL FOR PLANTING.

Our tobacco field for the crop of 1910 was ploughed in the fall of 1909 and manured at the rate of 18 tons of farmyard manure to the acre. Spring work was started on May 6, 1910, as follows:—

1. One ploughing with the ordinary plough.
2. Two diskings with a disk harrow.
3. One harrowing with the drag harrow.

The weather being favourable all this work was easily and comparatively well done; up to that time, conditions were much better than the preceding year; we were nearly one month ahead, as in 1909 the spring work could not be started before the second of June. But this advance could not be maintained; a rainy period starting on May 12 and lasting sixteen days in succession put the soil back to the condition in which it was at the end of winter, and it was necessary to work it over again entirely. On May 25, the seedlings were well grown and the stand was compact. After two or three days of comparatively fine weather, setting out was started. On May 26 a chemical fertilizer was applied to the plot reserved for a special test of fertilizers—the results of which will be given later—and on May 25, 3,000 seedlings of Hybrid Comstock x Sumatra and 3,000 seedlings of Comstock were planted. Then a new period of rain and cold set in and no more transplanting could be done before the 17th of June. On June 10, a heavy frost caused a great deal of damage. A number of tobacco fields were completely destroyed and had to be entirely reset.

From the 20th of May to the 17th of June, transplanting operations were at a complete standstill. The seedlings had to be left in the beds, which became extremely dense and had to be thinned to prevent rot from setting in. Of course, the best and earliest plants were sacrificed. A number of growers neglected this precaution and rot soon appeared in the beds. Not being able to foresee when the rain would stop, an endeavour was made to check the growth of the seedlings. No more watering was done. The exposure to the sun was reduced to a minimum, very little ventilation was given during the day and a great deal at night. By dint of care we succeeded in saving about ¾ of the seedlings in each bed, but a great many growers were not so fortunate. Some had to cut down their plantation by half. Others had to leave out tobacco entirely for the year. Such accidents occurred almost everywhere in the province of Quebec, and this is the reason why the crop of 1910 was not much larger than that of 1909, whilst if conditions had been favourable, Quebec would have produced at least 7,000,000 pounds of tobacco in 1910.

NICOTINE OXALATE AND PARIS GREEN FOR THE DESTRUCTION OF CUTWORMS AND WIREWORMS.

Paris green is about the only insecticide used at present against insects affecting tobacco. It varies greatly in efficiency. In dry weather, the chances are that the cutworms will be destroyed, but in rainy weather the Paris green is very often washed off before its effect can be felt. As to the wireworms, Paris green does not affect it in the least. This worm is very hard to get at, as it penetrates into the young plants through the root and eats off the inside of the stem. We have experimented with another insecticide this year: the nicotine oxalate, and also with Paris green, for purposes of comparison.

In order to ascertain what strength of solution would give the best results, it was first necessary to determine the resistance offered by the plants to both of these insecticides. We proceeded as follows:

On May 20, 12 rows of Comstock Spanish were set out with 10 plants in each row. These 12 rows were watered twice on the same day with the following solutions:—

Rows.	Quantity of insecticide used.	Strength.
No. 1.	5 grams nicotine oxalate in 1½ litre of water	1/250
2.	10 " " "	1/125
3.	15 " " 1 litre of water	1/100
4.	30 " " "	1/50
5.	60 " " "	1/25
6.	150 " " "	1/10
7.	Ordinary water, check plot.	
8.	Paris green solution—1 teaspoonful in 5 gallons of water.	
9.	" " 4 "	
10.	" " 3 "	
11.	" " 2 "	
12.	" " 1 "	
13.	" " ½ "	
14.	Ordinary water, check plot.	

Four days later the following observations were made:

		Per cent.
No. 1.	Oxelate at 1/250: growth	100
2.	" 1/125 "	100
3.	" 1/100 "	90
4.	" 1/50 "	60
5.	" 1/25 "	20
6.	" 1/10: not one seedling survived.	
7.	Ordinary water: growth	90
8.	Paris green—1 teaspoonful in 5 gal. water: growth	90
9.	" " 4 " " "	100
10.	" " 3 " " "	90
11.	" " 2 " " "	100
12.	" " 1 " " "	100
13.	" " ½ " " "	70
14.	Ordinary water, check plot	100

The following conclusions were at once evident:—

1. Paris green does not practically interfere with the growth of the plants.

2. Nicotine oxalate interferes with the growth only when used in solution of one part to fifty parts of water; all plants were destroyed when it was used at the strength of 1/25 and 1/10.

Ten days later the growth was quite normal in rows No. 1, No. 2 and No. 7. Two plants were dead in row No. 3 as well as in row No. 4 and one in row No. 5. It was then concluded that it was safer to use solutions of a strength of 1/250 and 1/125.

At the same date the following observations were made on the plot treated with Paris green:—

1. The growth was normal in rows Nos. 8, 9 and 10.

2. Two plants were dead in row No. 11 and those that remained had a sickly appearance. This sickly appearance was more pronounced in row No. 12, and still more so in row No. 13 in which 5 plants were dead; those that remained appeared to be checked in their growth and had the characteristic yellow hue of sick plants; much later plants which remained in rows Nos. 11, 12 and 13 showed very distinct symptoms of rust, and one case of polyphyllie was observed.

With this information available, we were ready to start the fight against the cutworms and the wireworms. The experiment was conducted as follows:

Plot (*a*) 3 rows, each containing 253 plants, treated with a solution of nicotine oxalate of a strength of one part in 250 parts of water. A known quantity of nicotine oxalate was dissolved in a definite volume of water and the mixture was placed in the barrel of the sowing machine.

Plot (*b*) 3 rows, untreated, used as checks.

Plot (*c*) 3 rows with nicotine oxalate at the strength of $\frac{1}{125}$.

Plot (*d*) 3 rows, untreated, used as checks.

Plot (*e*) 3 rows treated with nicotine oxalate at the strength of $\frac{1}{125}$, and with Paris green, at the strength of one teaspoonful to four gallons of water.

Plot (*f*) 3 rows untreated, used as checks.

Plot (*g*) 3 rows treated with Paris green, one teaspoonful in five gallons of water.

Results.—Generally speaking, the growth was perfect. The proportion of plants which had to be reset in the various plots was as follows:—

	Per cent.
Plot (*a*) $\frac{1}{250}$ nicotine oxalate, 3 resettings, total	6·25
Plot (*b*) Check "	11·40
Plot (*c*) $\frac{1}{125}$: "	4
Plot (*d*) Check "	10·52
Plot (*e*) $\frac{1}{125}$ " and Paris green—plants reset	2·25
Plot (*f*) Check—Plants reset	12
Plot (*g*) Paris green, 1 teaspoonful in 5 gallons, plants reset.	8

For the remainder of the crop, which was treated with Paris green, the average proportion of plants reset was 7 per cent.

CONCLUSIONS.

1. Nicotine oxalate has a very marked effect, especially when used at the strength of $\frac{1}{125}$. When this solution was used 4 per cent of the plants had to be reset, instead of 6·25 per cent when the strength was $\frac{1}{250}$.

2. Nicotine oxalate seems to have a stronger action than Paris green; witness plot (*g*), treated with Paris green, and where only 8 per cent of the plants had to be reset.

3. Paris green used in solution does not seem to have any efficiency.

4. However, used in solution with nicotine oxalate, Paris green seems to have some effect. If we look at plot (*e*) we see that only 2·25 per cent of the plants had to be reset.

5. Paris green used in powder form kills both cutworms and wireworms. Some dead insects were found where Paris green had been used in powder form, but not one was found dead in plot (*g*) where it had been used in solution.

6. Nicotine oxalate does not kill these insects. It seems rather to drive them away. In plots (*a*), (*c*), (*e*) we have not found any dead insects, and we even found some alive in plot (*a*), but not one in plots (*c*) and (*e*). Probably the smell of nicotine oxalate around the root of the plant drives away both cutworms and wireworms.

This conclusion is based upon the fact that between the plots (*a*, *c*, *e*, *g*) where buckwheat had been sown, we found a rather large number of cutworms and wireworms, especially in the buckwheat of plots (*c*) and (*e*).

We do not claim that these conclusions are absolutely correct, but we think the results obtained are worth noting, and we intend to repeat this experiment on a large scale as soon as a sufficient quantity of nicotine oxalate is available.

WORK AND YIELDS.

A summary of the work done and of the yield obtained is given in the following table:—

Varieties Sown.	Area.	Plantation.	Topping.	Crop.	Yield per Arpent.
Hybrid Comstock x Sum.	1 arp.	June 1	July 25	Sept. 2	1352 lbs.
" "	1 "	" 1	" 25	" 3	1172 "
Comstock Spanish	1 "	" 15	Aug. 6	" 6-7	1076 "
Big Ohio	½ "	" 15	" 15	" 20	1865 "
Cuban	½ "	" 16	" 10	" 21	680 "
Big Ohio x Sumatra	140 ft.	" 8	July 15	Aug. 25	2127 "
Comstock x Sumatra	100 "	" 8	" 13	" 24	1684 "
Comstock x Sum. x Sumatra	300 "	" 8	" 16	" 22	1028 "

RESULTS OF AN EXPERIMENT WITH CHEMICAL FERTILIZERS.

With the object of finding out positively the fertility of the soil at our station, the experiment with chemical fertilizers, started in 1909, was resumed this year, with this difference, however, that this time the farmyard manure was ploughed in before the winter instead of being ploughed in in the spring. The hybrid Comstock x Sumatra was used for this experiment. The plot operated upon measured an arpent. This was divided in five equal lots, which were treated as follows:—

Lot No.1.—18 tons of manure to the arpent.

Lot No. 2.—

18 tons of manure to the arpent.
Sulphate of ammonia; 500 pounds per arpent.
Sulphate of potash: 300 pounds per arpent.
Superphosphate: 300 pounds per arpent.

Lot No. 3.—

Farmyard manure: 18 tons per arpent.
Sulphate of potash: 300 pounds per arpent.
Superphosphate: 300 pounds per arpent.

Lot No. 4.—

Farmyard manure: 18 tons per arpent.
Sulphate of ammonia: 500 pounds per arpent.
Superphosphate: 300 pounds per arpent.

Lot No. 5.—

Farmyard manure: 18 tons per arpent.
Sulphate of ammonia: 500 pounds per arpent.
Sulphate of potash: 300 pounds per arpent.

The five lots were planted the same day. On the 5th of July the following observations were made:

1. Lot No. 1 was the latest by far.

2. Lot No. 2 was a great deal earlier than the other lots and particularly earlier than lot No. 1.

It was concluded from this experiment that the soil was not remarkably fertile and that heavy manuring would be necessary. These conditions maintained during the whole of the growing period, until harvesting which took place on September 2.

YIELD.

Lot.	Weights obtained. Lbs.	Yield per arpent. Lbs.
No. 1	214	1,070
No. 2	308	1,540
Lot. 3	265	1,325
No. 4	285	1,425
No. 5	280	1,400

CONCLUSIONS.

It is obvious, in the first place, that the use of chemical fertilizers is beneficial, since Lot No. 2, which has received a complete fertilizer, has yielded 470 pounds more than Lot No. 1, which has received only farmyard manure. The yields of lots Nos. 3, 4 and 5 also confirm this conclusion.

Evidently this soil needs three kinds of plant food in the form of chemical fertilizer: nitrogen, phosphoric acid and potash. But nitrogen seems to be the most important of the three. Lot No. 3 which had received no sulphate of ammonia yielded only 1,325 pounds. About the same proportion of potash and phosphoric acid seem to be required. Lastly, a comparison between the two arpents planted in hybrid Comstock x Sumatra brings out the fact that the use of chemical fertilizers has caused a gain of 180 pounds. In 1909 the difference in yield between the plot manured with farmyard manure and the plot which had received a complete fertilizer

was 442 pounds. This year, the difference was only 180 pounds, a gain of 262 pounds. This gain may be attributed to the fact that for the crop of 1910 farmyard manure was ploughed in before the winter, while it was ploughed in only in the spring for the crop of 1909.

NOTES ON VARIETIES.

Hybrid Comstock x *Sumatra.*—This hybrid, recently originated, was grown on a large scale for the first time this year and we were able to judge its qualities from a practical point of view. In a general way it may be said that the qualities which were observed last year were again noticeable this year. Of course, as usual at the start with all hybrids, we found some plants reverting back to the Sumatra and Comstock blood. However, it was very easy to find 200 seed plants which presented all the characteristics of the original type. Furthermore in order to make as good a selection as possible, we took as standard a hybrid of the same nature but originated last year and grown this year for the first time.

The qualities of the tissue were much the same as in the original type, and the two chief points that we were anxious to fix, viz., earliness and yield, are quite apparent. Of course, another year or perhaps two more years of selection will be required to fix this hybrid, but such as it is the result may be considered as quite satisfactory.

Hybrid Comstock x *Sumatra* x *Sumatra.*—The infusion of a blood of Sumatra to the Hybrid Comstock x Sumatra does not appear to be profitable. The tendency to go back to the Sumatra variety, or to the type under which this variety is known in our country, is quite marked: plant comparatively high, leaves small and corrugated with rather prominent ribs. Furthermore this variety appears to be tender and it is not so early as the hybrid Comstock x Sumatra. For all these reasons, we think it is as well to drop this hybrid. We will keep the hybrid Comstock x Sumatra and try to improve it and fix it by selection.

Hybrid Big Ohio x *Sumatra.*—This hybrid was originated at St. Jacques in 1909. The object was to secure an earlier strain of Big Ohio and to improve its tissue, especially in elasticity and strength. Although this tobacco was grown only on a very small scale, yet the results seem to indicate that it is a promising variety, more so perhaps than the hybrid Comstock x Sumatra. Earliness, yield, size of leaf and good texture are among the chief qualities of the hybrid Big Ohio x Sumatra.

Earliness.—Set out on the 9th of June, the Big Ohio x Sumatra was harvested on the 24th of August. Thus the time required for this hybrid to reach maturity is only two months and a half, which leaves the whole month of September available for curing. This makes it very valuable for Quebec growers. In this case, as in the case of the hybrid Comstock x Sumatra, the infusion of Sumatra blood has caused a very great improvement in earliness. This fact is still more striking when one considers that the Big Ohio requires a little over three months to ripen.

Yield.—The hybrid Big Ohio x Sumatra gives about one ton to the arpent. This is probably the best yield ever observed in the provnce of Quebec. On account of the large proportion of wrappers which it gives and owing to the fine texture of the leaves, the Big Ohio x Sumatra sells easily for 16 cents a pound. Therefore a net

yield of $320 an arpent may be expected with this variety. Few crops are as profitable to the farmer.

Tissue.—It can be stated, without exaggeration, that the Big Ohio x Sumatra is thinner than the thinnest Comstock actually grown. Its heavy yield is due exclusively to the large number of leaves that are left at topping time and to the size of these leaves. No less than 16 leaves and very often 18 leaves are left on a plant. Furthermore, leaves 25 inches long are not rare. This tobacco possesses one advantage over the Big Ohio: the tissue is firm as well as elastic and the ribs are remarkably fine in proportion to the size of the leaves. However the leaves are so thin that instead of being lost, as it were, in the tissue the ribs are slightly protruding on the under surface of the leaves. This is a slight defect which we hope to be able to correct by selection.

In conclusion, let us say that if the characteristics of the hybrid Big Ohio x Sumatra can be maintained, this strain will probably, before long, take the place of the Comstock Spanish, and there may be no advantage in keeping the hybrid Comstock x Sumatra.

ST. CESAIRE STATION.

The experiments which it was proposed to undertake at this station could not, unfortunately, be completed. On the 8th of August a hail-storm, accompanied by a strong wind, practically destroyed our crop.

We intended to make a comparative study of two varieties: the Brewer hybrid and the hybrid Comstock x Sumatra. We wanted to find out what results these varieties would give for the production of binders and even of wrappers on the soil of St. Cesaire.

It was proposed also to ascertain what effect the maintenance of the terminal buds would have, if any, on the labour, the nicotine contents and the texture of the top leaves. Experiments with chemical fertilizers were also carried, but the results were not sufficiently conclusive to be worth mentioning. Our two arpents of tobacco were almost entirely destroyed and only about 700 pounds of Brewer and 750 pounds of Comstock x Sumatra were harvested; furthermore this crop was so badly torn that it was quite impossible to use it for manufacturing purposes, except for 'cut tobacco.'

Yours respectfully,

O. CHEVALIER,

Assistant in charge of Quebec Stations.

OTTAWA, January, 1911.

III.

THE HARROW TOBACCO EXPERIMENTAL STATION.

(Report of the Assistant in charge.)

SIR,—I have the honour to submit herewith a report on work done during the season of 1910 at the Tobacco Experimental Station of Harrow, Ont.

HARROW STATION.

Twelve acres of tobacco, comprising six acres of Burley (Improved), Big Ohio, and Connecticut Broad Leaf, and six acres of the kiln dried type—Warne variety, were experimented with.

Twelve acres of corn and wheat were also grown. This latter mentioned acreage was seeded with clover, the six acre field of wheat at the rate of 15 pounds per acre, and the six-acre plot of corn at 10 pounds per acre. Since most of this land received a light coat of manure either the fall of 1909 or in the spring of 1910, a very fair catch of clover was obtained. I might add that part of this area was seeded with clover in the spring of 1909, but very little of it grew.

Since, the acreage of the farm has been extended to 40 acres, with 36 acres available for a systematic rotation; the intention is to grow 12 acres of tobacco, 12 acres of wheat and 12 acres of corn, in rotation. At all events the acreage in corn and wheat will be seeded with clover every year. Since no stock is raised, the crop will not be pastured, but whatever growth has been made will be ploughed down the following spring. By manuring the Burley ground every year, (the area for bright tobacco does not require manure), and as much as possible of the corn ground, together with the ploughing under of clover, and the use of commercial fertilizer, it is believed that the fertility of the soil will be maintained and even increased.

While this rotation will not apply directly to the whole farm of the average farmer, (since his acreage is too large to warrant having one-third of the land in corn or tobacco), still a short rotation suited to particular classes of crops is advisable.

Again the average tobacco grower keeps considerable stock on his farm, and provision has to be made for pasturage. Notwithstanding, the writer would advise the grower not to aim to produce Burley tobacco on the same field oftener than once every three years.

CORN AND WHEAT EXPERIMENTS.

Six acres of Imported Leaming corn were planted on May 27. The seed was obtained from a member of the Canadian Seed Growers' Association. Twenty ears were selected to plant a seed plot, composed of 20 rows with 20 hills to the row. This plot was conducted according to the regulations of the association. The general crop of Leaming yielded 100 measured bushels of ears per acre of well matured hard corn, which is being sold for seed purposes. Undoubtedly, had a severe drought not affected the crop when earing up, the yield would have been much larger. On August 22

clover (at the rate of 10 pounds per acre), was sown in the corn before the last cultivation. Despite the late seeding and the dry weather following, it made a very fair growth. Small plots of Reid's Yellow Dent and Wisconsin No. 7 gave splendid yields. It would seem that the first-mentioned is well adapted to this soil so far as yield is concerned, but it is too late in maturing.

Six acres of Dawson's Golden Chaff wheat was sown, but the yield was not up to standard, the crop being badly winter killed. The sample was good, and a portion of the crop was sold for seed purposes. Several pounds were selected in the head in the field before harvest, and this hand-selected seed was used to sow a seed plot for 1911.

PLANT-BED EXPERIMENTS.

OBJECT OF THE WORK.

A continuation of the work outlined in 1909 was undertaken. The object was to illustrate the best method of rearing healthy, vigorous plants, with good development of roots.

SCARCITY OF PLANTS.

As was the case last season, a large number of failures with plants were reported, and there was a scarcity of plants at planting time. Although a number of people in the villages, and many small farmers and gardeners made a business of growing plants to sell, still there was an increasing demand for seedlings at high prices. The need for plants was even greater than in ordinary seasons, owing: first, to the excessive ravages of the cutworms at planting time; and second, to the severe drought experienced at setting time, causing a large percentage of seedlings to die. Several fields had to be cultivated over again and entirely reset, while most fields required resetting more than once.

NECESSITY FOR THE WORK.

The failures in rearing plants may be attributed to a variety of causes, the chief of which are the following: Too frequent growing of plants in the same bed without changing the soil. The large permanent beds under glass of the Walker Company, Walkerville, sown with the Burley variety, were almost a total failure. Part of the soil had been used but one year. This soil was in an ideal physical condition and rich chemically, being well manured and fertilized. It was thought the cause of the trouble was due to a bacterial disease of the roots. The outcome is that their permanent beds with steam fittings are being torn down at a large expense, and the frames are being built in a different location. Other causes of failure are insufficient watering, a location lacking natural drainage, and lack of care in establishing the beds.

THE KINDS OF BEDS.

Beds to the extent of 1,300 square feet were established according to the following methods: 1st. Cold bed with glass covering. 2nd. Cold bed with cotton cover-

top. 3rd. Cold bed with different proportions of plant bed fertilizer applied to the ordinary soil. 4th. Cold bed with a thin layer of black soil on top. 5th. Hot bed with glass covering. 6th. Hot bed with cotton covertop. 7th. Hot bed with different proportions of plant bed fertilizer applied. All the beds received the same care, and were sown on the same date—April 9.

WARNE AND YELLOW ORONOKO BEDS.

Seven beds, of 70 square feet each, were prepared as follows: The land was ploughed, thoroughly worked in the fall, and a dressing of well rotted manure, applied. In spring it was spaded up and a special plant bed fertilizer—'Gold Dust' mixed with ½ to 1 inch of ordinary soil at 1/10 of a pound per square foot. The seed was sown dry on March 30 and the whole area covered with glass.

RATE OF SEEDING.

The seed was sown at the rate of ⅓ of an ounce per 70 square feet. This rate was found about right for this variety. The plants had sufficient room for free circulation of air between them. No symptoms of root rot were apparent, and a large number of plants were produced from the above area. Thinner seeding (⅓ oz. per 100 square feet—⅓ oz. is a heaping teaspoonful), would be advisable for tender growing plants like the Burley variety. They have a tendency to develop root rot, and become spindly when sown too thickly.

NOTES ON BEDS.

The first plants were noticed April 12, just two weeks from the date of seeding. Had the weather been favourable, the plants were ready for transplanting on May 30. Four and one-half acres were planted June 2, 3 and 4 from the 490 square feet.

The 'Gold Dust' fertilizer made the plants grow quite rapidly giving them a very rich dark green cast. They were just as large and as early as where the 'Eureka' fertilizer was applied.

DRY VS. SPROUTED SEED.

While the seed was very slow in germinating, still the plants made very rapid growth when once the seedlings appeared through the ground. The reason for the retarded growth at first was the fact that dry seed was used instead of swollen seed and the beds did not receive sufficient watering during my absence for three days. Where the seedlings are grown under glass, there is no risk in the way of killing the young tender germ when dry seed is used. Whereas if sprouted seed containing long sprouts were sown there is great danger of scorching the young germ, particularly if the day is warm and sun shiny. The danger of bruising the tender gemmule, in sowing the seed, is eliminated also. The grower gains a few days by using sprouted seed and it would seem, in cold beds with cotton covering, the practice is a plausible one, and generally not attended with any evil effects. However, the writer recommends the practice of bursting the seed coat only, and not allowing the young germ to grow to any appreciable size before sowing. By so doing the plants will come on about as soon, and there will be no danger from injury, through cold unfavourable weather, and from causing disease by bruising the young germ.

BURLEY EXPERIMENTS WITH METHOD OF BED ESTABLISHMENT.

Exp. 1.—One sash fertilized at ⅛ pound per square foot plant bed fertilizer 'Eureka' on surface of ordinary soil mixed with ½ to 1 inch of soil; hot bed using 3 to 4 inches manure in the bottom and 4 to 5 inches ordinary soil on top.

Exp. 2.—Hot bed, 1 sash fertilized at ⅛ pound per square foot using 'Eureka' fertilizer. It was mixed with ½ to 1 inch of ordinary soil and then about 1 inch of fine black soil applied.

Exp. 3.—Hot bed, 1 sash fertilized with 1/12 pound per square foot 'Eureka' fertilizer mixed with ½ to 1 inch of ordinary soil.

Exp. 4.—Hot bed, 1 sash fertilized with 1/16 pound per square foot 'Eureka' fertilizer mixed with ½ to 1 inch of ordinary soil.

NOTE.—The above sash was sown with dry seed Improved Burley, on April 8.

Exp. 5.—Cold bed, under glass, 1 sash fertilized with 'Eureka' at ⅛ pound per square foot on surface of ordinary soil mixing the fertilizer with ½ to 1 inch of the latter.

Exp. 6.—Cold bed, under glass, 1 sash fertilized with 'Eureka' at ⅛ pound per square foot on surface of ordinary soil; a thin layer of black soil applied to the surface of the fertilized soil.

Exp. 7.—Cold bed, 1 sash fertilized with 1/12 pound per square foot 'Eureka' fertilizer mixed with ½ to 1 inch ordinary soil.

Exp. 8.—Cold bed, 1 sash fertilized at 1/16 pound 'Eureka' fertilizer per square foot mixed with ½ to 1 inch ordinary soil.

Exp. 9.—Hot bed, 1 sash in area but covered with cotton, fertilized at 1/12 pound per square foot 'Eureka' fertilizer; no black mould used.

Exp. 10.—Cold bed, 1 sash in area, cotton covering, fertilized at 1/12 pound per square foot 'Eureka' fertilizer; no black mould used.

NOTE.—The soil for these 10 experiments had been prepared in the fall and an application of well rotted, farmyard manure given. The latter six beds were sown with dry seed April 3.

NOTES ON BURLEY BEDS JUNE 9.

Hot Beds.

Exp. 1.—The plants are large and uniform all over the bed, colour good. No blight or burning of the plants from this rate of application of the fertilizer.

Exp. 2.—This sash gave the largest and earliest plants, ready to set June 1 or sooner. The black soil with the glass covering absorbed the heat and caused the plants to grow much quicker. Then, too, the fertilizer made the plants grow quite rapidly.

Exp. 3.—Very uniform stand; plants about as large as where the lighter application was given. It would appear that fertilizer applied at ½2 to ⅛ pound per square foot will give as good results as any rate of application.

Exp. 4.—Large thrifty seedlings, even stand.

Cold Beds.

Exp. 5.—On June 9 the plants in these beds were just ready for transplanting, hence the hot bed with manure below gave plants ten days earlier than the cold bed with the same covering-glass on each.

Exp. 6. —The stand was more even than in Exp. 5.

Exp. 7.—The seedlings were about the same size as in Exp. 6.

Exp. 8.—The plants were apparently as large as where the heavier application of ⅛ pound per square foot was given.

Exp. 9.—Hot bed, cotton covering, stand not good, most of the seedlings were too small to set—very poor showing compared with the hot bed under glass.

Exp. 10.—Plants were quite small, not as large as in Exp. 9.

Burley Cold Beds under Cotton.

About 400 square feet of bed area was sown with swollen seed on April 15. The beds were fertilized with 'Gold Dust' at the rate of ⅒ pound per square foot on the surface of ordinary black soil, not bush mould. The fertilizer was thoroughly mixed with the soil by hand raking, the seed sown and raked in. The plants were nicely up in a week's time. However, these beds made very slow growth, due no doubt to the lack of heat. It would seem that ordinary soil was preferable to muck soil, under cotton, since the latter retained too much moisture and kept the beds cold. On the other hand the black soil under glass gave excellent results owing to the opportunity for greater absorption of heat, and the consequent drying out of the soil particles. The temperature was on the average 10° to 15° Fahr. higher under glass as compared with the cotton.

These beds produced strong healthy plants, but they were rather late for planting at the proper time. In case the grower is growing Burley plants under cotton, it is preferable to make up a portion of the bed area in hot bed to have plants ready for setting early in June. The area in cold frames might be watered with heated water, thus hastening growth. I saw some excellent plant beds handled in this manner that were ready for setting early in June. A number of successful growers have found it necessary to change at least a portion of their bed area from the cotton covering to the glass sash to get plants sufficiently early.

Watering with Nitrate of Soda Solution.

Whenever the plants were well started in the beds a weak solution of nitrate of soda was used in watering. A small handful in a 4-gallon can was tried at the outset. This quantity was gradually increased. After sprinkling with the soda solution, another light sprinkling with pure water was given. The plants were closely watched, and in case the leaf became spotted, or the edges turned yellow in any particular

spot of the bed, the application of nitrate of soda was withdrawn for two to three days. The effect of the soda solution was very noticeable in most beds, particularly those of the flue cured type.

SUMMARY.

1. The plants grown under glass were ten days to two weeks earlier than those grown under cotton.
2. The hot bed with glass covering gave plants a week earlier than the cold bed with similar cover top.
3. A solution of nitrate of soda gave excellent results in forcing the plants.
4. An application of 1/12 to 1/8 pound of fertilizer per square foot gave the best results. One-twelfth of a pound per square foot could be recommended.
5. Swollen seed gave as good results as dry seed, and the former method did not let the weeds get such a start.
6. The average temperature of the hot beds was 75° Fahr.
7. There was no appreciable difference in the thrift and robustness of the plants under glass or under cotton.

PREPARATION OF THE TOBACCO GROUND.

Five acres of ground were manured for Burley at the rate of 10 loads per acre and ploughed 4 to 5 inches deep. I might add that a great deal of the manure obtained was not of a very high manurial value. After ploughing, the land was rolled, double disked, rolled, harrowed, and rolled before planting. On account of the severe drought at this time, the soil tended to dry out quickly on the surface. The object of the several rollings was to firm the soil and bring the moisture nearer the surface so the plants would live when set out. Of course a mulch was soon restored again after planting, by cultivation, thus avoiding a loss of surface moisture. Planting was begun June 15.

GENERAL CARE OF THE CROP.

Owing to the severe ravages of the cutworms one acre of Burley had to be planted over again, while the whole area in tobacco required resetting four times. Thus we used several thousand more plants than was required in an ordinary season.

The crop was cultivated about every ten days with a two-horse combination tobacco and corn cultivator. This implement was used until there was danger of damaging the leaves and breaking off the root hairs spreading out in the rows, when it was exchanged for the single cultivator and the harrow-toothed cultivator. The Burley crop required hoeing but once owing to the splendid work done by this special one-horse implement. The Virginia leaf was cultivated rather more than the Burley. Being planted earlier and the small weeds getting a chance to grow more, it required hoeing twice. But with these two hand hoeings and continuous stirring with the two-horse cultivator, the weeds were easily kept down and a surface blanket of loose soil maintained. In no small degree do we attribute the yields to thorough tillage.

SPRAYING WITH LEAD ARSENATE.

During the first part of August the tobacco worms became quite numerous and spraying with lead arsenate was resorted to. This insecticide is cheaper than Paris green, will not burn the leaves and adheres longer to them. It was used at the rate of 3 pounds to 40 gallons of water. While it was quite effective in killing the young worms, it would have been necessary to spray three times to keep the large worms in close check. Hence a more effective agent, namely the duck, was resorted to.

THE USE OF DUCKS IN TOBACCO CULTURE.

Twenty ducks were placed in the 12-acre patch of tobacco, and it was quite encouraging to find that the large worms, also the smaller ones, were becoming fewer every day, and the tobacco was not damaged any more by caterpillars. The ducks were not fed any grain, simply given plenty of water in the field, consequently they were compelled to hunt for a good living. By moving the watering basin occasionally they kept the patch practically free of worms. Later in the fall they were fattened on corn and disposed of to good advantage. Several of the neighbouring growers kept their tobacco fields free of worms by the same means.

I would strongly recommend the trial of a small flock of ducks in the tobacco plantation, and have them in the field whenever the first worms are noticed.

FERTILIZER EXPERIMENTS WITH BURLEY.

With a view to finding out how to maintain and increase the present yields of Burley tobacco a series of experiments that were begun in 1909 were continued this season.

The intention was to prove that on such a soil, (a first class tobacco soil, but only of fair fertility), the yield could be materially increased. It will be seen further that despite the severe drought in the early part of the growing season—not allowing the fertilizer to become dissolved and available—we had very good success.

The whole five acres were under different fertilizer tests. One acre was divided into six plots of equal size. The soil of each plot being of like texture, was prepared in the ordinary manner, and planted June 29 with the same type of plants. The distance of planting was the same on all plots—3 feet 6 inches x 32 inches.

The three single fertilizers, namely: nitrate of soda, sulphate of potash, and superphosphate, besides farmyard manure, were used in this experiment. To each plot different combinations of the above manures were applied.

These fertilizers, which may be obtained from any fertilizer company, were spread on broadcast and harrowed in.

The plots were treated as follows:—

Plot No. 1—

400 lbs. nitrate of soda per acre (66·6 lbs.).
300 lbs. sulphate of potash per acre (50 lbs.)
200 lbs. superphosphate per acre (33·6 lbs.).
Barnyard manure, 10 tons per acre.

Plot No. 2.—Barnyard manure, 15 tons per acre.

Plot No. 3.—

300 lbs. sulphate of potash per acre (50 lbs.).
200 lbs. superphosphate per acre (33·6 lbs.).
Barnyard manure, 10 tons per acre.

Plot No. 4—

300 lbs. sulphate of potash per acre (50 lbs.).
400 lbs. nitrate of soda per acre (66·6 lbs.).
Barnyard manure, 10 tons per acre.

Plot No. 5—

200 lbs. superphosphate per acre (33·6 lbs.).
400 lbs. nitrate of soda per acre (66·6 lbs.)
Barnyard manure, 10 tons per acre.

Plot No. 6.—Check plot, no manure, no fertilizer.

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

First.—The influence of chemical fertilizers.

Second.—The demands of the crop and the particular elements lacking in the soil.

Third.—The necessity for using barnyard manure.

GENERAL OBSERVATIONS.

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

Plots 1 and 4 always were ahead, while plot 6, the check plot, made very slow growth and yellowed up prematurely, not showing the natural process of ripening. Plot 4 indicated that the Burley plant required the two elements, potash and nitrogen, while phosphoric acid was least required. The manure plot gave a larger and darker green leaf than the check plot, indicating that the soil required manure.

The yields per acre, the value of the crop calculated at 16 cents per pound—the prevailing market price—the cost of the manure and fertilizer, and the net receipts per acre, are given in the following table. The cost of the fertilizer was figured according to market prices. Sulphate of potash $54 per ton, nitrate of soda $54 per ton and superphosphate $18 per ton. Farmyard manure was valued at $1 per ton.

No. of Plot.	Quantity of fertilizer in pounds per acre.	Yield of crop per acre.	Value of crop per acre.	Cost of fertilizer per acre.	Cost of manure per acre.	Net returns per acre.
			$ cts.	$ cts.	$ cts.	$ cts.
1	400 lbs. nitrate of soda, 300 lbs. sulphate of potash, 200 lbs. superphophate, 10 tons manure	2,028	321 48	20 70	10 00	283 78
2	Barnyard manure, 15 tons	1,566	250 56	.....	15 00	235 56
3	300 lbs. sulphate of potash, 200 lbs. superphophate, 10 tons manure	1,644	263 04	9 90	10 00	243 14
4	300 lbs. sulphate of potash, 400 lbs. nitrate of soda, 10 tons manure	1,848	305 68	18 90	10 00	276 78
5	200 lbs. sulphate of potash, 400 lbs. nitrate of soda, 10 tons manure	1,656	264 96	12 60	10 00	242 36
6	Check plot, no manure, no fertilizer	1,204	192 64	.....	.....	192 64

COMMENTS.

As shown by the table Plot 1 gave the highest yield and the largest net return per acre. Plot 4 receiving the potash and soda was a very close second. The former yield was 824 lbs. per acre more than that obtained on the check plot. This latter mentioned plot, where no manure or fertilizer was applied, gave the smallest net return of any of the plots. Plots 2 and 6 showed the advantage of using barnyard manure, an increase of 562 lbs. per acre being obtained through its use. An increase of 462 lbs. per acre in Plot 1 over Plot 2 indicated that to get maximum results, commercial fertilizers must be used. The small difference of 12 pounds per acre between Plot 3 fertilized with potash and phosphoric acid, and Plot 5 fertilized with nitrate of soda and phosphoric acid is worthy of comment. A comparison of Plots 3 and 1 indicated the beneficial effect of nitrate of soda. Plots 5 and 1 indicated the effect produced by sulphate of potash. The difference in yield in these two cases was about equal, indicating that both nitrogen and potash were lacking in the soil and that the Burley plant required a large supply of both. Plots 3 and 5 indicated that one was needed as badly as the other and Plot 4 demonstrated that they were inseparable if the best results were aimed at.

CONCLUSIONS AND RECOMMENDATIONS.

First.—An application of manure was a necessary paying investment and it was the most economical method of adding humus and plant food to the soil.

Second.—To get the largest yields in growing Burley, barnyard manure must be supplemented with a moderate dressing of commercial fertilizer.

Third.—The soil was lacking in potash and nitrogen, and the Burley plant required both elements. This fact was plainly shown by the increase in yield of 644 lbs. per acre in the potash and nitrogen plot over the check plot.

Fourth.—The results of the fertilizer experiments of 1910 bear out those obtained in 1909. In the light of two years successful tests, it is economical to use the single fertilizers.

Experiment 2.—One acre of Improved Burley was planted 3 feet 8 inches x 32 inches June 11. The fertilizer was spread on broadcast and harrowed in before planting. It was applied as a complement to a light coat of manure at the following rate:—

300 lbs. nitrate of soda per acre.
250 lbs. sulphate of potash per acre.
12 tons manure per acre.

The above fertilizers were mixed together on the barn floor before application. The same method was adopted in all other experiments.

Notes on the plot.—The plants grew well but for the severe ravages of the cutworms which destroyed fully 60 to 70 per cent of the plot. This necessitated replanting at different times, consequently there were a great many small plants at harvest time and the plot lacked uniformity. It seemed that this plot was attacked worse by the cutworms than any others.

Nevertheless, the plants that remained from the first setting were very large, showing that the crop required sulphate of potash and nitrate of soda. The yield per acre was 1,340 lbs., and I believe had the cutworms not attacked it so badly, the yield would have been at least 300 lbs. more. I might add that the above rate of application of the two fertilizers—sulphate of potash and nitrate of soda—is recommended for trial by the average grower. The cost of the above, including freight, will be $16 per acre.

Experiment 3.—One acre was divided into two plots of half an acre each. Each plot was planted with Improved Burley on June 15, at the same distance 3 feet 8 inches x 32 inches in the row. The fertilizer was broadcasted by hand and harrowed in.

The plots were treated as follows:—

No. 1, ½ acre.—Apply 600 lbs. per acre sulphate of potash, 12 tons manure per acre.

No. 2, ½ acre.—Apply 300 lbs. per acre sulphate of potash, 12 tons manure per acre.

As indicated, the experiment was planned to find out the effect on the yield of the different quantities of potash with manure. I might mention that it was found from last season's experiments that Burley required a large supply of potash to make the best development. The results coincided with those of 1909. The average yield per acre for the two plots was 1,680 lbs. per acre.

Plot No. 1 yielded 1,896 lbs. per acre.
" No. 2 " 1,464 "

The net value of the crop from No. 1 was $276.36 per acre.

The net value of the crop from No. 2 was $216.74 per acre.

The above return was arrived at after deducting the value of the fertilizer at $50 per ton, plus freight and manure at 75 cents per ton From these figures it will be seen that the heavier application gave a net return of about $60 per acre more than the lighter dressing.

When the heavier applications of this special fertilizer paid better than the lighter dressing on this average soil, the writer is safe in saying that the average tobacco farmer can very profitably apply some sulphate of potash along with a good application of manure. He can get sufficient nitrogen by using all the manure available, and by plowing under a clover sod, but the required supply of potash can come from no other source than some form of potash fertilizer, preferably the sulphate. The outlay need not exceed $10 per acre.

Experiment 4.—One acre was divided into two one-half acre plots, planted the same day with the same type of plants. The plots were treated as follows:—

Plot No. 1—

600 lbs. per acre nitrate of soda (300 lbs.).
300 " sulphate of potash (150 lbs.).
100 " superphosphate (50 lbs.).
12 tons per acre manure.

Plot No. 2—

1,000 lbs. per acre guano.
12 tons per acre manure.

COMMENTS.

No. 1 yielded 1,742 lbs. per acre.
No. 2 yielded 1,542 lbs. per acre.

After deducting the cost of each particular application of chemical fertilizer and the manure, the net value of the crop per acre was as follows:—

No. 1. Net value of crop per acre, $246.72.
No. 2. " " " $219.72.

The difference in favour of No. 1 was $27 per acre. However, final conclusions should not be drawn from one particular test. The grower should experiment for himself with the different fertilizers and find out one which gives the best results on his particular soil, during varying seasons.

Experiment 5.—A plot of one acre was planted the same day with the same type of plants. It was treated as follows:—

625 lbs. per acre nitrate of soda.
325 " sulphate of potash.
150 " superphosphate.
10 tons per acre barnyard manure.

The yield was 1,330 lbs. per acre. However, had not at least one-tenth of an acre been taken up, and shaded by trees, the yield would have been over 1,400 lbs. per acre. The manure applied to thia plot was of very poor quality, being quite strawy. Again, this plot was planted later than the others.

A special tobacco fertilizer.—A tobacco fertilizer composed apparently of tobacco refuse was applied by hand to each plant on a small plot not mentioned above. It was hoed in. However, owing to the lateness of the arrival of the fertilizer, the test was not a fair one. Considering the low cost per ton, it gave very good results for the outlay. It is the intention to give it a thorough test next season.

CONCLUSIONS AND RECOMMENDATIONS.

First.—To get the largest yield in growing Burley a moderate application of commercial fertilizer should supplement barnyard manure. Burley is a special crop requiring particular food elements.

The Burley crop of the farm averaged 1,560 lbs. per acre. I consider that, by thorough cultivation and the use of commercial manures, the increase per acre was at least 400 lbs. The net returns from the crop, after paying for the fertilizer, was at least $200 more than had it not been used. In short the direct gain from its use was $40 per acre.

Second.—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. The same fertilizers applied at equal

rates per acre gave larger yields on small plots in 1909. This difference was due to the more favourable climatic conditions during the growing season. The grower should not draw conclusions from a single year's test with a particular fertilizer.

The fertilizers should be tested during varying seasons. Purchase the single ingredients, mix them together in the proportions above indicated, and apply broadcast, harrowing in well before planting. If a small amount is applied, mix with the soil around the plant by hand hoeing, or if planting by hand apply in the hill before setting out.

Third.—An application of sulphate of potash and nitrate of soda gave best results. The phosphoric acid element was least required. An application of 300 lbs. sulphate of potash and 250 lbs. nitrate of soda in conjunction with a liberal application of good manure might be tried to advantage on the ordinary soil. In case a thick clover sod were plowed under, the quantity of nitrate of soda might be reduced.

CONNECTICUT BROAD LEAF AND BIG OHIO VARIETIES.

About ¾ of an acre was planted with the above varieties. The ground was not manured or fertilized. Where the soil was light in texture the crop was good, but owing to a goodly portion of the area being of a clay nature, the crop was below average. If a farmer has a piece of ground that will not grow Burley successfully, or a soil containing a large amount of black muck, either of the above varieties might be tried. However, owing to the lack of demand for this dark type, the Burley variety is recommended to the average grower.

FERTILIZER EXPERIMENTS WITH THE KILN DRIED TYPE.

The object of these experiments was to determine the influence of the different combinations of fertilizers on the growth and subsequent colour of the crop. One acre was planted with the Warne variety and divided into six plots. They were treated as follows:—

Plot No. 1.—800 lbs. per acre of a 3-8-3-fertilizer was applied broadcast before planting.

Plot No. 2.—Check plot.

Plot No. 3—

350 lbs. per acre superphosphate (58·5 lbs.).
300 lbs. per acre nitrate of soda (50 lbs.).

Plot No. 4—

350 lbs. per acre superphosphate (58·5 lbs.).
300 " nitrate of soda (50 lbs.).
200 " sulphate of potash (33·3 lbs.).

Plot No. 5—

300 lbs. per acre nitrate of soda (50 lbs.).
200 " sulphate of potash (33·3 lbs.).

Plot No. 6—

350 lbs. per acre superphosphate (58·5 lbs.).
200 " sulphate of potash (33·3 lbs.).

The 3-8-3 combination is the form of fertilizer extensively used in Virginia in growing bright tobacco. The figures represent 3 per cent potash, 8 per cent phosphoric acid, and 3 per cent nitrogen. The larger percentage of phosphoric acid is to hasten the maturity of the crop. Owing to the excessive damage wrought by the cutworms on this particular area, necessitating replanting several times, the crop was quite uneven and rather late in maturing. Consequently each plot was not kept separate in the curing process.

The tobacco on each plot matured about the same time. However, owing to the lateness of the planting, the colour was not as good as in the case of the first planting. The crop grew larger, but it retained the greenish cast in the field longer than is desired to produce a bright colour. In short the fertilizer stimulated the growth, but did not hasten the maturity or improve the final colour when cured.

The balance of the area in Warne tobacco, comprising an area of 4 acres, was fertilized with the 3-8-3 combination at the rate of 800 lbs. per acre. 'Guano' at the rate of 500 lbs. per acre was applied to a plot of one acre. All the above fertilizer was broadcasted and harrowed in. Since the four-acre plot was planted the first days in June and the cutworms did not cut off many plants, the crop was quite uniform and presented the desired colour in the field.

CULTURAL DIRECTIONS.

Selection of the soil.—The importance of close selection of the soil for bright tobacco was suggested again this season. A small portion of the field was low lying and tended towards a clay loam. The tobacco on this spot was quite small and seemed to retain the green cast when the crop on the higher lying sandy soil was growing well and had taken on the marked yellow appearance. The very light coloured sandy soil on some farms might produce a bright yellow wrapper, while other portions of the same farm (better adapted probably for Burley or for other farm crops) would produce only the second or cheaper grade.

The season.—However, the season, the distribution of the rainfall, or a cold backward period in the early spring, have a close relationship to the final product.

To illustrate, the crop must have a uniform growth after setting, or the plants will grow up, button out, and require topping too early.

After topping, if moisture comes, the crop will take a second growth and keep on growing when it should be ripening. This condition of affairs is very objectionable, and the crop is likely to cure with a greenish cast and have a rough leaf. The crop should make its growth the latter part of June and the first part of July, but not in August, when it should be ripening. A moist June and early part of July followed by dry weather in August is the kind of weather most desired.

Date of planting.—This type of tobacco would have been planted the latter part of May, but the weather was quite cold and backward and snow fell the last day of May. As a consequence planting was delayed till June 2, when the snow and rain ceased and the temperature increased. Four acres were set at the first planting, and the balance was planted in about ten days' time. The early planting ripened up quicker, was more uniform, and altogether presented a brighter coloured leaf than the later setting.

Any farmer contemplating the culture of this tobacco should make provision for a supply of early plants. As was indicated last season it is almost imperative that glass sash be used for rearing the seedlings if they are to be ready in due time. It is absolutely necessary to have a plant thoroughly ripe before harvesting if we are to obtain the ideal colour. Then too the season is none too long for this type of tobacco. In fact the season of 1910 seemed to be rather short for some of the crop to ripen. Unless harvesting is commenced about the middle of September, the high winds during the latter part of September and the early part of October will damage the leaves about as badly as early frost. Further the grower, who is going to handle three acres in one kiln, will find that at least one curing must be completed early in order to handle the balance of the crop expeditiously and avoid damage from letting it stand in the field too long.

Priming.—The plant was 'primed'—that is the sand leaves and two or three lower ones were removed so that nothing but sound members remained. Sometimes three and occasionally five leaves were stripped off. It depended on the condition of the lower ones and the future possibilities of the plant. These sand lugs were of poor quality and simply increased the waste products and the subsequent work of grading. Then too 'priming' favoured the development of adventitious roots and allowed the plant food to be carried to the sound leaves rather than to the damaged bottom members.

Topping. This operation was begun when the button appeared, sometimes sooner. The plant was topped at eight to twelve leaves, the average being about ten. This operation required the best of judgment; in addition one must be able to sum up quickly what the future possibilities of a plant will be. A guiding rule at topping time is to top low in a damp season and to top high in a dry season. Since, if the weather is wet at topping time it will usually be dry later on and vice versa. By following the above rule we shall have a smaller percentage of immature top leaves. However, no set rule can be closely followed, the grower must use forethought and the most delicate sense of judgment. Following this operation the plants were hilled up by turning the inside shovels of the two-horse combination cultivator. Up to this date, August 7, the crop had been hoed twice, cultivated four times, and the fifth or last cultivation was called 'laying by' the crop.

HARVESTING.

The Virginia leaf should be riper before cutting than is the case with any other type of tobacco, Burley included. Every leaf on the plant should show marked yellow spots on the upper surface. Since there was a marked difference in the manner and rate of ripening of different plants, the crop was picked over in the field and the ripest spots taken. By so doing the kiln was filled with plants of a more uniform ripeness and the curing was better.

Splitting the stalk.—The plant was first split from the top down to near the bottom leaves, and then cut off at the ground, with a knife made specially for the purpose. This knife was sharpened on both edges, the rounded side being used for splitting and the hooked edge for cutting the stalk. After splitting, the plant was inverted and placed over the lath. This operation required a boy to hold the stick

in a horizontal position and lay it down when full, after plants had been evenly spaced. The splitting of the stalk hastened the curing process by allowing a more ready escape of moisture from the tissues.

The method.—The method of procedure was to drop the lath through the field every fourth row, thick enough to take the tobacco that was to be cut. From six to ten plants, depending on the size and condition, were placed upon a lath. The tobacco was hauled to the barn before thoroughly wilted, the cutting and hauling going on simultaneously. When sufficient was cut, the filling of the curing barn was completed, the cutting, hauling, and hanging being completed in one day.

I purpose, another season, trying piling while on the lath a portion of the crop and allowing it to wilt thoroughly and yellow up before hauling. It might be left in the field for two days or longer, before hauling to the kiln. By so doing the leaf should be thoroughly wilted and the lath could be hung more closely in the barn, without danger. In addition to the material saving of barn room, a larger load may be hauled from the field. However, great care must be exercised in handling the lath, as the leaf is very tender when in the yellowing stage of curing. It is very easily bruised and darkened. If hung on a tobacco rack when hauling from the field, and the tips of the leaves not allowed to drag over the racking, no particular damage should result. By this method of handling, it is expected that the leaf will cure up to a more uniform yellow colour.

CURING.

The object of the curing was to develop a lemon yellow colour, in short a bright wrapper for plug purposes. The ideal leaf in addition to the colour had a fine texture and a rich, oily, elastic appearance. The first two kilns were filled September 9 and 10, or 105 days from the date of setting. The tobacco was allowed to stand in the kiln during one day before the fires were started. The object was to start the yellowing process before applying the heat. The firing was begun on Monday, September 12, and the entire process was completed Friday morning at 6 p.m. or in four and a half days. A cold high wind prevailed, consequently it was more difficult to get the tobacco to yellow. Then too it required more fuel to maintain the temperature in the kilns.

Curing of Burley.—Several Burley leaves were placed in the curing barn, but it was found that after yellowing the leaf turned red as it dried. The final colour was practically the same as when air cured. However, to have a fair test, the Burley should have been handled in a separate kiln, since it required different temperatures for drying. This result was not in keeping with the 1909 experiment, when a bright lemon yellow colour was obtained. However, the leaf presented a rich gummy appearance and had a thicker tissue.

The two kilns were filled again September 26 and 27, and the fires were started the evening of the 27th. The time required to handle these two curings was about the same as in the former case, namely four days six hours. There was warm calm weather most of the time and the temperature was easily maintained.

Formula for curing.—(See Bulletin No. A-9.) However, the same formula did not apply successfully in every particular curing. The principal reason for this state

of affairs was that all the methods were based solely on the temperature. The condition of the tobacco must be watched as closely as the thermometer.

Scalding and sponging.—If the sap was dried into the leaf through increasing the temperature too rapidly, a greenish dark colouration known as 'scalding' resulted. We experienced some of this during one of the curings. On the other hand, if there was not sufficient heat applied, or if there was not ample ventilation to carry off the excess of moisture as soon as given off by the leaf, the latter 'sponged.' These troubles occurred immediately after the sapping of the leaf or during what was known as 'setting the colour,' which latter period was the most critical of the whole process.

The following is a summary of the method followed during two of the curings:—

80° to 90° Fahr.	during	24 hours.
100° " 105° "	"	12 "
110° Fahr.	"	12 "
115° "	"	6 "
120° "	"	12 "
125° "	"	2 "
140° "	"	12 "
150° "	"	6 "
160° to 170° Fahr.	"	12 "
180° " 190° "	"	15 "

Total 4 days 17 hours.

When the curing was finished, the doors and ventilators were opened. The weather conditions were generally such as to bring the tobacco 'in case' in condition for handling without breaking. A light shower, or a foggy night, brought the tobacco in good order.

Bulking down.—When the leaf was in condition it was bulked down in the basement of the air curing barn without being removed from the lath. A short time in the bulk improved the colour and straightened out the leaves. If not in good case, the laths were first hung up on scaffolding in the basement of the barn where the leaf generally came in good shape for handling. The longer the crop was left hanging up so that it came in and out of case occasionally, the better the colour obtained.

Grading.—The following classes and grades were made: First. 'Wrappers,' subdivided into three grades, bright yellow lemon, bright red and dark red. Second. 'Tips,' leaves having a distinct greenish cast. Third. 'Lugs,' divided into the bright and dark grades.

This latter class might be termed smokers; it included what sand leaves were present and all those leaves which were badly torn or of a very thin texture.

The proportion of the different grades will vary with different [illegible]s, in fact with different curings of the same crop. To illustrate, the first four cu[illegible]gs of our 1910 crop contained six grades, while the last two curings which were co[illegible]osed of a poorer type of leaf contained but three grades. While the grading required [illegible] 50 per cent more time than the ordinary method of handling air cured tobacco, still, the crop presented a much more attractive appearance, and suited the demands of the market.

Tying.—This tobacco was tied into small hands, using the tip end of a good leaf for wrapper and covering the stem end of the leaf almost entirely. While the above method would not allow the stem to dry out as thoroughly as would the ordinary manner of handling Burley, with the market favoured it, and it was the custom in the bright tobacco belt. Further the stem in a leaf of the flue-cured type is more free from moisture than is the case with Burley, hence this method of tying.

Rebulking.—After tying the leaf was bulked into large piles, keeping each grade separate. These piles must be closely watched that they do not become too moist, or the temperature rise beyond normal, when the tobacco will heat and mould very quickly. In case the bulks began to get too warm they were torn down, the hands shaken out and the whole rebulked again. This avoided any further trouble.

RETURNS FROM THE CROP.

The crop yielded 900 lbs. per acre, and the price obtained was 30 cents per pound for the entire crop. The gross return per acre was $270. This result was quite encouraging. We can account for the enhanced price from the fact that the crop was more uniform than that obtained last season, and in addition the percentage of good bright red tobacco was larger.

When we consider that no manure was applied and the cost of fertilizer did not exceed $5.75 per acre the net returns compared very favourably with Burley. The cost for fuel was 6.75 per acre. This figure included the initial cost of the wood, the cutting, the hauling, etc. The net return, not including the labour, use of buildings and rent of land, was $270 less $12.50—$257.50 per acre.

However, having secured the use of a ten acre field which is higher lying and presenting to all appearances a better bright tobacco soil, we hope to produce a still better grade of leaf in 1911.

SEED SELECTION AND DISTRIBUTION.

Over 500 typical Burley plants were selected for seed and a 10-lb. paper bag placed over each flower just when it was beginning to open. This prevented the intercrossing of other varieties grown in the field and also prevented any cross fertilization of the flowers of good plants with those of poor ones and vice versa.

As the plants grew, the bag had to be pulled up on the flower head in order to give the flowers a chance to develop. When sufficient pods had formed seed, the bags were removed, and all small immature capsules and flowers were destroyed. Thus nothing but large well developed capsules were allowed to mature. By this method of selection the seed pods seemed to grow well and ripened normally when the bags were removed.

The leaves were allowed to remain on the seed plants till after the whole crop of tobacco was harvested. When it was thought the seed required the balance of the season to ripen or to brown up, the leaves were stripped off and hung on a lath by a string fastened to the lath at both ends, and a special loop holding together a bunch of about ten leaves. There were from 15 to 20 bunches of 10 leaves each, on every lath. This necessitated a good deal of work, but through this method the leaves cured up a better colour than they would have by another practical method.

IMPORTANCE OF SOWING RELIABLE SEED.

Experience has taught farmers the necessity of sowing reliable seed for all farm crops. Why not use selected tobacco seed? Large plump grains will germinate more quickly and produce stronger plants with good root development. Then too, heavy seed will produce more disease resistant plants. Secure a small sample from a known reliable source. Select a few plants for your own seed supply, and practice selection with this particular type. Seed selected on your soil and grown according to the above directions should give best results. By so doing we shall not have so many crops lacking in uniformity and yield. One way of increasing the yield per acre of your crop is individual seed selection.

FREE DISTRIBUTION OF SEED.

Over 13 lbs. of Improved Burley seed was grown for free distribution to any farmer and may be had by applying to F. Charlan, Tobacco Division, Canadian Building, Ottawa.

Yours respectfully,

W. A. BARNET,

Assistant in charge of Harrow Station.

HARROW, February, 1911.

IV.

CLEANING AND GRADING TOBACCO SEED.

During the last few years the advantage of using heavy tobacco seed (plump and well ripened) has been particularly urged upon tobacco growers.

It is well known that the quality of the seed varies greatly according to the proportion of ripe or unripe capsules that are harvested, and it is also known that unless special precautions are taken, the capsules on the same plant are at various stages of maturity when harvested.

Uniformity of quality in the seed is a very important factor in tobacco growing. Good seed is essential in order to secure good seedlings, and the success of the crop depends, in no small degree, on the quality of the seedlings. This is why seed production and sowing methods have received so much attention from this division.

These two subjects, the production of seeds and their treatment before sowing, have been discussed at full length in previous publications of this division (Bulletins A-1, A-8, A-9 of the Tobacco Division), and the grower who closely follows the methods advised in these bulletins will be sure to get seed of good quality. But recommendations are not always acted upon, and it is quite likely that many growers will continue to harvest mixed seed which will require to be carefully cleaned and graded before it can be utilized.

Various apparatus have been devised for cleaning and grading seed.

In the first place there are the sieves in sets: hulls and fragments of capsules remain on the top sieve whilst the cleaned seed is found on the lower one; the dust is collected in a solid bottom. However, tobacco seed is too small to be graded by weight and size with this apparatus, and the results, being incomplete, are not entirely satisfactory.

In other apparatus, a mechanical separation of seeds, dust and fragments of capsules is effected, generally by means of air currents. The results are pretty much the same as those obtained with the sieves, and the latter have the advantage of being more economical.

The largest tobacco seeds are generally the heaviest, but on account of the extremely small size of the seeds, as stated above, they cannot be graded with sieves. It was necessary therefore to adopt some system of mechanical separation in which the seeds, being carried by a current of air, would settle at various distances, according to their weight.

One of the first apparatus with this object in view is a small mechanical cleaner, devised by M. E. Yehl, an inspector of the Tobacco Branch, of France.

By means of this apparatus, which has since fallen into disuse, Mr. Yehl managed to separate two qualities of seed, one of an apparent density of 0·470, the other of 0·300. This apparent density was obtained by weighing 1 litre measure filled with all the tobacco seed it could contain.

More recently, Americans have advocated the use of an apparatus consisting of a vertical glass tube (see Fig. 1), made up of two parts, held together by a metallic

joint, cemented at the top. At the bottom of the top part is a metallic cloth, fine enough to check the passage of tobacco seed, and a stopper for regulating the passage of air, which is forced into the tube by means of a treadle blower, connected with the apparatus by a rubber tube. Under the effect of the current of air, the dust and fragments are blown out of the tube, and the seeds of tobacco, being carried by the air towards the top, run down, when the strength of the current is well regulated in a series of falls, during which the heaviest seed, falling quicker than the others, gathers progressively and fairly rapidly at the bottom of the tube.

We have succeeded in separating seed of a considerable density (0·600) by means of this apparatus, but there are objections to its use.

In the first place, the action is not continuous. After each operation the two halves of the tube must be taken apart in order to gather the seed which has collected at the bottom. This must be done with care so as not to lose any of the seeds contained in the movable top part. Then, there is nothing to indicate the separation between the seeds of various density. Furthermore, in order that a separation may be effected, it is necessary to operate upon a larger quantity of seed than is required to fill the lower tube.

It is evident that the heaviest seeds collect at the bottom and that the density goes decreasing progressively from bottom to top, whilst the dust and light fragments are blown out; but there is nothing to show definitely what quantity of seed must be rejected.

In theory, the results are excellent, since two distinct grades of seed are obtained, the heaviest and the lightest, but it may be doubted if this apparatus would work satisfactorily in practice, at least in the hands of one who is not an expert. Furthermore, it is rather expensive, the total cost, blower included, being $10. To this, the duties must be added, as the apparatus is manufactured in the United States.

But we have obtained a perfect separation by means of a small fanning mill, with ventilator attached (see Fig. 2). This mill, which may be operated at varying rates of speed, divides the seeds into three classes, whilst dust and chaff are carried out.

However, in order to secure good results, the seeds must first be sifted, so as to take out all big fragments which might interfere with the regular rate of speed of the distributor.

In order to test the efficiency of the machine it was run at varying rates of feeding, and the following results were obtained:—

1st trial.—Cuban seeds.

(*a*) High rate of feeding—average speed—

No. 1	52·274
" 2	38·672
" 3	23·84

(*b*) Slow rate of feeding—average speed—

No. 1	0·577
" 2	0·528
" 3	0·43

SEED CLEANER AND GRADER.

The heaviest seed gather at the bottom of the tube between the two metallic joints cemented to the glass.

4876—p. 38.

SEED CLEANER AND GRADER.

For the sorting of tobacco seed in three grades. The heavier seed gather in a box placed at the bottom, the other two grades in the receiver, placed in front of the blower.

(*c*) Average rate of feeding—average speed—

No. 1	0·527
" 2	0·491
" 3	0·414

In the first case, owing to the higher rate of feeding, a large quantity of dust and fragments was retained in grades 1 and 2; No. 3 contained very few seeds, but chiefly dust and fragments.

No. 1 grade was again put through, and the following results were obtained:—

Apparent density—

No. 1.—(*a*)	0·5884
" 1.—(*b*)	—
" 1.—(*c*)	0·4986

In this, the letters *a*, *b*, *c* represent the original lots 1, 2, 3 respectively.

When operating at a high rate of feeding, seeds of lot No. 1, as well as those of lot 2, had to be passed through again. This loss of time could have been avoided.

A second trial took place with Comstock-Spanish seed, at an average rate of feeding and low speed. The ventilation not being so strong, fewer seeds were carried in No. 3, whilst dust and fragments were well removed.

The following apparent densities were noted:—

No. 1	0·514
" 2	0·446
" 3	0·350

Grade No. 1, if Yehl's figures are to be adopted, represents an excellent density. Lot 3 was rejected as being of insufficient density and lot 2 was passed through again in order to rid it of seeds of the third grade which it might still contain. The results were as follows:—

No. 2 (*a*)	0·48360
" 2 (*b*)	0·4787
" 2 (*c*)	0·3360

Lots 2 (*a*) and 2 (*b*) still contain excellent seed and we feel certain that by putting together lots 1, 2 (*a*) and 2 (*b*), we will be able to guarantee the quality of the seeds that are being distributed.

In order to confirm these results the seeds were tested at the laboratory of the Seed Division, Ottawa. The following results were obtained:—

—	Percentage of germinated seeds.	
	6 days.	14 days.
No. 1	77	86
2	76	80
2a	82	87
2b	70	75
2c	54	58
3	31	39

Lot No. 3 must be rejected, and lots 1, 2 (*a*) and 2 (*b*) can be safely mixed.

The apparatus works rapidly, makes a clean grading of seeds according to density, removes all dust and fragments and gives a minimum quantity of waste seeds. Any quantity of seed may be worked upon. Therefore it is practical and may be recommended.

Up to the present time, we have chiefly relied upon good methods of production and careful selection for improving the quality of the varieties of tobacco grown in Canada. Any seeds obtained by the methods which have been recommended in previous publications will not require to be graded by this process. We do it however in order to further guarantee the quality of tobacco seed distributed through the Department of Agriculture, as we feel confident that before long all growers will get their seed from the department. The effect of this distribution of seed will be to increase the yields in weight, to insure a greater uniformity of quality and less variation in the strains. As the quality of these strains for manufacturing purposes is daily becoming more apparent, it is important that they be fixed as soon as possible.

NOTE.—The opportunity here presents itself to condemn a practice too common among tobacco growers with regard to seed testing: The seeds are thrown into a glass of water and only those that fall to the bottom are considered as good. This method is worse than useless. As a general rule the specific weight of tobacco seed is below 1. It must therefore be expected that it will remain at the surface, and seeds should not be rejected as bad because the method of testing is faulty.

In one of his trials, G. Blot, of France, has observed that the specific weight of seeds varies from 0·78 to 0·90. In a more recent trial conducted by the Experimental Farm laboratory at Ottawa, with tobacco seed of a density of 0·60, the specific weight reached as high as 1·0123. However, in spite of this exceptional density, this seed, when thrown into a glass of water, remained on the surface, owing to the adherence of air to the hull.

F. CHARLAN.

APPENDIX.

THE TOBACCO DIVISION.

BY

F. Charlan.

The Tobacco Division was organized towards the end of the year 1905, when the Honourable Sydney Fisher, Minister of Agriculture, instructed an officer to inquire into the condition of the tobacco growing industry in Canada. This officer, who is the author of this article became, in time, the chief of the Tobacco Division.

After a tour of inspection in the chief tobacco growing centres of Canada, viz., a few counties in Quebec and the county of Essex, in Ontario, a campaign of improvement was started, beginning with the province of Quebec, the effects of which are already noticeable. If any part of Canada stood in need of improvement at that time, so far as methods of growing and curing were concerned, it cannot be doubted that this part was the province of Quebec.

Of course, we are still far from perfection and a great deal remains to be done, but this much has been gained: the growing of tobacco, in the chief productive districts of the province of Quebec, has now a definitive aim: the production of pipe and cigar tobaccos.

Long before this time, the growers of Essex county, more enlightened or better advised, had found their calling, and were carrying on the tobacco industry for a purely manufacturing purpose, the Burley being their almost exclusive product. This variety, which is greatly appreciated by the manufacturers of plug tobacco and which may also be utilized in the preparation of some pipe mixtures, requires special climatic conditions, not generally met with in the province of Quebec.

At the present time, the tobacco growing centres in Canada may be defined as follows.

1. South Ontario and Essex county (chiefly the latter). Specialty: plug tobacco, Burley variety, a heavy yielder in weight, and requiring a fairly long summer and a favourable fall in order to ripen and cure properly. The soils of Essex county contain a fairly large proportion of lime, which favours the production of a leaf with a porous texture; such leaves are eminently suitable for the production of plug or chewing tobaccos, on account of the ease with which they absorb the juices which enter in such a large proportion in the manufacture of these products.

2. Quebec. The chief contributors to the tobacco crop of this province are the counties on the north shore of the St. Lawrence: Montealm, Joliette, l'Assomption, Deux-Montagnes, etc., and a new group which is daily becoming more important: the Rouville group, on the opposite shore, south of Montreal. Owing to the comparatively short season, the growers of Quebec were compelled to select early varieties such as Canelle, Petit Rouge, Petit Havana, etc., which are the so-called Canadian tobaccos. These varieties of tobacco are remarkably early, but their yield, with the exception of the Canelle which still commands high prices, is so light that they are

not generally very profitable. Other varieties including the seed leafs; Connecticut Seed Leaf, Havana Seed Leaf and Comstock Spanish, give sufficient yields to leave a good profit to the producer. Sooner or later, however, the Connecticut Seed Leaf will cease to be grown in the province of Quebec. Being a very slow grower, this tobacco cannot be depended upon, with any degree of certainty, in a normal year, to ripen before the first autumn frosts. During the last few years the Havana Seed Leaf, not so large a variety but a surer cropper, has been taking its place. But the Havana Seed Leaf is also gradually disappearing before the Comstock Spanish, a recently introduced variety in Canada and which has become acclimatized in a marked degree.

3. British Columbia (Okanagan valley). Cuban tobacco has been grown for some time with good results in this part of Canada. The products of this tobacco are fillers of excellent quality although rather strong.

The county of Essex appears to be particularly well adapted to the growing of Burley, the province of Quebec to the seed leafs and Comstock, and the Okanagan vallley, owing to its special climatic conditions, is admirably adapted to the growing of an aromatic filler.

Before the Tobacco Division was organized the chief aim of the tobacco growers was to get the heaviest possible yield in weight. There could not be much objection to this system in the province of Ontario, owing to the special nature of the products, but it was entirely wrong in the province of Quebec, where climatic conditions were radically against it.

In the province of Quebec, it was useless to look for heavy yields from such small varieties as the so-called Canadian tobaccos, and the big and slow growing varieties such as the Burley having failed, the farmers of this province had almost generally adopted the Connecticut Seed Leaf, which they called the Grand Connecticut. The larger the leaf, the more profitable the variety was supposed to be. Too often, unfortunately, towards the end of August or in the first part of September, heavy frosts occurred, which in a few moments ruined a promising crop. As already stated this is one of the reasons for which this variety is being abandoned in Quebec.

At our first inspection trip in Quebec, two errors were observed. In the first place, the seed leaf tobaccos were generally too ripe when harvested. They were also planted too far apart. Therefore, in some cases, it seemed possible to avoid early frosts by harvesting a few days earlier, and it seemed also possible to get heavier yields in weight by planting closer, securing, at the same time, a leaf with a more delicate texture and large enough for all purposes.

The first experiments carried on with Comstock Spanish on the Central Experimental Farm, at Ottawa, in 1906, gave us a yield of 1,800 lbs. per acre. Although the spring of 1906 was rather cold, the year may be considered as having been favourable to the growing of tobacco.

This showed us that with earlier varieties, the heavy yields so eagerly sought by the farmers of Quebec could easily be obtained. This is one of the first advantages of close planting. But there is another advantage: Some varieties which, when planted too far apart, gave thick and strong tobaccos, yielded, when planted closer, finer leaves and lighter products. Here was a possibility of producing a binder type of tobacco, of first class quality, in the province of Quebec. It is well known that

Canada imports millions of pounds of tobacco for th... purpose every year from Wisconsin and Connecticut. There was no reason why a home grown product, of equal quality, could not meet this demand.

Quebec growers, at least those situated in the more important districts, soon realized the importance of specializing in such varieties. Two districts were foremost i... s... doing, Montealm and Rouville. Warehouses for the handling and preparation of these tobaccos have now been established in the province of Quebec and a number of others will soon be built. This is conclusive proof that the products of this province are now suitable for manufacturing purposes and they are of first class quality according to some manufacturers.

The future work of the Tobacco Division will be to endeavour to centralize, in different districts, the various types necessary for the Canadian manufacturing industry. To do this will require far more work and work of a more delicate nature than to correct mistakes in production as was done for the farmers of Quebec. It is very difficult to induce a farmer to give up the growing of a variety to which he is accustomed and which he considers as profitable. Private interest, sometimes misunderstood, often speaks louder than general interest. This led to the establishment of experimental fields in the various districts, in order to test the adaptability of the different varieties of tobacco as produced in all parts of Canada.

The main object was to find out whether the county of Essex was able to grow as good a quality of seed leaf as that produced in various parts of the province of Quebec. The Quebec grower looked upon his colleague from Ontario as a rival, and lived in constant fear of seeing the seed leafs of the latter province entering in competition with his own.

Our first experiments convinced us that, generally speaking, the seed leafs of Ontario have a much looser and coarser texture than those of Quebec. The soils of Essex are particularly well adapted to the growing of Burley. But the porous tissue, which is a quality in Burley, is an objection in seed leaf tobacco. Again in burning quality, the seed leafs of Ontario are generally inferior to those of the province of Quebec.

The series of experiments undertaken in 1909 has enabled us to ascertain the quality of the various varieties of tobacco grown in different parts of Canada. Comstock Spanish, Hazelwood and Cuban were grown the same year, at Harrow, St. ... 'Ac...zan and St. Cesaire. After being cured these tobaccos were handed ... packer which had them fermented in his warehouse at Farnham.

A ... of the products after fermentation gave the following results:

Comstock Spanish: binder type. The tobacco from St. Cesaire stands first with a fine ... and well developed leaf. The tobacco grown at St. Jacques is not quite ... in texture; its chief fault is lack of size, although the leaves are large enough ... to be used as binders. The Ontario Comstocks, not quite so large as those of St. ...saire, yield a thicker leaf, with a strong taste and aroma. The superiority of Quebec seed leafs is quite evident, and in this, our opinion is corroborated by the experts who helped us in handling the products.

The Cuban variety grown in Essex yields an excellent filler, with an agreeable aroma, fairly strong. However, the Cuban grown at St. Jacques l'Achigan is a better product, the leaf is not quite so large, but the aroma is very delicate and mild in

taste. It is even possible that this Cuban may compete with the fillers of British Columbia, which, generally speaking, have a stronger taste. There a question rises: whether the growing of Cuban from imported seed or from Canadian seed of the first and second generation may not be profitable in the province of Quebec. Doubtless, it will be profitable if the farmer can get a price sufficient to make compensation for the rather weak yield in weight of this variety.

On the other hand, the Hazelwood grown in Ontario appears to be of better quality than the Hazelwood grown at St. Jacques l'Achigan. This is an anomaly which requires explanation, as we do not see why some varieties of filler tobacco should give better results in Ontario while other varieties give better results in Quebec, inasmuch as all of them may be included in the same group, the Havanensis.

A lot of Big Havana at Harrow gave a thick filler with a rather strong taste and a fair aroma, but the fermentation of this product has proved difficult. After being submitted to very high temperatures in bulks, the leaf of the Big Havana was still streaky as though the fermentation had not been sufficient.

Judging by these results, it seems useless to try to grow seed leafs with light tissue in Essex. Perhaps, owing to the length of the season which allows for the curing of large tobacco, good results may be obtained with Big Ohio in this part of Canada. But delicate products such as the Comstock Spanish and the Brewer hybrid will have to be grown in suitable districts in the province of Quebec.

A mention should be made here of the hybrid Comstock-Sumatra, created by this division in 1908 at St. Cesaire, and grown for the first time in 1909 at our station of St. Jacques l'Achigan. This tobacco possesses remarkable qualities; the oval shape of the leaf is a distinct advantage, as it enables the manufacturer to produce a maximum number of wrappers. The tissue is fine, although resistant, and the ribs, instead of being prominent, lose themselves in the tissue. Owing to this fact, this variety can be used as binder in the manufacture of cigars of superior quality wrapped with Sumatra. The burning quality is good. The yield in weight per acre is much above that of the Comstock Spanish, owing to the larger size of the leaf and the larger number of leaves that it is possible to leave on the plant at topping. In addition to these qualities, which make this variety a manufacturing tobacco of high merit, it ripens quickly, dries more easily and more regularly than the Comstock and is less susceptible to rust. Whilst the bottom leaves of the Comstock grown at St. Jacques station showed numerous spots of rust, those of the Comstock-Sumatra were not in the least affected. This particularity shows that the bottom leaves of the hybrid are more resistant and more elastic than those of the Comstock, and, in fact, the handling of the small quantity of the Comstock-Sumatra that we were able to harvest has not given any waste to speak of, while for the Comstock there was a minimum of 6 per cent of waste. All low leaves, torn, and of such a texture that they cannot be utilized with profit, are looked upon as waste.

Experiments with Burley, the variety almost exclusively grown in Essex, are being conducted at Harrow. The object of these experiments is to demonstrate the advantages of a rotation of crops, and to find out what fertilizer gives the best results with this kind of tobacco. The soils of Essex, where Burley has been grown for many years without interruption, give signs of fatigue, which we hope to overcome by a suitable rotation. By the rational use of fertilizers, we hope to increase the yields in weight and improve the quality. The results obtained so far are most

encouraging. In some cases, the yield in weight has gone up to nearly 2,500 pounds per acre. This yield, much above the average, fully justifies the use of fertilizers. The cost of fertilizers being deducted, the yield in money, computed at market prices for the year 1909, has reached $323 per acre. If growing expenses are deducted from this sum, it leaves a net profit of at least $250 per ac.

At Harrow station, special attention is given to the growing and curing of Virginia tobaccos. This industry is still in the experimental stage in Essex county, but from all appearances it seems to be quite profitable. All soils are not equally adapted to the growing of yellow tobaccos, but there are a few gravelly hillsides which appear to be quite suitable. Favourable results were obtained the first year and we hope in the near future to see the process of flue curing generally adopted in Essex county. If the Essex farmers, who have suitable soils for the purpose, should grow Virginia, there might be a corresponding decrease in the production of Burley, which would not be an objection as there has been an over production of this variety for some years. This decrease would tend to regularize the prices. The Virginia tobaccos, produced in fairly large quantities, would find a ready sale in Canada, as our manufacturers make heavy imports of this kind of product.

Special attention was given to seed beds. This question is of very great importance for the growers of the province of Quebec, who must have their seedlings ready towards the end of May or the beginning of June. Hot beds are a necessity in this part of Canada, and experiments have been undertaken with a view of teaching Canadian farmers to use these beds so as to get the best results. Although climatic conditions are more favourable in Essex county, it seems likely that hot beds will gradually replace cold frames, generally used in this part of Canada. The growers of Essex county have suffered in 1909 because their seedlings were not well protected. It cannot be doubted that the area in Burley would have been far greater last year but for the lack of seedlings. The loss to growers may be readily imagined from the prices at which this tobacco sold last year.

Bulletins No. 8 and No. 9 of the Tobacco Division, to be published shortly, will show the results obtained on our various stations during the year 1909.

Special attention was also given to the production of seeds, particularly at the Central Experimental Farm, Ottawa, where we have a small experimental field. If Canadian growers will follow the instructions contained in our bulletins No. 6 and No. 8, they will be able to produce tobacco seed of first quality and so improve their types. This is the first requisite if one wishes to obtain good yields. Tobacco seed, grown after the method which we suggest, has a germination of 85 to 100 per cent. A special apparatus, to separate heavy seed from light seed, is always profitable, but if such are not available, one may obtain good heavy seeds of high quality by following our instructions.

We have made a large distribution of seeds obtained at our various stations, as we wanted in the first place to supply the growers with choice seeds for their crop of 1910, and in the second, to replace entirely, in time, the seed of low quality, too often purchased by farmers unable to verify their origin. When the use of selected seeds grown in the locality will become general, there will soon be an improvement in the product as well as a greater uniformity in the quality, and the crop, being more uniform, will be more easily marketed at more remunerative prices.

Ottawa, April, 1910.