COCOA REHABILITATION IN TRINIDAD AND GRENADA

BY

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YEAR III DIPLOMA, JUNE 1954
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APPENDIX (i) COCOA MAP OF TRINIDAD
" (ii) " " GRENADA.

* * * * *
"Give fools their gold, and knaves their power
Let fortune's bubbles rise and fall.
Who sows a field, or trains a flower,
Or plants a tree, is more than all."

(Whittier)
At the end of 1920, the Trinidad cocoa planters looked back over the last 50 years with an air of satisfaction and looked forward to an era of untold wealth, only to find their hopes shattered by a fall in prices in 1921. The factors contributing to this decline were several, but outstanding were, declining yields, the termination of indentured immigrants and their repatriation, mortgages and fragmentation of estates.

The discovery of Witches' Broom disease (Marasmius Pemiciosus) in 1928 could be described in terms of the industry, as "flogging a dying horse." Here was cocoa at its lowest ebb, yet receiving another set back. By the end of 1928, 6,000 acres were infested, though 60,000 acres were suspected.

Agriculture is a business, and the aim of the agriculturist is to make a profit. When this becomes impossible, interest in agriculture ceases, and so it was with the cocoa industry. Thus field operations were neglected and even abandoned.

The following figures summarise the situation and give a clear picture of the alternating prosperity and depression of the industry, as well as the part it played in the economic structure of the colony.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cocoa Exports (lbs)</th>
<th>Relative Value</th>
<th>% Total Value of Domestic Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1917-1923</td>
<td>63,692,052</td>
<td>£1,837,268</td>
<td>100</td>
</tr>
<tr>
<td>1924-1930</td>
<td>59,524,870</td>
<td>£1,373,818</td>
<td>75</td>
</tr>
<tr>
<td>1931-1937</td>
<td>59,440,980</td>
<td>£567,003</td>
<td>32</td>
</tr>
</tbody>
</table>
Between 1931-38, 15%-20% of the total cocoa acreage were abandoned; in 1946, this had fallen to less than 100,000 acres. In this period, the acreage under sugar almost doubled, limes and grapefruit trebled.

THE NEED FOR REHABILITATION.

The stage was set for Rehabilitation (taken to mean to restore to its former position) or some measures designed to assist the planters.

Government concern over the situation resulted in the Mortgage Restriction Scheme which prevented mortgagees from foreclosing or demanding repayment of the principal, unless both parties agreed, or interest payments became six months overdue. This was followed by the Agricultural Relief Ordinance (1921) a complimentary measure, designed to make advances to growers for the purpose of carrying out cultivation, harvesting, marketing, paying interest on mortgages and other encumbrances. Another relief measure was the Agricultural Bank, founded in 1924 to foster and encourage agriculture in the colony.

THE ORIGIN OF SCHEMES FOR REHABILITATION.

The anxious moments given Government by a fall in export duties, led to the appointment of committees and the introduction of Bills in the Legislative Council, all with one common object – to stem the tide. This was not surprising since two comprehensive surveys were made; one by Gilbert, the other by Shephard.

SURVEYS OF THE INDUSTRY.

Gilbert's survey (3) was conducted in 1931 and he designed measures to strengthen the industry.

Shephard's survey (1) was more intensive. He found that:

(1) There was a high proportion of poor yielders in
(2) There was an increase in yield from 15 - 20 years, followed by a corresponding decrease;

(3) Total yields could only be increased by replacement of poor bearers, instead of total replanting.

His recommendations for the operation of a Rehabilitation policy (a form of replanting whereby old trees are replaced by young plants) could not be implemented since no money was available.

THE COCOA RELIEF ORDNANCE.

The crying need for some measure of assistance resulted in the Cocoa Relief Ordinance of 1930 (*). Loans were made available to planters after valuation of their estates, on the following terms - That money should be used

(1) To pay off premiums on insurance;

(2) Maintenance;

(3) Cultivation of subsidiary crops.

Only about 4% of the total cocoa acreage benefited by this scheme, taken over by the Agricultural Bank in 1932.

THE ORIGIN OF THE SCHEME FOR COCOA RESEARCH. (5)

This scheme was started in 1930 and had its origin in the Committee set up by the Imperial Government to consider Agricultural Research in the non-self governing dependencies, presided over by Lord Lovat. A memorandum on Biological Research on Cocoa at the Imperial College of Tropical Agriculture was prepared by Professor Cheesman which included Botanical research on the crop only. The findings of this scheme were to affect the Rehabilitation programme subsequently, and more would be said of it later.

THE COCOA RELIEF SCHEME (Later called the Cocoa Subsidy Scheme)

In 1935 a Committee was nominated by the Finance Committee
of the Legislature to consider proposals for the relief of the Cocoa Industry. (6). For administrative purposes, the estates were divided into 3 groups from the 1931 survey made by Gilbert. A. 1 - 30 acres, B. 11 - 50 acres, C. Large Estates.

SUMMARY OF RECOMMENDATIONS.

1. That assistance be given to the Cocoa Industry by way of a grant extending over a period of four years.

2. That individual grants be based on production, and that one cent per-lb. not exceeding a maximum of $5.00 per acre be allowed, subject to certain adjustments and conditions.

3. That states be divided into three groups.

4. That apart from states of ten acres and under, a specific programme of work be demanded.

5. That no grant be awarded in the case of large estates which had been grossly neglected or abandoned.

6. That nurseries of heavy bearing strains of cocoa be established for distribution of plants.

7. That a committee be appointed to administer the grants.

8. That $2,500,000 be provided by loans repayable in not more than 8 years.

9. That extra taxation yielding $360,000 annually be imposed.

Nurseries were laid down for the production of budded strains and the scheme began in 1936. Little attention was paid to replanting and a 1938 Cocoa Relief Survey was carried out to enquire into:

1. The immediate needs of the Cocoa Industry;

2. The extent and condition of further assistance.

This survey gave birth to the Cocoa Rehabilitation Scheme (1940).
THE 1940 SCHEME FOR COCOA REHABILITATION. (7)

PROPOSED EXPENDITURE OF SCHEMES:

This was based on amount accruing from special annual taxation - $400,000; Expenditure for 10 years being $4,000,000.

THE RELATIVE VALUE OF THE INDUSTRY:

Indicated by 1938 exports - $2,369,285. It was deemed a matter of great urgency that the deterioration of the Cocoa Industry be checked. Rehabilitation was therefore urged on lines that would result in production comparable to that in the years preceding the depression. The consensus of opinion was that lowered yields were due to inadequate cultivation.

REMEDIES FOR DECLINING YIELDS:

(a) Concentration on better soils.
(b) Systematic replanting with higher yielding strains.
(c) Better cultural practice.
(d) Continuous campaign against Witches' Broom.
(e) The drawing up of a programme of work and provision for strict control.

SOIL SURVEYS:

These revealed that soils varied in their character, some responded to fertilizers, others did not, even with excessive applications. These soils graded under 5 groups, were regarded in terms of:

(1) Nutrient status, physical behaviour and water holding capacity.
(2) Appearance of cocoa in situ.
(3) Their response to manurial and cultural treatment.

GRADE I - Soils yielding more than 3 bags per acre - chocolate soils.
GRADE II - Soils yielding 2 - 3 bags per acre - medium loams, free draining clays with good lime status.
GRADE III - Soils yielding 1 - 2 bags per acre - Northern Range Schists
alluvial loams, silty clays - low yield attributable to poor aeration and low nutrient status, corrected by good cultivation and manuring.

GRADE IV - Soils yielding less than 1 bag per acre - clays, silty loams, shallow water logged soils.

V - Shallow Tamana soils, deficient in nutrients, and water logged due to impervious subsoil.

It was found that in spite of low prices, the industry paid labourers a higher price than it could bear as compared to other cocoa producing countries; and that the high percentage of poor bearers resulted in low yields.

The Committee discovered that during the 3 years of the existence of the Cocoa Subsidy Scheme (1936-1939) the total expenditure amounted to $666,232. Of the $510,109 spent on Cocoa Rehabilitation, drainage alone amounted to $78,390 - an evidence of previous neglect.

PROPOSALS FOR SUBSIDY SCHEME 1940-1949

The proposals consisted of 3 Heads.

A. SUITABLE COCOA SOILS
   (i) Special Regeneration.
   (ii) Partial Replanting.

B. SOILS UNSUITED TO COCOA

C. WITCHES' BROOM CONTROL

A. SOILS SUITABLE FOR COCOA

(1) Special Regeneration:

The programme aimed at establishing 7,500 acres in 9 years with budded trees or clones, except where Witches' Broom incidence was high. When immune varieties were discovered, 200,000 plants were to be made available to these areas. Materials then considered suitable for Rehabilitation were:

(a) Budded I.C.S. self compatible types.
(b) " "Red" " " " from River Estate.
The cost of replanting an acre was estimated at $15.50; of this, $5.50 were met from the value of bananas and ground provision during the first 5 years, leaving $100. Thus 100,000 acres were to be replanted at a cost of $10,000,000.

The Rate of Propagation:—

This was to be such that in 9 years the whole 100,000 acres would be replanted if 36,000,000 plants were produced by the St. Augustine Nurseries and private estates.

Cocoa Cuttings:—

The technique was recommended since it had two distinct advantages over budded plants:—maturity and cultural requirements

(1) The short time taken to produce the cuttings,
(2) The elimination of the stock effects.

It was estimated that 50,000 plants could be produced by this method in 1942 and it was therefore expedient to take steps to construct propagators, potentially able to yield a ton of beans.

The cost of after cultivation:—from these trees gave rise to the origin. This was estimated at $30. per acre, but to realize greater yields and larger revenues, much more than this had to be spent.

(ii) Partial Replanting:—

$75,000 were to be set aside annually for this, grants being made for replacement of poor bearers and better cultivation methods.

B. LAND UNSUITABLE FOR COCOA.

85,000 acres came under this category, yielding less than one bag per acre. It was recommended that no assistance be given except for mixed farming.

C. CONTROL OF WITCHES' BROOM AND OTHER DISEASES.

The seriousness of this disease made it necessary that funds should be available for measures deemed desirable by the...
was the general opinion that some form of soil rehabilitation should accompany the Cocoa Rehabilitation programme, so that valuable time and money should not be wasted.

After the Cocoa Subsidy Scheme ended in 1939, the proposals for the Rehabilitation Scheme were adopted by Government, but the war prevented its inauguration in 1933 at King's Bay in Tobago.

As originally stated, the Cocoa Research Scheme greatly affected Government schemes for Rehabilitation. Starting in 1930, the intentions of this scheme were:

1. To investigate yields with a view to their improvement from 45 uniper acre and the selection of outstanding trees.

2. To discover means of propagating these trees.

3. To investigate the manorial and cultural requirements of cocoa, to understand the optimum conditions under which selected trees could be grown, where infection was originally estimated.

The results of these investigations were successful; trees were discovered which bore pods twice the normal size, containing beans twice as heavy and potentially able to yield a ton of beans per acre. Propagated cuttings from these trees gave rise to the original 100 I.C.S. clones.

Against this background, the policy for Rehabilitation was based, but planters believed that without Witches' Broom resistant strains, the industry was doomed. To allay these fears, visits were made to South America by Pound and as a result a few Witches' Broom resistant clones were discovered, of which two - B.C.A. 6 and 12 showed almost complete immunity to cocoa.

The situation was promising, and on the advice of the Cocoa Board, the following areas were designated:

1. Areas suited to local high yielding strains.

2. Areas suited to resistant strains.

3. Areas convertible to other crops, which included the cost of initial clearing and new planted trees.

The construction of a large propagating station at La Pastora...
was started in 1942 and the first plants were propagated in April 1943. The selection of this site has been criticised because of its distance from the best cocoa growing areas.

This fact was aggravated by the discovery of Red Mottle virus by Posnett on surrounding estates. (10) Construction of additional stations was started also in 1943 at King's Bay in Tobago and Harper Farm.

Shortage of planting material at La Pastora caused suspension of the Scheme in 1942. This station was originally estimated to have a capacity of about 360,000 plants per annum from 45 units.

Following on the report of a Committee in 1944 a few amendments were adopted by the Cocoa Board. (11)

(1) (a) The use of standard I.C.S. clones - Witches' Broom resistant clones were only to be used where infection was high.

(b) Close planting without shade or wide planting with shade, planting distances to be approved by the board.

(c) Complete replanting unless permitted otherwise by the Board.

(2) The reviewed amounts for assistance were to be allocated thus:

<table>
<thead>
<tr>
<th>Estates with Sound Cocoa Potentialities</th>
<th>$2,700,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of special regeneration</td>
<td>$2,700,000</td>
</tr>
<tr>
<td>Clearing land at $10 per acre</td>
<td>100,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estates with soil unsuitable for Cocoa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserve</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Administration</th>
<th>$4,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(g) The Board arrogated to itself the rights to use the advance as security for supplies of 10% for supplies.</td>
<td>$200,000</td>
</tr>
</tbody>
</table>

(3) The sum provided for a maximum grant of $333 per acre which included the cost of initial clearing and newly planted
trees. Supplies were given at the rate of 10% of the original allocation.

This was the first scheme in which a fixed policy for rehabilitation was laid down. At that time it was thought that

(4) Minimum replantable acreage \( \frac{1}{2} \) acre, maximum 50 acres. Broom was transferred to regeneration and land clearance.

(5) The original sum of $1,000,000 earmarked for Witches' some intensive cultivation measures should precede replanting.

Pound (12) therefore suggested that the old field should be

(6) Under alternative crops, a mixed farming programme was converted into a food garden then turned over to cocoa after advocated.

(7) Plants were issued under the following conditions.

(a) Proprietor applied to the Board for Subsidy, seeking approval of selected site. Plots of 6 trees in old cocoa were allowed, provided that no

(b) If site was favourable, provisional allocation was U.S. Base and the reluctance to fell existing cocoa; in the latter, made, and date of delivery advised.

(c) Three months prior to delivery, proprietor confirmed that land was clear felled and not burnt, that ground

(d) If report was favourable, the proprietor was notified of time and cost defeated the purpose of this measure;

(e) The cost of plants was charged against the proprietor tree was less than 7 ft. from any other tree. This method was

(f) The field was checked 3 years after and subsidy was paid on the following basis:

\( 60\$ \) for each 3 year well grown tree.

\( 55\$ \) " 2 " supply.

\( 45\$ \) " 1 " old supply up to a maximum of $323 per acre.

The advance was deducted from this sum on a basis of 30\$ per plant less an allowance of 10% for supplies.

(g) The Board arrogated to itself the rights to take cuttings or budwood from subsidized areas if all the material was not required by the owner. The factors of time and cost defeated the purpose of this measure;
because the plants had to be rushed to La Pastora.

This was the first scheme in which a fixed policy for Rehabilitation was laid down. At that time it was thought that some intensive cultivation measures should precede replanting. Pound (12) therefore suggested that the old field should be converted into a food garden then turned over to cocoa after several years.

The response from both estates and peasants was not very encouraging. In the former case, it could have been attributed to a deficient labour supply occasioned by the presence of the U.S. Base and the reluctance to fell existing cocoa; in the latter, lack of faith born of suspicion.

Nevertheless, the Replacement Scheme which started in 1947 met with favourable success and between 1947-48, approval was given for 1,627 acres, of which some 946 acres were converted to citrus. It was suggested that this shortage could only be overcome by cutting the father of each tree with the offspring of the son tree being allowed to join the father, provided that no tree was less than 7 ft. from any other tree. This method was popular in the Monsterrat area, on the famous chocolate soils; but it was difficult to control shade and assess payments. It was generally agreed that such trees came into bearing later than clones planted by clear felling.

To stimulate interest, particularly from small planters, blocks of 6 trees in old cocoa were allowed, provided that no tree was less than 7 ft. from any other tree. This method was popular in the Monsterrat area, on the famous chocolate soils; but it was difficult to control shade and assess payments. It was generally agreed that such trees came into bearing later than clones planted by clear felling.
The large number of failures on the floor during January-
June was not an unusual situation. The number of failures was stored until the next planting season. The number of failures in October was more than 20% of the total number of plants planted. It was suggested that this shortage could only be overcome by:

1. The extension and manuring of nurseries to obtain better cuttings.
2. Increase use of single leaf cuttings. A normal stem cutting gave 4 single cuttings, but floor space had to be increased since they took longer to harden.
3. Increase propagation efficiency. The loss between cutting via rooting bins to distribution amounted to 55% and 45% at La Pastora and Harpers respectively, being greatest in the rooting bin and open shade after hardening. This loss could be reduced by

(a) Rigid selection of cuttings.
(b) Elimination of saw dust from potting mixture.
(c) An increased period in hardening shed.
(d) Spraying with Bordeaux mixture and Fe SO₄ in open shed as necessary.
The large number of failures on the floor during January-June was due to their hold over from one season to the next. Distribution was done during May-December with a peak from June-September. From August onwards, plants were stored until the next planting season.

Tracing the progress of the Scheme to 1952,

1946 - Only 50% of the applicants made adequate preparation for plants from a total of 192 for planting 910 acres.

1947 - In this year there were 24 applications for planting 23½ acres. Total area planted to date 600 acres.

1948 - About 1 million plants produced, new techniques for rooting tried out.

1949 - Open bin continuous daytime fog spray tried out - efficiency found to be 80% (14).

1950 - 203,000 plants were produced at La Pastora. The open bin method was continued and experiments started on the less expensive type of Estate propagators with a view to decentralization. Witches' Broom resistant clones were uprooted at Marper and replaced by Surinam clones C.C. 7 and Ecuador's I.M.C. 67.

1951 - Composition of clonal mixture from three centres. (15)

<table>
<thead>
<tr>
<th></th>
<th>La Pastora</th>
<th>Marper</th>
<th>King's Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.C.S. 1</td>
<td>65%</td>
<td>55%</td>
<td>65%</td>
</tr>
<tr>
<td>I.C.S. 5</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>I.C.S. 9</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.C.A. 6</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It was an oversighted policy to plant nurseries exclusively with one clone - I.C.S. 1 - on the flimsy pretext that it performed...
years later. Maximum subsidy is an aggregate of $150 multiplied by 1/10 of the cocoa acreage eligible for subsidy. This subsidy is alternative to clear felling rate. Additional plants are available above the 10% to which subsidy might be claimed. These plants are obtained free, and when established, a subsidy of 10 cents per plant will be paid.

Estates propagators are erected on request under the following conditions:

1. The presence of an experienced resident owner or manager.
2. A good supply of water.
3. A demand for cuttings on a basis of 10,000 per annum for not less than 5 years.
4. The availability of a variety of clones and the willingness to plant nurseries.

Two classes are recognised - Independent and Assisted.

(i) Independent: This allows planters to follow their own methods regardless of the Board's approval.
(ii) Assisted: The Board's approval is required. Financial assistance is greater and subsidy is paid as if plants were propagated on the Board's station. Propagators of this type are present at San Juan and El Salvador in the Montserrat district also Ron Pareil in the Sangre Grande area, having a combined production of 40,000 plants. More recently, stations have been erected at San Jose' and Tortuga in Montserrat; Cyrnos at Erin and Roxborough in Tobago, each with a capacity of 10,000 plants.

Initially the type of plants produced at the older stations were not of a high standard since nurseries were not planted. Their efficiency can however be increased to relieve the pressure on Government Stations.

The planting of 6 tree Blocks has been discontinued, and besides Clear Felling which gives the best results, Per Centage replanting has been introduced. This is designed to assist planters unwilling to fell Seedling Cocoa. 35% of old cocoa are
replaced by clones. The existing regulations re shade etc. are to remain and clonal cocoa must be spaced 8 ft. from any other tree. Subsidy payment is at the rate of 25¢ per plant; 10 cents as felling grant and 15 cents maintenance payable 2 years afterwards. Maximum subsidy is $150 per acre.

More recently, there have been some variations of the Subsidy Scheme in the form of:

1. A manuring subsidy - free fertilizers for
   a) Clonal cocoa planted by clear felling.
   b) Seedling cocoa to the extent of 35%.

2. Approval for interplanting coffee in old cocoa.

FINANCES.

The original expenditure of the Scheme was estimated at $4,000,000 for 10 years. Revenue was derived from:

- Special taxation on Sweepestake, Stamp tax and Increased Custom Duties.
- Contributions from general revenue when it was foreseen that the sum from special taxation would fall short of the goal.
- Cess - at the rate of 2¢ per lb. of cocoa produced, and imposed under the Cocoa Industry Ordinance, when price of cocoa exceeded $15 per bag of 165 lbs. This was suspended by Ordinance 1 of 1942 but reimposed in 1947.

COST OF PRODUCTION. (16)

Cost Account of production at La Pastora (excluding supervision)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. OF PLANTS PRODUCED</th>
<th>COST PER 100</th>
<th>COST PER PLANT</th>
<th>NO. OF PLANTS DISTRIBUTED</th>
<th>COST OF TRANSPORT</th>
<th>TOTAL COST PER PLANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>255,967</td>
<td>$16,623.29</td>
<td>$64.70</td>
<td>209,607</td>
<td>5.42</td>
<td>70.14</td>
</tr>
<tr>
<td>1952</td>
<td>283,993</td>
<td>$21,006.10</td>
<td>$75.80</td>
<td>262,101</td>
<td>5.24</td>
<td>81.04</td>
</tr>
</tbody>
</table>

Ammonia and nitrate or sulphate of potash and two ounces of superphosphate per tree every two months. The best corrective, however,
BREAKDOWN OF COST PER PLANT IN FIELD.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>LABOUR</th>
<th>STORES</th>
<th>DEPRECIATION</th>
<th>MISCELLANEOUS</th>
<th>TRANSPORT</th>
<th>SUPERVISION</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>38</td>
<td>18</td>
<td>08</td>
<td>01</td>
<td>05</td>
<td>07</td>
<td>77</td>
</tr>
<tr>
<td>1952</td>
<td>42</td>
<td>25</td>
<td>08</td>
<td>01</td>
<td>05</td>
<td>08</td>
<td>89</td>
</tr>
</tbody>
</table>

Total cost of establishing an acre of cocoa in 1952 was $1,020.03 approximately made up of 537 plants and 90 supplies @ 89c = $858.03 and subsidy of $162.

SUPERVISORY COMMITMENTS FOR REPLACEMENT AND REHABILITATION ON 31ST DECEMBER 1952

APPROVED ACREAGE

<table>
<thead>
<tr>
<th>1945</th>
<th>1946</th>
<th>1947</th>
<th>1948</th>
<th>1949</th>
<th>1950</th>
<th>1951</th>
<th>1952</th>
<th>TOTAL TO DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>923.03</td>
<td>127.74</td>
<td>490.20</td>
<td>79.92</td>
<td>1159.47</td>
<td>2,231.915</td>
<td>12270</td>
<td>7441.60</td>
<td>24,729.875</td>
</tr>
</tbody>
</table>

NURSERY MANAGEMENT AND PROPAGATION TECHNIQUE:

La Pastora, the largest propagating station with a nursery of 30 acres produces about 66.3% of the total plants. Like other stations in the West Indies, mineral deficiency is rife, (18) and even where periodic dressings of nitrogen, potash and phosphate are given, seasonal deficiency of nitrogen occurs after periods of wet weather when soil nitrification is low. This could be counteracted by small frequent applications of 1/2 lb. Sulphate of Ammonia and muriate or sulphate of potash and two ounces of superphosphate per tree every two months. The best corrective, however,
is a liberal dressing of Farm Yard Manure (F.Y.M.) supplemented by fertilizers. Iron deficiency could be corrected by spraying with 1% Ferrous Sulphate; Manganese and Copper by 0.5% Manganese Sulphate and Bordeaux mixture. An analogous condition to Nitrogen deficiency is caused by overexposure in the nursery, upsetting the C/N ratio; this is corrected by adequate shade. Mineral deficient leaves deteriorate rapidly in rooting and hardening bins.

Propagation technique is more or less standardized, with very few modifications. The rooting per centage of clones vary, being 70% and over in some cases and as low as 30% in some. Hormone treatment increases the speed of rooting in easily rooted clones and the per centage of poor rooters. Rooting can be induced with as little as 10% of leaf surface on cutting, but leafless cuttings will not root except treated with sucrose and amino-acids solutions when roots will be formed, but not leaves.

At present, the aim is to reduce expenditure and increase efficiency by

(a) Continuous spraying in open bin propagators.

(b) Use of single leaf cuttings.

The technique of single leaf cuttings was first developed by Stahel and presented some initial difficulty when light was found to be the limiting factor. With optimum conditions, these cuttings could be ready for planting in six months.

ESTABLISHMENT, CULTIVATION AND FIELD PERFORMANCE OF CLONAL COCOA IN TRINIDAD.

ESTABLISHMENT:

The emphasis placed on clear felling as a method of preparation is important, in that all possible obstacles are removed from the outset, lessening the cost of subsequent upkeep. The piling of logs and bush between trees may result in greater fertility, but also greater harbouring of insect pest and diseases, imnical to growing of cocoa.

In Trinidad, opinions differ as to the time of planting.
shade, the necessity for primary shade and the species of shade plant to use. (15) According to Van Hall, (19) the usefulness of shade is not to the cocoa tree, but to the soil. Without shade, the soil will have to be shaded by close planting and the soil kept porous and loose by hoeing and forking. The effect of light intensity on growth, physiology and yield of cocoa was determined by a large scale experiment of the Cocoa Research Scheme. (20) Light intensities were 15%, 25%, 50%, 75%. The results of this experiment were interesting.

The first year saw the best growth being obtained from the 50% light, followed by 25%, 15%, 75% and 100% light respectively. Light had an outstanding effect on the habit of the trees. At low intensities e.g. 15% and 25%, the trees were fan shaped with a tendency to be procumbent. At 75% and 100%, the trees were symmetrical and bushy being firmly anchored.

CULTIVATION:

(a) Mulching: This is sometimes adopted as a substitute for tillage, and to be successful, the layer must be thick and frequently replenished. However, certain mulches introduce changes in the physical, chemical and biological conditions of the soil not always beneficial to the crop. Bagasse and saw dust cause a suppression of nitrification and the development of a new micro-climate on the soil surface, resulting in further locking up of available nitrogen. (21)

(b) Manuring: The importance of a balanced nutrition can never be too strongly stressed. A relatively high C/N ratio and appropriate total Nitrogen are important. A satisfactory Phosphate status is necessary to improve Biological condition, multiply soil micro-organisms and to stimulate root growth. Potash is regarded as the key to Cocoa nutrition and a large amount is fixed by humus. Too much Calcium reduces Potash uptake, upsetting the nutrient balance.

Several manurial experiments have been laid down, they
include treatment comparisons of N,P,K. and F.Y.M., equivalent as N.P.K. and mulch with N.P.K.

(c) Drainage: Inadequate drainage (20) results in defective soil aeration and acute Nitrogen deficiency. The results are shedding of the leaves, premature senescence and stunted growth. It is futile to grow cocoa without shade on a soil with defective drainage. On the Sangre Grande Silty Clay, the root system of cocoa was found to be restricted, leading to decrease yields, chiefly because of bad drainage.

FIELD PERFORMANCE OF CLONES:

The results of the C.R.B. experiments (Cacao Randomised Blocks) (22) at River Estate are conclusive and definite proofs of the potentialities of some of the I.C.S. clones under varying circumstances.

General Results of the C.R.B. Experiments.

(1) 3 classes of clones are distinguished according to yield.
   (a) Consistently heavy bearers from the beginning 
      (I.C.S. 1, 6, 8, 39, 40, 43, 59, 60, 84, 95, 98, S.C.A. 6 and 12). These two latter yielded poor quality produce, but their resistance to Mitches' Broom gave them added status for breeding purposes.
   (c) Clones yielding poorly in early years becoming efficient in later years (I.C.S. 2, 14, 55).

(2) Good clones (a) out yielded the same clones when budded on unselected seedling rootstocks, the difference becoming less marked as the trees mature. Clones of group (b) and (c) show improvements as buddings.

(3) There was no significant difference between fan and chupon material with regard to yield. (Fan cuttings possess indeterminate growth with 3/8 phyllotaxis, chupon cuttings have determinate growth with 3/8 phyllotaxis).
A favourable response was given to manorial treatment; poor clones benefiting more than good ones.

Seasonal yields varied and good clones were more consistent over the seasons than poor ones.

Self-incompatibility was no handicap to heavy bearing under experimental conditions.

Under estate conditions in San Juan, cuttings yielded four times as seedlings although more attention was given the latter. When planted alternately in "Cuttings - Seedlings" plots, at 7 years cuttings yielded 2½ times as much as seedlings. During one season, cuttings yielded at the rate of 1,300 lbs. per acre, seedlings 320 lbs. per acre. Highly significant was the early age the cuttings came into bearing, yielding at four years, the equivalent of seedlings at seven. This factor is important in estate improvement, since capital need not be tied up for 10 - 15 years.

Consistent early bearers at San Juan and reaching a maximum at 4-5 years were I.C.S. 1, 45, 95, 89. I.C.S. 89 yielded as much as I.C.S. 1 at 4 years, but subsequently increased, until at 10 years it had doubled the rate.

![Comparison of yield per acre between cutting and seedling](image-url)
With regards to general conditions, Field counts on various estates revealed that:

(1) The highest yields were obtained in the Montserrat district.

(2) Clear felling was superior to interplanting - close planting without shade or with partial shade gave the highest result in clear felling.

(3) Ultimate yield depended on method of planting, soil type and maintenance.
Aided and abetted by the depression of the sugar industry, the cocoa industry expanded until the post 1914-18 war financial crisis, when prices fell from 42/- per cwt. compared with 92/- for the previous four years. By the turn of the thirties it had reached 23/-. Peak yields were reached in 1913 and 1927 when 135,572 cwts and 100,478 cwts respectively were exported. Production in 1944 was 62,365 cwts; and 61,128 cwts in 1953.

This decline was attributable to several causes.

(1) The prolonged period of depression.

(2) Hurricane in 1921.

(3) Conversion to other crops, e.g. nutmegs and bananas - particularly the former.

(4) Age of trees.

(5) Neglect of cultivation as a result of low prices, causing curtailment of expenditure on items such as manuring.

Nevertheless, comparing the decline with that in Trinidad, the Grenada industry weathered the storm of depression better, chiefly because the planters were not heavily indebted, being more cautious in the days of prosperity. The yields per acre were 2½ times that of Trinidad and it was reasonable to assume that this was due to a difference in management. Very significant was:

(1) The absence of overhead shade with close spacing.

This method was not unique to Grenada, being practiced in Brazil and West Africa. However, the West African farmer relied on the transient fertility of the soil.

(2) Liming and Manuring.

The manurial policy was based on Pen Manure, necessitating the maintenance of livestock. Since there was little
systematic growing of fodders P.M. from peasants and labourers was always in demand. Artificial were applied between two successive applications of P.M., but lime was applied before the latter, particularly on the red acidic soils. This systematic manuring made the productive life of a field longer. On the other hand, little manuring was practiced in Trinidad, but there was systematic planting of Immortelles (Erythrina sp.) in as shade.

On the other hand, little manuring was practiced in Trinidad, but there was systematic planting of Immortelles (Erythrina sp.) in as shade. (3) Forking. Technical advice and assistance with a view to the Pen Manure was forked into the soil after spreading, between April and May. This was done in 3-5 year intervals. Under estate conditions, fields were never forked in Trinidad. Unsuitable cocoa areas were planted in Nutmegs etc. which cushioned the effects of the slump. As a result, unprofitable fields were reduced to a minimum, unlike Trinidad, where, during expansion, all cocoa soils including the worst were cultivated. A flexible labour supply and the absence of competitive industries, resulted in comparatively low labour charges for the Grenadian planter while his Trinidad counterpart was wrestling to throw off the shackles of indentured immigrants and the sea the labour demands of a growing oil industry. There was always to hope for subsequent recovery in Grenada, and when planting in Trinidad ceased with the depression of 1921, there was still a measure of expansion in Grenada. It soon became apparent however, that the price premium obtained over West African cocoa could not be maintained indefinitely and it was imminent that the efficiency of the industry be increased.

ORIGIN OF SCHEMES FOR REHABILITATION.

Except for various manurial trials on different estates, the results of which were inconclusive due to inadequate supervision and primitive layouts, there were no steps taken to that
initiate a Rehabilitation programme until surveys were made by Clough and Shephard. (25) The former found that 25% of the trees examined were non-yielders in contrast to 62% in Trinidad. The average yield was 2.01 lbs per tree or 376 lbs. per acre in contrast with 1.0 lb. per tree in Trinidad.

Shephard's survey arose from agitation by producers, who in 1938 petitioned Government to assist them to place and maintain the industry on a sound and economic basis. The I.C.T.A. was then approached for technical advice and assistance with a view to the operation of the scheme. An appeal made to the Imperial Government for financial aid, resulted in provisions for two schemes from C.D.& W funds to assist the Rehabilitation of the Cocoa industry. (26)

The survey was very comprehensive. Shephard (27) showed that exports had fallen from 119,220 cwts between 1914-18 to 77,325 cwts during 1934-38 and recovery could only be made by some policy of rehabilitation. Thus he suggested the replacement of poor yielders in blocks, by seedlings, budded plants and cuttings. It was recommended that a field survey, followed by the incorporation of Manurial and Cultural Trials, should precede the granting of relief. If it took 3 years to raise production to 80,000 plants per annum; the rehabilitation programme could not be started till the fourth year.

The opinion was expressed that relief for unemployment and underemployment of labourers on cocoa cultivation was less urgent than rehabilitation of the estates themselves.

The two schemes proposed were:

(1) Research Scheme

(ii) Rehabilitation Scheme

THE RESEARCH SCHEME:

This was to be financed by a free grant of $18,720. The objects were to ensure by investigation and experimentation that
rehabilitation should proceed on sound economic and scientific lines. The scheme originally called C.D.S. 560 and changed to D.51 was to be administered by the Economics department of I.C.T.A. with the co-operation of the local Department of Agriculture.

Twenty four plots of cocoa each 2½ acres, were selected to represent the principal soil types, different ages of cultivation, rainfall, elevation and other characteristics of the industry. The trees on these sites were labelled for detailed investigation to commence in 1940, and the analysis of data during 1940-41 was to form the basis for the experiments.

THE REHABILITATION SCHEME:

This was to be based on the results of the Research Scheme, $270,000 were made available to planters to assist them in replanting portions of their cultivations. One half of the sum was a free grant, the other, a loan free of interest for 7 years. This scheme referred to as C.D.S. 573, was to be administered by the Economics Department of I.C.T.A. also. The objects were to assist producers large and small to replace the worst 25% of their trees by high yielding strains.

It was recommended that grants should be postponed for 3 years to enable production to reach 80,000 plants per annum, further, no grants were to be given for complete replanting. Funds available provided for rehabilitation of 3,200 acres in 4 years. The cost of erecting propagators and establishing nurseries was estimated at $60,000 spread over a period of 3 years.

All grants were to be determined by the quality of cocoa produced during a defined period. Planters had to submit a programme of work during the third year of the scheme, $20 were to be spent on labour during the first year, (excluding management, supervision, reaping etc.,) $15 in the second and third years.
All estates were responsible for cultivation during the fourth year and owners were required to submit monthly statement of accounts to be approved for payment.

It should be observed that the scheme then envisaged did not make provision for the rehabilitation of the entire cocoa acreage, since plants would have had to be produced at the rate of 160,000 per annum for ten years. It was hoped however, that the initial success would lead to complete rehabilitation.

The two schemes were started in 1940 and in February of the same year, Cheesman (28) visited the colony to enquire into:-(1) The progress already made in selecting high-yielding strains; (2) Suitable nursery sites. (3) The practical layout and construction of propagating units. There was some delay in erecting the first propagators and when everything was ready to commence the rehabilitation experiments in 1941, not a single plant was ready. The first propagator bin was not ready until August 1941. Further, the number of clones selected were inadequate, in September 1941 only three were considered for propagation, necessitating further selection and testing.

Owing to unforeseen circumstances viz: the shortage of material and unsuitable water supply, Scheme 573 did not progress favourably. (29) Consequently, the progress of both schemes was reviewed and they were merged into a general plan of agricultural development for the colony, based on recommendations of the W.I. Royal Commission 1938-39 - "that the outstanding agricultural need for the W.I. is more intensive use of the land". (29)

The revised scheme came into operation in 1946 and originally involved a free grant of $236,175, but this was later increased to $315,360. This Scheme was called C.I.I.S. D.612 (Cocoa Industry Improvement Scheme) and expired in 1951 when application was made for funds to continue and intensify the work over a
further period of 6 years. After 1949, the Scheme came under the direct supervision of the Agricultural Department.

OBJECTS OF C.I.I.S. D61:

To increase productivity by replacing existing old cocoa on more fertile soil types by a system of complete replanting with plants of high yielding strains. The programme aimed at replanting 40 - 50% of 10,000 acres in the first 10 years or 400 - 500 acres per year.

Since improvements could only be based on sound scientific evidence as a result of investigation and demonstration, such a programme was instituted.

The investigational programme included:

(1) The selection and establishment of high yielding clones.
(2) Clone testing for yield, quality, resistance to pest and disease.
(3) Manurial and cultural trials.

Between 1941-43, seventy-nine trees selected under C.D.S. 573 were propagated by budding. These budded plants were planted in nurseries at Boulogne Propagating Station. This was followed by the acquisition of other stations at Ashenden in the upper St. David's parish, representative of a typical "Red Earth" soil and at Maran in St. John's parish representing a "Shoal Soil" type. On these stations, nurseries of the 79 selected clones were established with rooted cuttings propagated from the original budded clones at Boulogne. At a later date, another station was acquired for investigational work at Mt. Hope on a "Brown Earth" soil type.

There were two propagating units at Boulogne originally constructed under Scheme D.573, but provisions were made under Scheme D.612 for construction of four additional units during the first five year period. As a result, two units were constructed at Maran and one each at Ashenden and Boulogne.
WITCHES' BROOM DISEASE (Marasmius Perniciosus)

The incidence of this disease led to a decline in cocoa production. It was first recorded in the island in the parish of St. Mark's and confirmed by Dale in 1948. The disease was present in every parish of the island both in the coastal belts and at high elevations, the latter areas accounting for 34% of the infection. In the well protected valleys where humidity was high, infection was as intense as at high elevations. 92% of the infection was found on only 14% of the small cocoa holdings. Cushion and pod infection was not as high as vegetative infection and crop losses due to the former was only 4%.

Legislation was enacted under authority of the Plant Protection Ordinance with a view to institute control measures.

1. All trees with 5 brooms or more had to be pollarded as well as those with cushion and pod infection.
2. All infected trees above the 1200 ft. contour had to be felled.

Surveys indicated that the disease was spreading in the middle and lower belts and the control measures still in progress and based on a thorough knowledge of the Life History of the fungus, consist of the removal of disease tissue from April-May and September-October.

It thus became necessary to increase the production of cuttings for distribution. Funds were made available from the Cocoa Reserve Pool during 1949 for the construction of two additional units, one each at Boulogne and Ashenden. This brought the total to eight - four at Boulogne and two each at Ashenden and Maran. Following on this, production steadily increased.

The original policy of the Scheme was that only proven clones were to be distributed, but since this involves a lapse of a few years after establishment of clonal trials, limited amounts
of clonal material were made available to growers. Besides, plants produced in these early stages were used in establishing nurseries. Thus few estates and small holdings were planted during this period. Later, twenty seven of the original 79 clones were selected for multiplication and distribution with hopes of future addition, on the following characteristics – performance and productivity of parent tree – derived from estate plot record.

In 1949 the Board of Agriculture outlined a suggested policy for the rehabilitation of a 100 acre unit. (31) 16

1(1) Gradual elimination of the lowest yielding 20 acres and replanting with fodder grass. 15,007 165.9

(2) Gradual cutting out of old cocoa in the intermediate category and replanting with high yielding clones. Trinidad to hold over from one season to the next and Phyto- fication are made by spraying with Bordeaux mixture.

(3) Concentration on the best 10 acres with a view to increasing and maintaining yields.

(4) The institution of soil conservation measures.

In 1950 the efficiency on all stations was low. (32) Of the 100 cuttings set, only 45, 43, and 32 reached the fields every 100 cuttings set. 40 - 50 acres were to be planted in the first ten years. The average gross cost of clearing and preparing land for replanting and maintaining plants to the age of 3 years was given at $371.49. This expenditure was offset by:

(a) Revenue derived from shade plants.
(b) Savings on expenditure from old cocoa released for replanting.
(c) Cash assistance granted under a proposed financial arrangement.

The replanting programme of 100 acres: 40 - 50 acres were to be planted in the first ten years. The average gross cost of clearing and preparing land for replanting and maintaining plants to the age of 3 years was given at $371.49. This expenditure was offset by:

(a) Revenue derived from shade plants.
(b) Savings on expenditure from old cocoa released for replanting.
(c) Cash assistance granted under a proposed financial arrangement.

(1) An alternate acid soil.

(2) More bulk and porosity in potting soil by incorporation of coconut fibre, bagasse or nutmeg shell.

(3) Potting with friable soil and not a wet mass which packs and gives faulty aeration.
The losses on hardening floor were mainly due as in Trinidad to hold over from one season to the next and Phytophthora attack. Efforts at controlling this fungus are made by spraying with Bordeaux mixture.

In 1950 the efficiency on all stations was low. Of every 100 cuttings set, only 45, 43 and 32 reached the fields, respectively from Boulogne, Maran, and Ashenden. This was due partly to unsatisfactory nursery material giving rise to poorly rooting plants, and a greater extent to poor potting mixture, a result of soil alkalinity. Spraying with Iron Sulphate reduced iron chlorosis. Better attention to cutting material improved the rooting per centage from 47% in July 1950 to 80% in October.

It was nevertheless suggested that optimum results could be obtained by:

1. An alternate acid soil.
2. More bulk and porosity in potting soil by incorporation of coconut fibre, bagasse or nutmeg shell.
3. Potting with friable soil and not a wet mass which packs and gives faulty aeration.
(4) Construction of open spray propagators.

Following on these suggestions the following were carried out:

(a) Application of \((NH_4)_2 SO_4\) to maintain optimum C/N ratio.
(b) All nurseries at Boulogne were planted with Cassia for permanent shade.
(c) All nurseries laid down were planted 5' x 5'.
(d) The Boulogne nurseries were pruned regularly.

Tracing the progress of the Scheme to 1952.

1948 - Clonal Trials of the 79 C.S. clones were laid down on approved statistical lines on the three stations 9 x 9 lattice with 4 Replications at Mt. Borne and Ashenden, 3 Replications at Mara.

1949 - Additional propagators were constructed at Boulogne and Ashenden.

1950 - Cultural Trials established.

(1) N.P.K. Manurial Trials - Objects - to investigate the manurial requirements of clonal cocoa on three main soil types - a partially 3 x 2 x 2 random layout.

(11) P.M. VS. N.P.K. equivalent with extra N - Objects - to investigate whether clonal cocoa can be kept in good condition by manuring with the chemical equivalent of P.M. as with P.M. itself. A 2x2x2 partially confounded random block layout - plots split for 3 clones.

(iii) Forking, Mulching & Forking in Mulch Trials: Objects - to investigate the behaviour of clonal cocoa given heavy dressing of cut bush mulch with and without forking mulch into the soil. A 4x2x2 layout, partially confounding clones x mulching x forking. Interest attached to yield, vigour, commercial quality, susceptibility to disease.
1951 - Eight propagators of the closed bin Cheesman type were in use to date together with 2 open spray beds at Ashenden, where a glass house with sprays and accommodating 500 plants was constructed. Towards the end of the year, an experimental open spray bed was erected at Mt. Home. The use of a fibrous rooting media, followed by hardening in situ raised the rooting percentage to 79%. Scheme D.612 expired, further scheme financed by a free grant and Cocoa Cess.

1952 - Rooting per cent fell to 69% due to overcrowding in bins, unsuitable cuttings and decomposing rooting media. Nevertheless, production increased to 31,600 - an increase of 31% over 1951. Nursery area on all stations was extended and at Boulogne, replanting of the original budded plants began. Additional bamboo lathes storage sheds were constructed to accommodate an extra 31,700 plants.

1953 - The distribution this year was based on the number of clones of each type on the hardening floors.

Clonal composition from the three Stations:

<table>
<thead>
<tr>
<th></th>
<th>Boulogne</th>
<th>Maran</th>
<th>Ashenden</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.S. 29</td>
<td>20%</td>
<td>18%</td>
<td>15%</td>
</tr>
<tr>
<td>&quot; 36</td>
<td>20</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>&quot; 76</td>
<td>9</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>&quot; 19</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>46</td>
<td>63</td>
<td>59</td>
</tr>
</tbody>
</table>

Comparing the above with the 1951 Table for Trinidad (Latest) it would be seen that distribution of I.C.S. 1 and 95, supposedly good clones, from all stations amounted to an average of 62% and 25% respectively. In Grenada on the other hand, G.S. (Grenada Selection) 29 and 36 consistently good performers were distributed to the tune of 20% and 15% respectively.
Recent developments in the scheme include:

1. Irrigation of nurseries during the dry season using a Sigmund Irrigation Pump.
2. The use of natural shade for storing plants using Gliciridia 10' x 5' with a nutmeg shell layer 4" - 5" thick on the ground for drainage.
3. A mulch of semi-decomposed nutmeg shell used over the soils in the potting baskets.

All these have given favourable results and it is hoped to erect in 1954, a Bahmon Centrifugal Humidifier, which at 100% efficiency could produce 25,000 plants per annum.

A duly constituted Board was appointed, whose duties were to apply the funds of the Cocoa Cess Account, acting in an advisory capacity to the Department of Agriculture, in matters affecting schemes for the improvement of the cocoa industry of the colony.

The regulations were as follows:

1. Application for plants: This had to be made before the 31st of May each year, applicant stating the number of cuttings, area and situation of the land.
2. Inspection of Area: This was made as soon as possible after the receipt of application. The applicant was then notified as to whether the area was suitable or not.
3. Advice on Preparation: The applicant was informed as to the minimum requirements of ground shade, windbreaks and soil conservation.
4. Distribution: After the 31st of May each year, the applicant was informed as to the approved number of cuttings for delivery during the next year. If the number applied for exceeded the amount available,
allocation was made in the following order of priority.

(a) Replanting an area felled as a control measure against Witches' Broom.

(b) Planting an approved private nursery.

(c) Replanting areas deemed unproductive by an authorised officer.

(d) Planting areas not previously in cocoa, but where the original was felled with the advice and consent of an authorised officer.

(e) Planting other areas.

Deliveries were free of charge on fulfilment of the above conditions.

With regards to Estate propagators, no financial assistance is given to these as is done in Trinidad. They are all independent, but might be supplied with cuttings from Government Stations. Except for the Brothers and Waltham estate propagators, the following are still in operation each with an average capacity of 600-1000 plants per annum.

(1) La Sagesse Estate Propagator.
(2) Carriere
(3) Dougaldston
(4) Laura
(5) Gouyave

While no actual proposals are made for the granting of a manural subsidy as in Trinidad, the Cocoa Board has ordered fertilizers in bulk for resale to planters at cost, plus a small amount to defray unforeseen expenditure.

FINANCES. (26)

The initial financing of this scheme differed from that of Trinidad in that funds were made available in the nature of C.D.W. grants. Later on a cess was imposed as in Trinidad.
These 665,000 plants are to be produced as follows and can be compared with actual production:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BOULOGNE</th>
<th>ASHENDEN</th>
<th>MARAN</th>
<th>TOTAL</th>
<th>ACTUAL PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>50,000</td>
<td>25,000</td>
<td>15,000</td>
<td>90,000</td>
<td>92,027</td>
</tr>
<tr>
<td>1952</td>
<td>75,000</td>
<td>35,000</td>
<td>15,000</td>
<td>125,000</td>
<td>123,700</td>
</tr>
<tr>
<td>1953</td>
<td>90,000</td>
<td>40,000</td>
<td>20,000</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>1954</td>
<td>90,000</td>
<td>40,000</td>
<td>20,000</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td>90,000</td>
<td>40,000</td>
<td>20,000</td>
<td>150,000</td>
<td></td>
</tr>
</tbody>
</table>

Total: 325,000 180,000 90,000 665,000

There is a possibility of increasing the 1954 acreage to 100. Applications were received in 1953 for 278,500 plants to be planted in 1954. As a result, future production would be based on demand and there is every indication of increase demands.

The peasants are convinced that planting of clonal cocoa gives better results than seedlings. On the other hand, annual acreage replanted on estates may diminish due to labour difficulties, strikes etc., until initial plantings come into full bearing.

COST OF PRODUCTION (34)

The cost of production has not been worked out as was done in Trinidad, but from discussions it would seem to be somewhat less than Trinidad. The total cost of establishing an acre has been estimated at approximately $905.20. In Trinidad where the cost of labour is higher this is estimated at $1,020.03 inclusive of Subsidy.

ESTABLISHMENT, CULTIVATION AND FIELD PERFORMANCE OF CLONAL COCOA IN GRENADA (35)

ESTABLISHMENT: This is basically the same with Trinidad except that in preparing the site clear felling is not stressed. Forging or ploughing the area, incorporating trash, bush and pen manure is advocated. The recommended planting distance is 10' x 10' or 35 plants per acre. With regards to shade, since bluggoe plants do not stand up to a rigorous dry season, the use of Gliricidia 20' x 20' is advised, also pigeon pea, Tephrosia candida, Velvet bean, Tannias and Cassava for rapid ground cover.
The optimum period for planting is June-September and early planting results in a low rate of supplying.

**CULTIVATION:** The regulation of shade is very important. Clonal cocoa planted under Grenadian conditions require shade at all times until the trees develop their own canopy. The shade should then be gradually reduced, being allowed to close in again towards the end of the rainy season.

After planting, a complete cover of mulch throughout the area is recommended, but where this is not possible circle mulching should be done. Pen manure if available should be applied, at the rate of two baskets per plant 5 years and older, fortified with 12 ounces of sulphate of potash. Younger trees receive proportionally less. A fertilizer mixture may be used alternatively consisting of equal parts of Sulphate of Ammonia, Superphosphate and Sulphate of potash. This is applied at the rate of two pounds per tree 5 years and older, reducing the rate for younger plants.

The conditions under which cocoa is grown in Grenada necessitate adequate drains and permanent windbreaks of trees such as clove, mango, galba and mahogany. Pruning when the trees are about two and a half years old might be necessary, since at this age branches have a tendency to grow horizontally. Whip-like branches are cut back and terminal buds removed to encourage a good branching system.

**FIELD PERFORMANCE OF CLONES:**

Some time will elapse before conclusive data from the manurial experiments is obtained. However, the analyses of yields in the Clonal Trials indicate that the most promising clones so far are C.S., 29, 36, 19, 18, 67, 65 and 46.

<table>
<thead>
<tr>
<th>NAME</th>
<th>YEAR PLANTED</th>
<th>YIELD/ACRE(1952)</th>
<th>YIELD/ACRE(1953)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulogne Estate</td>
<td>1946</td>
<td>1,600 lbs.</td>
<td>2,000 lbs.</td>
</tr>
<tr>
<td>La Taste</td>
<td>1945</td>
<td>1,200 lbs.</td>
<td>1,400 lbs.</td>
</tr>
<tr>
<td>Waltham</td>
<td>1945</td>
<td>1,200 lbs.</td>
<td>1,200 lbs.</td>
</tr>
</tbody>
</table>
These plots consist of a mixture of all the 79 clones whose yield per acre is more than the average island production. It was expressed that a substantial expansion in cocoa output can be accommodated without unduly depressing prices. It was therefore incumbent on manufacturers to install the necessary confidence in producers. In the last few years, production has failed to respond due to disease, unsound marketing and the years inherited from the unstable and low prices of the 1930's. This is a threat to producers since these high prices could lead to substitutes in the confectionary industry.

**H.I. PRODUCTION OF COCOA (1000 tons)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>26</td>
<td>20</td>
<td>15</td>
<td>11</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

**WORLD PRODUCTION (1000 tons)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>787</td>
<td>670</td>
<td>575</td>
<td>780</td>
<td>680</td>
<td>735</td>
<td></td>
</tr>
</tbody>
</table>

The failure of world production to expand even with increasing prices is evident from the above table. Some of the causes for this are:

1. Disrupted shipping during the war leading to a surplus of unsaleable cocoa in European markets.
2. Alternative and more lucrative employment in some cases causing a shift to other areas.
3. The incidence of witches' broom in the West Indies and swollen shoot in the Gold Coast.

This gap between supply and demand must be bridged. Substantial and immediate results could only be secured by increasing production in areas already growing cocoa. The panacea is continued rehabilitation by better cultivation techniques aiming at 1000 lbs. per acre, encouragement of new plantings, special attention to the physical state of the soil and a more comprehensive
THE FUTURE OF COCOA REHABILITATION AND ITS EFFECTS ON WORLD PRODUCTION.

At the Cocoa Conference convened in London in 1951, the view was expressed that a substantial expansion in cocoa output can be accommodated without unduly depressing prices. It was therefore incumbent on manufacturers to instill the necessary confidence in producers. In the last few years, production has failed to respond due to disease, unsound marketing and the fears inherited from the unstable and low prices of the 1930's. This is a threat to producers since high prices could lead to substituting in the confectionary industry. (36) Grenada Rehabilitation

W.L. PRODUCTION OF COCOA (1000 tons).

<table>
<thead>
<tr>
<th>Year</th>
<th>1930-32</th>
<th>1933-34</th>
<th>1935-36</th>
<th>1937-38</th>
<th>1939-40</th>
<th>1941-42</th>
<th>1943-44</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1921</td>
<td>1930</td>
<td>2040</td>
<td>2050</td>
<td>2060</td>
<td>2070</td>
<td>2080</td>
</tr>
</tbody>
</table>

The failure of world production to expand even with increasing prices is evident from the above table. Some of the causes for this are:

1. Disrupted shipping during the war leading to a surplus in Trinidad. The cost of establishing an acre differs of unsaleable cocoa in European markets.
2. Alternative and more lucrative employment in some cases causing a shift to other crops.
3. The incidence of Witches' Broom in the West Indies and in Ghana their yields per acre are above the average swaller shoot in the Gold Coast.
4. Disrupted shipping during the war leading to a surplus in Trinidad. The cost of establishing an acre differs of unsaleable cocoa in European markets.
5. Alternative and more lucrative employment in some cases causing a shift to other crops.
6. The incidence of Witches' Broom in the West Indies and in Ghana their yields per acre are above the average swaller shoot in the Gold Coast.

This gap between supply and demand must be bridged. Substantial and immediate results could only be secured by increasing production in areas already growing cocoa. The panacea is continued rehabilitation by better cultivation techniques aiming at 1000 lbs. per acre, encouragement of new plantings, special attention to the physical state of the soil and a more comprehensive
and vigorous attack on diseases and pests.

The West African problems are being tackled by the West African Cocoa Research Institute and West Indian problems by the Cocoa Research Scheme at I.C.T.A.

SUMMARY AND CONCLUSION.

(1) A comparison is made between the origin of schemes for rehabilitation in Trinidad and Grenada, tracing their growth and development.

(2) In Trinidad the present Subsidy Scheme evolved from schemes dating back as far as 1930; whereas in Grenada Rehabilitation Schemes were inaugurated around 1940.

(3) The financing and administering of the schemes differ in both colonies. In Trinidad revenue is derived from taxation and a cess, funds being administered by the Cocoa Board. In Grenada the scheme was originally financed solely by C.D.W. grant, when it was administered by the Economics department of I.C.T.A.; later on, a cess and revenue on cocoa station were included and the local department is administering the funds.

(4) The cost of production is higher in Trinidad than in Grenada. However, there is no subsidy to planters in Grenada as exists in Trinidad, thus the cost of establishing an acre differs in both colonies, on the other hand, labour rates are higher in Trinidad than Grenada.

(5) In Trinidad cuttings yield 2½ times as much as seedlings, in Grenada their yields per acre are above the average island production.

(6) Despite high prices, world production has failed to expand, this can only be achieved by continued research into rehabilitation methods.
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