A REVIEW OF THE BANANA INDUSTRY
OF TRINIDAD AND TOBAGO

T.R. Evans, B.Sc., (Wales)

SECTION II. AGROECONOMIC BENEFITS OF PRODUCTION

II. 1. Climatic requirements of the crop
II. 2. Varieties
II. 3. Soil conditions
II. 4. Climate and soils of Trinidad and Tobago
II. 6. Supply of planting material
II. 7. Fruits preservation on Trinidad and Tobago
II. 8. Weeds and Diseases

SECTION III. MARKETING

III. 1. Local Marketing
III. 2. Export Marketing
III. 3. Figures of value

SECTION IV. PRODUCTION IN THE BANANA

IV. 1. The Department of Agriculture
IV. 2. The Marketing Board
IV. 3. Cooperative Organizations
IV. 4. Expenditure and Income

SECTION V. CONCLUSION

V. 1. Summary
V. 2. Possible improvements to the Banana Industry
V. 3. Future Prospects

1957

D.T.A. Report

In part fulfilment for the Diploma of Tropical Agriculture of the Imperial College of Tropical Agriculture, Trinidad, B.W.I.
## CONTENTS

**GENERAL INTRODUCTION**  

<table>
<thead>
<tr>
<th>Section I</th>
<th>DEVELOPMENT OF THE BANANA INDUSTRY</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. 1.</td>
<td>The origin of bananas as a cultivated foodstuff</td>
<td>3</td>
</tr>
<tr>
<td>I. 2.</td>
<td>Introduction to the West Indies</td>
<td>4</td>
</tr>
<tr>
<td>I. 3.</td>
<td>Development of the export industry in the West Indies</td>
<td>4</td>
</tr>
<tr>
<td>I. 4.</td>
<td>Some economic aspects of production</td>
<td>6</td>
</tr>
<tr>
<td>I. 5.</td>
<td>Applications to Trinidad and Tobago</td>
<td>8</td>
</tr>
<tr>
<td>I. 6.</td>
<td>Development of the Banana Industry in Trinidad and Tobago</td>
<td>9</td>
</tr>
</tbody>
</table>

**SECTION II AGRONOMIC ASPECTS OF PRODUCTION**  

<table>
<thead>
<tr>
<th>Section II</th>
<th>AGRONOMIC ASPECTS OF PRODUCTION</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. 1.</td>
<td>Climatic requirements of the crop</td>
<td>12</td>
</tr>
<tr>
<td>II. 2.</td>
<td>Varieties and Bunch Characters</td>
<td>12</td>
</tr>
<tr>
<td>II. 3.</td>
<td>Soil requirements</td>
<td>17</td>
</tr>
<tr>
<td>II. 4.</td>
<td>Climate and Soils of Trinidad and Tobago</td>
<td>18</td>
</tr>
<tr>
<td>II. 5.</td>
<td>Supply of planting material</td>
<td>19</td>
</tr>
<tr>
<td>II. 6.</td>
<td>Banana production in Trinidad and Tobago</td>
<td>22</td>
</tr>
<tr>
<td>II. 7.</td>
<td>Pests and Diseases</td>
<td>34</td>
</tr>
</tbody>
</table>

**SECTION III MARKETING**  

<table>
<thead>
<tr>
<th>Section III</th>
<th>MARKETING</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>III. 1.</td>
<td>Local Marketing</td>
<td>40</td>
</tr>
<tr>
<td>III. 2.</td>
<td>Export Marketing</td>
<td>41</td>
</tr>
<tr>
<td>III. 3.</td>
<td>Figures of Trade</td>
<td>50</td>
</tr>
</tbody>
</table>

**SECTION IV ORGANISATION OF THE INDUSTRY**  

<table>
<thead>
<tr>
<th>Section IV</th>
<th>ORGANISATION OF THE INDUSTRY</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV. 1.</td>
<td>The Department of Agriculture</td>
<td>51</td>
</tr>
<tr>
<td>IV. 2.</td>
<td>The Marketing Board</td>
<td>51</td>
</tr>
<tr>
<td>IV. 3.</td>
<td>Co-operative Organisations</td>
<td>58</td>
</tr>
<tr>
<td>IV. 4.</td>
<td>Breeding and Research</td>
<td>59</td>
</tr>
</tbody>
</table>

**SECTION V CONCLUSIONS**  

<table>
<thead>
<tr>
<th>Section V</th>
<th>CONCLUSIONS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. 1.</td>
<td>Summary</td>
<td>62</td>
</tr>
<tr>
<td>V. 2.</td>
<td>Possible improvements to the Operation of the Industry</td>
<td>62</td>
</tr>
<tr>
<td>V. 3.</td>
<td>Future Prospects of the Industry</td>
<td>64</td>
</tr>
</tbody>
</table>

**ACKNOWLEDGEMENTS**
CONTENTS

BIBLIOGRAPHY

APPENDICES

I  Map of Trinidad
II  Map of Tobago
III Total Rainfall Map of Trinidad
IV Soil Drainage Map of Trinidad
V Soil Map of Trinidad
VI Soil Map of Tobago
VII Land Productivity Map of Trinidad
VIII Map of Trinidad Extension Services
IX Map of Tobago Extension Services
X Crop map of Trinidad.

The sugar Industry of the island is mainly grown in the north-western part of the island, in the parishes of St. Andrew, St. David, and St. John. The soil in this area is dark brown and contains a high percentage of organic matter. The climate is warm and humid, with an average annual rainfall of 1,500 mm. This climate is ideal for sugar cane cultivation.

Sugar cane is a perennial crop that can live for up to 8 years. It is harvested once a year, and the juice is extracted using a traditional method called the "sugarcane press." The juice is then fermented and distilled to produce raw sugar, which is further refined to produce white sugar.

Sugar cane is a labor-intensive crop, and the industry is mainly dependent on the availability of labor. The availability of labor is a major concern for the industry, as there is a shortage of workers in the sugar cane belt. This shortage is due to the migration of young people to the cities in search of better opportunities.

The sugar industry is also facing challenges due to the increase in the cost of production and the decline in world sugar prices. These challenges have led to a decline in the profits of the sugar industry.

Despite these challenges, the sugar industry remains an important part of the economy of the island. The government has been working to improve the efficiency of the industry and attract more investment.

In conclusion, the sugar industry in Trinidad is a labor-intensive, labor-intensive crop that is mainly grown in the north-western part of the island. The industry is facing challenges due to the shortage of labor and the increase in the cost of production. However, the government is working to improve the efficiency of the industry and attract more investment.
GENERAL INTRODUCTION

Scope:

This review has been undertaken to examine the present state of the banana industry, and to determine its future possibilities as an export trade.

It incorporates a study of methods of production on peasant holdings and estates; of marketing of bananas and the part played by the Marketing Board, and an investigation of the services provided by the Department of Agriculture. The area surveyed is outlined in red on Maps I and II in the appendix.

Salient Facts.

From the accounts given in the following text, it appears that the banana industry is fairly well established. The banana export industry is increasing due mainly to the efforts of small producers. It was found that the Marketing Board was providing an efficient organisation for the marketing of export bananas, but that organisation of local marketing was very inefficient. The extension services of the Department of Agriculture appears to be carrying out good work in connection with increasing production in the banana industry. Further extension work is desirable particularly in Tobago, but is handicapped by lack of good communications there, a factor that limits banana production in that Island. In Trinidad it appears that the limiting factor to extending the acreage of banana production is one of suitable soil type.

The future prospects of the industry are fairly good. With a guaranteed market for export fruit for a further period of 13 years the immediate future of the export industry is promising. However, the prosperity of the industry after the Agreement with the Union International Company expires, appears to be linked closely with the future of the Cocoa Industry. A flourishing cocoa industry should encourage cocoa growers to replant...
replant old cocoa land which, with the use of bananas as a shade crop for clonal cocoa, would ensure that banana production was maintained at a high level.

It is suggested that an organization such as a Banana Growers Association should be set up to encourage production and to stimulate the industry in production of high quality fruit.

The composition of a variety of bananas is given in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Gaga Khan</th>
<th>Landon</th>
<th>Dinghain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>75.7</td>
<td>73.6</td>
<td>74.8</td>
</tr>
<tr>
<td>Reducing sugars</td>
<td>10.7</td>
<td>8.2</td>
<td>10.4</td>
</tr>
<tr>
<td>Non reducing sugars</td>
<td>6.3</td>
<td>10.9</td>
<td>-</td>
</tr>
<tr>
<td>Starch</td>
<td>2.7</td>
<td>6.5</td>
<td>12.7</td>
</tr>
<tr>
<td>Total carbohydrate</td>
<td>39.8</td>
<td>37.7</td>
<td>54.3</td>
</tr>
<tr>
<td>Protein</td>
<td>0.4</td>
<td>1.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Fat</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Rijpervitien</td>
<td>0.7</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Ash</td>
<td>0.4</td>
<td>0.8</td>
<td>0.3</td>
</tr>
</tbody>
</table>

All contain a fair quantity of Calcium, Iron; some lime, Sodil, Copper, Iodine, Magnesium and Vitamine 7, 8, 9 and 12.
I. DEVELOPMENT OF THE BANANA INDUSTRY

I. 1. The origin of bananas as a cultivated foodstuff.

It is probable that parthenocarpic fruit (i.e., fruit developed independently of pollination), appeared as a result of natural crossings of species or varieties of Musa. Sterility arising from hybridization is a factor that would favor the formation of more pulp in the fruit, and also inhibit seed growth. It is likely that man in his search for food would select the more edible forms of banana and not develop the more seedy ones. In this manner it is probable that through a process of selection and preservation of types, the edible banana developed.

The composition of a fully ripe banana is given in the table below.

TABLE 1. The Chemical Composition of Varieties of Ripe Bananas as Percentage of Fresh Pulp - Von Loesecke

<table>
<thead>
<tr>
<th></th>
<th>Gros Michel</th>
<th>Lacatan</th>
<th>Plantain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>75.9</td>
<td>71.6</td>
<td>63.8</td>
</tr>
<tr>
<td>Reducing sugars</td>
<td>10.7</td>
<td>8.2</td>
<td>18.9</td>
</tr>
<tr>
<td>Non reducing sugars</td>
<td>6.1</td>
<td>10.0</td>
<td>-</td>
</tr>
<tr>
<td>Starch</td>
<td>2.9</td>
<td>6.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Total carbohydrate</td>
<td>19.8</td>
<td>24.7</td>
<td>30.6</td>
</tr>
<tr>
<td>Protein</td>
<td>0.8</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Pectin</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Rotopectin</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Ash</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

All contain a fair quantity of Calcium, Iron; some Zinc, Cobalt, Copper, Iodine, Magnesium; and Vitamins A, B, C and G.
The value of bananas and plantains as a food compared with other fruit is shown in Table 2.

TABLE 2. Food Balance Sheet for 1954 - Trinidad & Tobago

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Quantity consumed - ozs. per day</th>
<th>Calories per day</th>
<th>Protein gm. per day</th>
<th>Fat gm. per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bananas</td>
<td>2.3</td>
<td>13.3</td>
<td>0.6</td>
<td>0.19</td>
</tr>
<tr>
<td>Plantains</td>
<td>0.4</td>
<td>8.1</td>
<td>0.1</td>
<td>0.03</td>
</tr>
<tr>
<td>Grapefruit and Oranges</td>
<td>0.7</td>
<td>5.6</td>
<td>0.1</td>
<td>0.04</td>
</tr>
<tr>
<td>Grapefruit juice &amp; Orange juice</td>
<td>1.1</td>
<td>8.9</td>
<td>0.1</td>
<td>0.06</td>
</tr>
</tbody>
</table>

I. 2. Introduction to the West Indies.

Historical evidence suggests that there were no edible bananas in the New World prior to European entry. The first edible banana was introduced in 1516 by de Berlanga to Santa Domingo (Dominica), from the Canary Islands. What variety this was is not known. During the next three centuries banana cultivation spread with the settlement and development of the Caribbean Islands.

In 1836, according to Reynolds (1927), a variety of Musa Sapientum began to be exploited, and this eventually gave rise to the Gros Michel banana. This variety was introduced into Jamaica from Martinique in 1836 by Pouyat. All the commercial plantings in Cuba and Central America were derived from Pouyat's Gros Michel.

I. 3. Development of the Export Industry in the West Indies.

Up until the mid-nineteenth century the banana was regarded as not being of use outside the tropics. This was due to lack of realisation that the fruit would withstand transportation. Baker and Keith were the first persons to set up an Export industry of any size in the West Indies. Baker in 1870 shipped bananas from Jamaica to New York and in 1871 to Boston. He conceived the idea of a schooner fleet transporting bananas from Jamaica...
<table>
<thead>
<tr>
<th>Year</th>
<th>British</th>
<th>Honduras</th>
<th>Dominica</th>
<th>St. Lucia</th>
<th>Grenada</th>
<th>Trinidad and Tobago</th>
<th>Jamaica</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>401,630</td>
<td>179,113</td>
<td>117,132</td>
<td>149,797</td>
<td>255,953</td>
<td>359,135</td>
<td>241,830</td>
</tr>
<tr>
<td>1954</td>
<td>614,127</td>
<td>303,229</td>
<td>166,316</td>
<td>165,616</td>
<td>275,720</td>
<td>397,640</td>
<td>256,180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>British</th>
<th>Honduras</th>
<th>Dominica</th>
<th>St. Lucia</th>
<th>Grenada</th>
<th>Trinidad and Tobago</th>
<th>Jamaica</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>6,773</td>
<td>10,92</td>
<td>9,975</td>
<td>9,975</td>
<td>4,953</td>
<td>3,953</td>
<td>3,953</td>
</tr>
<tr>
<td>1954</td>
<td>5,164</td>
<td>4,423</td>
<td>4,423</td>
<td>4,423</td>
<td>4,423</td>
<td>4,423</td>
<td>4,423</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>British</th>
<th>Honduras</th>
<th>Dominica</th>
<th>St. Lucia</th>
<th>Grenada</th>
<th>Trinidad and Tobago</th>
<th>Jamaica</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>1,103,937</td>
<td>1,17,132</td>
<td>166,316</td>
<td>165,616</td>
<td>275,720</td>
<td>397,640</td>
<td>256,180</td>
</tr>
<tr>
<td>1954</td>
<td>2,483,229</td>
<td>303,229</td>
<td>166,316</td>
<td>165,616</td>
<td>275,720</td>
<td>397,640</td>
<td>256,180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>% Contribution of Bananas to Total Value of Exports per Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>British</td>
<td>3.7</td>
</tr>
<tr>
<td>Dominica</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Table 3. - Compiled from figures obtained from the Caribbean Commission, Port of Spain, Trinidad. - Unpublished.
Jamaica to Boston, and in fact created as a result of this, the Jamaica banana industry. Baker and his associates founded the Boston Fruit Company in 1885.

Meanwhile Keith had been shipping bananas from Costa Rica, Columbia and Honduras to America. In 1899 the two companies under Keith and Baker amalgamated to form the United Fruit Company. The banana export industry was now established on a sound basis.

The first shipping line to transport bananas to the United Kingdom was started in 1901 by Sir Alfred Jones, Chairman of Elders, Dempster and Company. This line, the Imperial Direct Line operated from Jamaica to Bristol and carried regularly approximately 25,000 bunches a fortnight.

Also in 1901 this company was incorporated with Fyffe, Hudson and Company to form Elder's and Fyffe's Limited. In 1902 this became associated with the United Fruit Company and by 1910 the latter owned all the capital stock of Elders and Fyffe's Limited.

At this time banana exports accounted for 49.4% of the value of Agricultural exports in Jamaica. At the present time 50% of the export trade of the New World is dominated by the United Fruit Company.

All bananas from Trinidad are handled by the Union International Company Limited - a subsidiary of the British Vesty Corporation. This company owns three shipping lines - Booth, Blue Star, and Lamport and Holt. The former two only are used in transporting bananas from Trinidad.

The relationship of banana exports to that of other major agricultural crops in the West Indies is shown in Table 3. The value of the banana crop in each Island is expressed as a percentage of the total value of bananas exported from the whole area. It is clear that Jamaica with almost 85% is by far the major exporter. Dominica produced 10% and Trinidad and Tobago only 0.8% in 1951.
Thus the development of even a strong export industry in Trinidad would have little effect on overall production from the West Indies. The percentage contribution of the banana export industry to the value of agricultural exports per island shows that in Trinidad and Tobago the crop accounts for only 0.5% of total exports whereas in Dominica it accounts for 70% and in Jamaica 30%. Even with smaller islands bananas are of more importance as an export crop in the economy of the island than they are in Trinidad and Tobago.

The banana export trade of the West Indies was based almost entirely on the Gros Michel variety until recent years. The disease factors that affected this variety are dealt with later in this survey. A rough guide to the varieties exported from the West Indies at present given by Carr (1955):

- Jamaica - Gros Michel and Lacatan
- Honduras - I.C.2
- Guadeloupe and Martinique - Governor and Robusta (Poyo)
- Trinidad and Tobago - Gros Michel, Dwarf Governor, Giant Governor, Lacatan

I. 4. Some economic aspects of production.

The agronomic features of the plant have an important bearing on the economic production of the crop. The banana is a succulent plant and predisposed to damage by hurricanes and strong winds. It has a shallow root system, roots rarely penetrating much deeper than three feet into the soil, and large leaves offering a high resistance to wind, are factors that tend to make the plant top-heavy even before production of a bunch of 20 lb. - 100 lb. in weight. The quick growth of the plant resulting in bunch development in about 10 months - 12 months from time of planting, allows the possibility of rapid expansion or reduction of acreage according as market or other conditions dictate. For example, during World Wars I and II there was a rapid decline in banana production due to lack of shipping, but a rapid increase
FIG. I.

EXPORTS PER MONTH FOR 1954 AND 1956.
in production at the end of hostilities. Also after hurricane damage in Jamaica acreage figures soared from 70,000 to 100,000 acres in 1952-1953, Rodríguez (1955).

Similar expansion could not possibly be obtained from permanent crops such as citrus or cacao in such a short period of time.

The capital requirements for establishment of a banana cultivation are only moderate in comparison with tree crops. Thus the cost of establishment and cultivation up to and including the 5th year for citrus or cocoa is $900 - $1000 (B.W.I.) per acre, while for bananas cost of establishment in the first year is approximately $300 (B.W.I.) per acre, and this is recoverable in sale of bananas off the area. Due to this relatively quick turnover there is very little delay in the response in production to fluctuations in market prices.

The supremacy of the banana, as a food, over other fruit is shown in Table 2, and the fact that it can be easily grown makes it an important item of consumption in Trinidad and Tobago. With respect to the export market the fruit is attractive to the eye, has an easily acquired taste, is convenient for retailing and is popular in temperate countries. The perishable nature of the fruit, however, and the fact that it is not a staple food of any importing country are disadvantages in the establishment of a sound export trade.

A factor that should contribute much to the economic stability of small farmers is the non-seasonality of production as shown in Figure 1. The producer obtains regular payments throughout the year and has a quick return for any money invested in the crop. This factor of non-seasonality has also strengthened the competition of the banana with seasonal fruit in foreign markets. It must be pointed out, however, that in the United Kingdom there is a tendency for greater public demand for bananas in summer than there is in the winter months. The reasons for
### TABLE 4.  UTILISATION OF LAND IN FARMS AND SIZE OF FARMS

<table>
<thead>
<tr>
<th>Size of Farm (Acres)</th>
<th>No. of Farms</th>
<th>Average Size (Acres)</th>
<th>Area in group (Acres)</th>
<th>Cultivable Land (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 1</td>
<td>8,027</td>
<td>1.21</td>
<td>9,746</td>
<td>9,405</td>
</tr>
<tr>
<td>2 - 3</td>
<td>5,383</td>
<td>2.17</td>
<td>11,686</td>
<td>11,234</td>
</tr>
<tr>
<td>3 - 5</td>
<td>4,710</td>
<td>3.54</td>
<td>16,677</td>
<td>15,721</td>
</tr>
<tr>
<td>5 - 7</td>
<td>4,040</td>
<td>5.49</td>
<td>22,170</td>
<td>20,392</td>
</tr>
<tr>
<td>7 - 10</td>
<td>2,202</td>
<td>7.65</td>
<td>17,728</td>
<td>16,154</td>
</tr>
<tr>
<td>10 - 15</td>
<td>2,402</td>
<td>11.41</td>
<td>27,401</td>
<td>21,542</td>
</tr>
<tr>
<td>15 - 20</td>
<td>1,317</td>
<td>16.43</td>
<td>21,640</td>
<td>19,378</td>
</tr>
<tr>
<td>20 - 30</td>
<td>968</td>
<td>23.32</td>
<td>22,579</td>
<td>19,917</td>
</tr>
<tr>
<td>30 - 50</td>
<td>634</td>
<td>37.02</td>
<td>23,469</td>
<td>20,714</td>
</tr>
<tr>
<td>50 - 100</td>
<td>372</td>
<td>67.95</td>
<td>25,277</td>
<td>21,626</td>
</tr>
<tr>
<td>100 - 200</td>
<td>212</td>
<td>135.61</td>
<td>28,749</td>
<td>24,228</td>
</tr>
<tr>
<td>200 - 500</td>
<td>130</td>
<td>304.78</td>
<td>39,621</td>
<td>33,232</td>
</tr>
<tr>
<td>500 - 1000</td>
<td>52</td>
<td>717.36</td>
<td>37,303</td>
<td>32,255</td>
</tr>
<tr>
<td>1000 - 10000</td>
<td>44</td>
<td>2,520.2</td>
<td>110,891</td>
<td>85,333</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>30,493</strong></td>
<td><strong>3,854.14</strong></td>
<td><strong>415,037</strong></td>
<td><strong>354,131</strong></td>
</tr>
</tbody>
</table>

Annual Statistical Digest No. 5, 1955.
Central Statistical Office,
Government of Trinidad and Tobago.
This are not at all clear.

It has been said that in Jamaica the development of the banana industry has modified the pattern of economic development. It has provided the means for a large number of small farmers to acquire their own holdings. "In its immediate results it has done more for the upgrading of economic conditions of the Jamaican people than any other crop", Meek (1949). A report on the development and welfare in the West Indies (Stockdale, 1942), stresses the necessity of widening the range of agriculture particularly with reference to growing more foodstuffs. It states "the dominant principle has always been that a country should concentrate on production of crops for which it is best fitted, and on exports of these to supply the exchange necessary to enable it to import its requirements in other directions".

It is emphasised that a regular weekly wage, even if small, is a most valuable financial pillar for the peasant farmer.

The perishable nature of the fruit has already been mentioned, and this has an important bearing on areas suitable for banana production that are difficult of access. There is a prime necessity for good communications and transportation between producer and market, which if lacking may constitute a limiting factor to production.

I. 5. Applications to Trinidad and Tobago.

In applying the above considerations to Trinidad and Tobago the climate, soil types, the major agricultural and other industries offering alternative employment or competitive to banana production have to be taken into account.

Climate and soil types are dealt with in Section II of this report, and discussion is here limited to economic aspects only.

Reference to Table 1 shows that in Trinidad and Tobago 59.5% of the total number of farms are of less than 5 acres, and 17% in the 5-20 acres group. In terms of cultivable land...
These maladies changed the industry from a major enterprise to a subsidiary one, and as it was no longer feasible to grow bananas on a large scale in a pure stand, intercropping with cacao became established.

From 1936 onwards leaf spot disease became of increasing importance in its effect on the industry and in 1938 greatly affected the export trade. This factor followed by the outbreak of World War II and cessation of the export trade caused several large producers, who used to produce the bulk of the export fruit, to leave the industry. Cacao as a crop was progressing and due to uncertainty in the banana trade these producers did not participate in any revival of the industry. Thus the burden of a revival in the trade has fallen on the small producers, supplying from 1 - 10 stems per fortnight from stands in their cacao.

A preliminary survey of banana production in the colony was carried out by the Department of Agriculture in 1954, with a view to opening up a banana export industry. To that date little was known of the growth of the crop which was then only of minor importance in the agriculture of the island. Local consumption at that time was approximately 700,000 stems per annum with preference for the Sucrier variety, a non-exportable one. A committee was appointed by the Director of Agriculture to enquire into the possibilities of developing the banana industry. It set out to find

a) What should be done immediately to build up an export industry.

b) What varieties should be grown, source of planting material and the period that would elapse before sufficient quantities would be available.

c) Would the Cocoa Board make the banana industry part of a scheme for the rehabilitation of cocoa.

d) When would shipments of 350 tons per fortnight (including 100 tons from Tobago) be reached with 7 hand stems and over.
e) What would be the maximum development possible in terms of tonnage.

The conclusions reached were

1. That a substantial industry could be established based on the Lacatan variety. The Governor variety should be encouraged if the buyer would wrap the bunches.

2. Only limited help could be expected from the Cocoa Board for its functions are prescribed by Ordinance.

3. A minimum of 300 tons of 7 hand stems and over should be shipped fortnightly from the latter months of 1956 or early 1957. The total should reach 10,000 - 15,000 tons annually by 1961.

4. A long term contract is desirable and also guaranteed prices for fixed periods, with a guaranteed minimum price.

5. Marketing in the early stages of the industry should be done by the Marketing Board, but eventually a Banana Board should be set up or the crop sold by Co-operative Marketing Organisations.

6. For a successful industry to develop there must be intensive propaganda and education of growers in cultural methods. There should be personal visits by officers of the Department of Agriculture to farms, and high grade officers should organise and generally supervise the work - Interim Report (1953). The manner in which these conclusions have been justified and the recommendations fulfilled will be shown in later sections of this report.
II. AGRONOMIC ASPECTS OF PRODUCTION

II. 1. Climatic requirements of the crop.

Bananas thrive between latitudes 20° North and 20° South and grow well to an altitude of 3000 feet, if protected from winds. Temperatures of up to 105°F. have no adverse effect but if they fall to less than 60°F. cause chilling of the fruit which has an adverse effect on ripening. The ideal temperature range is from 65°F. to 95°F. Long periods at the lower temperatures delay fruit development and reduce the quality of the bunch.

A minimum rainfall of 80 inches is desirable, which should be well distributed. Soils should never dry out completely for any length of time and in areas of markedly seasonal rainfall irrigation may be required.

Wind has an important effect in damage done to the plants and drying action on the soil. Damage to the plant may be caused by lodging of the pseudostem, breaking the leaves or in dessicating the plant. When the latter occurs the leaf edges turn brown. Shelter provided by established cocoa brings about humid conditions, and encourages a surface mulch whereby successful banana cultivation may be attempted with lower rainfall than with pure stands in the open.

II. 2. Varieties and Bunch Characters.

Before describing the varieties grown in Trinidad a description of the ideal export conformation desired will help to show why some varieties are not acceptable for export. For export it is required that

a) the bunch should be symmetrical with the hands closely packed and fingers converging towards the stem; this enables close packing of fruit in transit with the least damage to the fruit.

b) the skin is thick and allows fairly rough handling
without excessive mechanical damage.

c) it should be physiologically suited to shipment at 53°F. rather than 57°F., the latter temperature being too close to the ripening temperature. If the temperature falls below 52°F., chilling of the fruit occurs, and if it rises above 57°F., fruit will start to ripen and will ripen prematurely.

d) the fruit have flavour and texture as near as possible to that of the Gros Michel banana.

e) fruit should ripen uniformly to a deep yellow colour.

A complete and full survey of the varieties of bananas in Trinidad and their botanical differences is given in a report by Frank (1951). For the purpose of this survey, therefore, a description will be given only of bunch characters of the common varieties and the main characteristics of the plant. The exportable varieties are dealt with first.

(1) The Gros Michel banana - also called Martinique Fig. (Plate 1.)
The chief distinguishing feature from other varieties is the lack of red pigmentation in the pseudostem, which is a yellowish-green in colour. The plant is tall growing 10 ft. - 14 ft. to the top of the pseudostem on good soils. Bunches conform to the ideal export type. Each finger ends in a "bottle-necked" tip. Bunches normally have 6 - 10 hands and rarely up to 13. The average weight of a bunch is approximately 55 lb., a good bunch weighing 80 - 90 lbs.
(2) Giant Governor variety - also called Giant Cavendish. This plant has a reddish pseudostem, and grows to a height of 7 ft. - 8 ft. to the top of the pseudostem. Male bracts are persistent on the rachis. The bunch is large but less compact than the Gros Michel variety. Fingers are incurved to the rachis when immature but tend to sag when mature. Hands tend to be spirally splayed. Fingers have soft skins and are blunt-tipped.

Both this variety and the dwarf variety have the leaf petioles compressed but the latter more so.

![Plate 2 showing general characteristics of the Governor variety](image)

Plate 2.

Plate 2 shows the general characteristics of the Governor variety

(3) Dwarf Governor - also called Canary Banana - Plate 3.

This is a short plant of about 5 ft. to the top of the pseudostem. Hands tend to be more spirally splayed than in the Giant variety. This variety is most suitable to hill slopes exposed to the wind due to its compactness. Also it is less exacting in soil requirements and tolerates a higher water table than do other varieties.

![Plate 3 showing Canary Banana](image)
(4) The Lacatan Variety - also called Giant Fig.

This variety has a rich red colouration towards the base of the pseudostem. It is a tall plant 9 ft. - 1½ ft., hands more erect and well packed with overlapping of fingers and fingers are larger than with the former Governor varieties. The importance of this variety to the export industry lies in its good commercial qualities and its resistance to Panama Disease. Unfortunately, it is attacked badly by leaf spot disease which has to be controlled by spraying.

(5) Robusta, also called Poyo.

This variety is very similar to Lacatan often only distinguished from it by ratio of length to breadth of leaf. If ratio less than 3:1 variety is Robusta; if greater than 3:1 is probably Lacatan.

(6) I.C.2 variety.

This is very similar to Gros Michel and it is very difficult to distinguish between them on vegetative characters. Gros Michel is a triploid and has a more erect appearance than I.C.2, a tetraploid;

The bunch is not as symmetrical as the Gros Michel, fingers are shorter and the tips blunt ended. The fruit pulp tends to be more sticky and less sweet than that of the Gros Michel variety. In Trinidad it is not of importance in the export trade due to these characters.

The important non-exportable varieties are

1) Silk variety - also called silk fig.

A semi-tall plant (about 10 ft.) with a slender pseudostem. Bunches hang obliquely to vertically and hands are not closely packed, the rachis being easily seen between them.
them. Fingers are large curving upwards. Finger tips are blunt and bear styles giving the fruit a hooked appearance when unripe. When ripe fingers break off easily under their own weight, and are thin skinned. These latter two characters are sufficient to preclude the variety from the export trade. It is popular in the local market and is grown all over the colony thriving on the heavier soil type.

2) The Suorier Variety - also called Ladies Fingers, Plate 4.

The plant is 8 ft. - 12 ft. tall to the top of a thin pseudostem, and the plant is devoid of any waxy covering - a diagnostic feature. Bunches are small, hands spreading out horizontally giving the bunch an asymmetric appearance. Fingers are very symmetrical, short and fat. Skin is very thin. Variety is widespread in Trinidad but is very susceptible to leaf spot disease.

Plate 4.

(7) Mysore - also called Fillbasket.

Plant is tall growing 10 ft. - 15 ft., the midrib, petioles and underside of leaves are masked by a dull bronze red colour. Bunches have large number of hands closely packed (11 - 18). Fingers curve upwards slightly, tips being bottle-necked.
bottle-necked. Bunch ripens irregularly starting at the top, or centre, and spreading down or up and down the stem. Fingers are short and fat (1/4" long by 1/4" wide approximately). Skin of fruit is thin. Usually found as shade for cocoa, due to its resistance to Panama and Cercospora leaf spot diseases.

The differences in finger size conformation are illustrated in Plate 5, and also the stage of maturity with respect to the export variety. A variety suitable for export with regard to commercial characters but not suitable for shipment due to the non-uniformity of bunch caused by spreading of hands is shown in Plate 6.

Plate 5.

Plate 6.

II. 3. Soil requirements.

Bananas grow well on a wide range of soils provided that the following conditions are satisfied

a) there is good drainage

b) there is an adequate moisture supply

c) there is maintenance of supplies of organic matter

d) sufficient attention be paid to tillage practices, with special emphasis on the elimination of weed and grass competition. A base soil with mulch cover is the ideal condition.

The best soils for production are deep, well drained loams of high organic matter content. Rich alluvial soils are very suitable for the crop. It should be emphasised that selection of the right variety is of fundamental importance for
successful commercial production of bananas. Experience in other countries in the West Indies has shown that bananas should not be planted on sands, gravels, eroded hill tops or unduly heavy clays that bake on exposure to sun. Swampy soils and those with a hardpan in the subsoil are unsuitable.

II. Climate and Soils of Trinidad and Tobago.

The climatic requirements listed above are satisfied in several areas of Trinidad and Tobago. The general areas most suitable for banana production on the basis of availability of moisture and good drainage are shown on Appendices III and IV. It is with the soil, however, that the major agronomic problem facing banana production arises. Most of them are not ideal, even the cocoa soils though suitable suffer from being too heavy. However, there are many floodplains and pockets of soil where bananas grow very well. It is suggested by Montserin (1952) that where bananas are grown on hillslopes subject to erosion, they should be contour worked with shallow trenches 1½ ft. deep and 20 ft. apart. Preferably a leguminous cover crop should also be grown.

Chenery (1952) in his survey of the soils of Central Trinidad covered an area of approximately 576,800 acres, of which only 7% was good cacao soil, and ideally suitable for banana growing. The remainder of Trinidad has not been surveyed thoroughly or soil types classified with any accuracy, but a soil map indicating general soil types in the areas of banana production is given in the Appendix V. A land productivity map of Trinidad drawn up by Chenery and based on production without addition of fertiliser indicates the scarcity of land of high inherent fertility in Trinidad - Appendix VI. A similar picture for Tobago is given in Appendix VII.

Bananas grow well on alluvial, podsolic and latitic soils if drainage is good, and as a general guide it can be said that wherever there is a good cocoa soil bananas will grow well.
<table>
<thead>
<tr>
<th></th>
<th>TALPARO</th>
<th>TOCO</th>
<th>MAYARO</th>
<th>MORUGA</th>
<th>SANGRE GRANDE</th>
<th>MONTSERRAT</th>
<th>RIO CLARO</th>
<th>BICHE</th>
<th>TAMANA</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>289</td>
<td>1886</td>
<td>317</td>
<td>495</td>
<td>1118</td>
<td>2022</td>
<td>1059</td>
<td>1293</td>
<td>1359</td>
</tr>
<tr>
<td>April</td>
<td>316</td>
<td>2504</td>
<td>497</td>
<td>608</td>
<td>1547</td>
<td>2688</td>
<td>1304</td>
<td>1490</td>
<td>846</td>
</tr>
<tr>
<td>May</td>
<td>125</td>
<td>1292</td>
<td>288</td>
<td>394</td>
<td>755</td>
<td>1254</td>
<td>518</td>
<td>629</td>
<td>877</td>
</tr>
<tr>
<td>June</td>
<td>613</td>
<td>4614</td>
<td>297*</td>
<td>352*</td>
<td>2566</td>
<td>4481</td>
<td>1027*</td>
<td>2217</td>
<td>2684</td>
</tr>
<tr>
<td>July</td>
<td>645</td>
<td>4731</td>
<td>644</td>
<td>1205</td>
<td>2711</td>
<td>4835</td>
<td>2207</td>
<td>2302</td>
<td>2941</td>
</tr>
<tr>
<td>Aug.</td>
<td>500</td>
<td>2975</td>
<td>448</td>
<td>810</td>
<td>1833</td>
<td>2803</td>
<td>1513</td>
<td>1886</td>
<td>1892</td>
</tr>
<tr>
<td>Sept.</td>
<td>870</td>
<td>5854</td>
<td>870</td>
<td>1614</td>
<td>2117*</td>
<td>3159*</td>
<td>3148</td>
<td>1451*</td>
<td>3439</td>
</tr>
<tr>
<td>Oct.</td>
<td>565</td>
<td>5501</td>
<td>679</td>
<td>1529</td>
<td>3684</td>
<td>4412</td>
<td>2722</td>
<td>2644</td>
<td>3467</td>
</tr>
<tr>
<td>Nov.</td>
<td>395</td>
<td>6144</td>
<td>814</td>
<td>1752</td>
<td>3905</td>
<td>5147</td>
<td>3660</td>
<td>2623</td>
<td>4120</td>
</tr>
<tr>
<td>Dec.</td>
<td>594</td>
<td>4301</td>
<td>471</td>
<td>1176</td>
<td>2568</td>
<td>3610</td>
<td>1877</td>
<td>1773</td>
<td>1949</td>
</tr>
<tr>
<td>Jan.</td>
<td>742</td>
<td>4776</td>
<td>636</td>
<td>1545</td>
<td>3124</td>
<td>4200</td>
<td>1799</td>
<td>2112</td>
<td>2062</td>
</tr>
<tr>
<td>Feb.</td>
<td>867</td>
<td>4323</td>
<td>715</td>
<td>1201</td>
<td>3546</td>
<td>4516</td>
<td>1999</td>
<td>2379</td>
<td>2080</td>
</tr>
<tr>
<td>March</td>
<td>557</td>
<td>3233</td>
<td>667</td>
<td>848</td>
<td>2313</td>
<td>3725</td>
<td>1187</td>
<td>1578</td>
<td>1611</td>
</tr>
<tr>
<td></td>
<td>TALPARO</td>
<td>TOCO</td>
<td>MAYARO</td>
<td>MORUGA</td>
<td>SANGRE GRANDE</td>
<td>MONTSERRAT</td>
<td>RIO CLARO</td>
<td>BICHÉ</td>
<td>TAMANA</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>------</td>
<td>--------</td>
<td>--------</td>
<td>---------------</td>
<td>-------------</td>
<td>-----------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>March</td>
<td>8.0</td>
<td>3.9</td>
<td>5.0</td>
<td>4.6</td>
<td>7.3</td>
<td>4.5</td>
<td>6.5</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>6.1</td>
<td>2.6</td>
<td>5.2</td>
<td>3.6</td>
<td>7.3</td>
<td>4.2</td>
<td>3.8</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>7.5</td>
<td>5.3</td>
<td>5.5</td>
<td>9.9</td>
<td>8.5</td>
<td>7.5</td>
<td>10.6</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>12.9</td>
<td>6.4</td>
<td>6.6</td>
<td>10.2</td>
<td>12.6</td>
<td>8.4</td>
<td>11.0</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>6.8</td>
<td>7.6</td>
<td>5.0</td>
<td>5.6</td>
<td>7.7</td>
<td>7.1</td>
<td>7.4</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>16.6</td>
<td>8.2</td>
<td>10.0</td>
<td>7.2</td>
<td>17.9</td>
<td>11.6</td>
<td>13.9</td>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td>Sept.</td>
<td>6.8</td>
<td>5.5</td>
<td>9.2</td>
<td>8.1</td>
<td>8.4</td>
<td>13.4</td>
<td>8.5</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>Oct.</td>
<td>14.4</td>
<td>7.3</td>
<td>7.9</td>
<td>7.9</td>
<td>10.5</td>
<td>17.4</td>
<td>10.4</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td>Nov.</td>
<td>12.7</td>
<td>3.1</td>
<td>6.3</td>
<td>8.1</td>
<td>19.1</td>
<td>9.9</td>
<td>8.7</td>
<td>11.7</td>
<td></td>
</tr>
<tr>
<td>Dec.</td>
<td>12.9</td>
<td>8.8</td>
<td>9.2</td>
<td>8.8</td>
<td>13.4</td>
<td>17.1</td>
<td>12.8</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td>Jan.</td>
<td>6.8</td>
<td>2.4</td>
<td>3.1</td>
<td>2.9</td>
<td>7.9</td>
<td>4.1</td>
<td>7.1</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Feb.</td>
<td>1.9</td>
<td>0.6</td>
<td>1.2</td>
<td>1.7</td>
<td>2.2</td>
<td>1.8</td>
<td>3.2</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>0.5</td>
<td>0.5</td>
<td>0.1</td>
<td>0.4</td>
<td>1.2</td>
<td>0.2</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
</tr>
</tbody>
</table>

Source of figures - Table 5 - Marketing Board Returns  
Table 6 - Hydrologists' Monthly Rainfall Record - Dept. of Water & Hydraulics. Section E.1 Trinidad & Tobago.
well. Also it was found during the course of this survey, and has been confirmed in other reports, that on soils where plantains are growing well, bananas will also grow very well. Plantains are more exacting in soil requirements, and only thrive on soils of good structure and high fertility. In Tobago the reddish brown soils on the hill slopes are highly productive and have excellent physical structure. The soils of Tobago on the whole are superior in fertility and structure to those of Trinidad and better suited to banana cultivation, possibly due to their calcareous nature.

An attempt has been made to correlate production of bananas with rainfall. Tables 5 and 6 give figures of production for certain districts of Trinidad and rainfall in each district. From Figures 2(a) and (b) of products and rainfall it is clear that there is a definite relationship between quantity of production and rainfall. The figures provided are for export bananas for figures for local production are not available. Figure 3 illustrates the relationship of production to rainfall for a specific area (Toco) and is taken from Figures 2(a) and (b). It is pointed out that the figures for production for June say, is influenced by the rainfall in May. This explains the apparent shift of one month in the coincidence of the graphs.

II. 5. Supply of planting material.

The director of Agriculture for Trinidad and Tobago in his annual report for 1954 stated that the supply of planting material was one of the limiting factors to development of the banana industry.

Vegetative propagation, the only method practicable, may use five different planting materials of which the first three only are used in normal practice.

(a) Bull-heads - these are rootstocks from plants that have borne a bunch. The crown is cut out and cut into pieces each having two or more eyes and weighing about 6 lbs. These are often termed "bits". Used mainly for the multiplication
FIG. 20 EXPONTS FROM SOME MAJOR AREAS OF PRODUCTION, MARCH 1956 — MARCH 1957

NUMBER OF STEMS FOR EXPORT (in thousands)

MONTHS
FIG. 2(b). RAINFALL OVER SOME AREAS OF BANANA PRODUCTION, MARCH 1956—MARCH 1957
FIG: 3  
RELATIONSHIP OF PRODUCTION TO RAINFALL,  
FOR TOCO.
of planting material in nurseries.

(b) Maiden suckers - these are suckers that have passed on from the sword sucker stage and have taken on full adult foliage. The age of the sucker is about 6 - 8 months old. For planting the stem is cut back to within six inches of the crown and if well grown should measure 8 inches in diameter at this cut surface.

(c) Sword suckers - these are the young suckers with narrow sword shaped leaves. These form the best planting material particularly for interplanting with cocoa.

(d) Peepers - these are suckers in their early stage of development growing from a plant or a maiden sucker; a sucker just as it peeps out of the ground. May be used for planting in nurseries, but not often used at all.

(e) Water suckers - these are suckers that should not be planted for they produce only a very inferior plant. They have broad leaves and arise from the top of the crown of a plant that has already been harvested.

During the early stages of the banana industry planting material was imported and used to establish nurseries in Trinidad and Tobago. The Cocoa Board imported 50,000 Cavendish suckers in 1954 from Jamaica for distribution to planters as shade for clonal cocoa. 12,000 of these plants in fact went to the Department of Agriculture for establishment of nurseries. The Marketing Board imported 91,000 suckers of Cavendish varieties (Lacatan and Governor varieties), and used them for establishment of nurseries. From these nurseries 50,000 suckers were sold in April - July 1955 at a rate of 10c each.

In 1955 the Marketing Board undertook importation and distribution of 125,000 banana plants on behalf of the Cocoa Board and the Department of Agriculture; 60,000 of these were Lacatan variety and the remainder Giant Governor variety. Despite the large number of plants imported demand for planting
material was, and still is high, and many estate owners imported their own material. Due to the fact that supply has not kept up with demand the Marketing Board rationed out planting material as shown in Table 7.

TABLE 7. Distribution of Planting Material 1956

<table>
<thead>
<tr>
<th>No. of plants required</th>
<th>1-200</th>
<th>201-500</th>
<th>501-1000</th>
<th>1001-5000</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of producers requiring plants</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>% allocation</td>
<td>100</td>
<td>75</td>
<td>70</td>
<td>55</td>
<td>50</td>
</tr>
</tbody>
</table>

It is clear from this table that during this period the small producer was favoured in supplying with planting material. This was done to encourage the peasant farmer and to try and get the industry established quickly on a wide basis.

Distribution for 1957 will be carried out according to figures shown in Table 8.

TABLE 8. Distribution of Planting Material for 1957

<table>
<thead>
<tr>
<th>No. of plants required</th>
<th>1-200</th>
<th>201-500</th>
<th>501-1000</th>
<th>1001-5000</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. required</td>
<td>6,390</td>
<td>17,700</td>
<td>25,250</td>
<td>109,400</td>
<td>76,000</td>
</tr>
<tr>
<td>% allocation</td>
<td>46</td>
<td>45</td>
<td>27</td>
<td>36</td>
<td>6</td>
</tr>
</tbody>
</table>

Distribution will be done more evenly with less accent on fulfilling the demands of the small producer than in 1956.

For 1957, 235,000 plants were acquired but only 100,000 are available. The Marketing Board has stated its willingness to undertake importation of planting material from St. Lucia but at a cost of 28¢ for a sucker and 42¢ (B.W.I.) for a bull-head. Up to the 12th March, 1957, requests had been made for only 500 plants. It is very doubtful if very many plants will be desired at the high prices quoted. At present in Trinidad and Tobago...
Tobago the variety in greatest demand is the Giant Govenor; this may be due to the fact that the variety is less exacting in its soil requirements, and is also resistant to Panama disease.

II. 6. Banana Production in Trinidad and Tobago.

Production of bananas in Trinidad and Tobago may be divided into (a) estate production and (b) peasant production. All production can be further sub-divided into that destined for local or for export markets, but the problems confronting the two groups of producers differ widely.

(a) Estate production.

Production on estates can be divided into that where the crop is grown as a pure stand, and that where grown with another crop. There are few estates of the former type in Trinidad or Tobago and where they exist are of recent production. One estate, visited by the investigator, in the Mora Valley (near Rio Claro) is in the process of being cleared from secondary bush and planted in bananas. The soil type is an extremely heavy clay with impeded drainage. The aim is to plant 3000 acres of bananas on this estate, but in view of the extreme soil conditions it is doubtful whether banana growing will be an economic success. When visited at the end of the wet season some Lacatan bananas showed symptoms of water-logging or a trace element deficiency. The latter is highly probable for heavy dressings of lime were applied at the base of each stool, an equivalent dressing of 24-4 tons per acre. The land was cleared in 1955 by hard labour and the cost of clearing and planting over the first six months of operation of the estate was $500 (B.W.I.) per acre. This has now been reduced to $300 per acre. The varieties grown were Lacatan, Giant Govenor and Robusta, and it appeared that the Govenor variety were giving the heaviest yields. Bullheads of the Lacatan variety were imported from Jamaica at a cost of 40¢ each, plus transportation costs.
costs. The Governor suckers for planting were purchased from other estates in Trinidad for 15¢ each. It was interesting to find that when Lacatan were planted out in holes 18 inches deep in the wet season only 42% germination was obtained. A system of what was termed "spot nurseries" was tried, i.e. planting material was planted in holes 6 inches deep and after they had germinated replanted in the field. This method proved to be a successful one for maintaining a high percentage germination.

In order to get any drainage on this soil drains had to be laid at least 2 ft. deep.

This estate is one of the Union International Company estates and is unique in its system of estate management with respect to cutting of bananas. To facilitate ease of cutting and estimating the number of stems ready for harvest at any one time a system of coloured darts is used to mark the plants. These darts were wooden skewers painted in different colours. As soon as a bunch is shot, i.e. the flowering head appears from the top of the pseudostem, a dart is pushed into the leaf bases. Thus all plants shooting at the same time are marked with the same coloured darts. The number of darts used is recorded. Fruit takes between 90 to 120 days from time of shooting to when ready to cut for export and so when ready to cut field foremen are simply instructed to cut all stems marked with a certain coloured dart. The period estimated for development to the cutting stage is adjusted according to weather conditions. Thus if there is a dry week it is counted as the equivalent of two weeks towards ripening. This system would prove extremely useful when the estate comes into full production.

On the above estate and elsewhere where grown as a pure stand, bananas were planted at distances of 10 ft. x 10 ft. or 12 ft. x 12 ft. These planting distances give 435 and 300 plants per acre, respectively.

The preparation for planting was carried out in the following...
A PRUNING CYCLE FOR BANANAS

1st Year

4 to 5 months old

3-5 months

8 to 9 months old

12 to 15 months

7 - 8 months

2nd Year

7 months

-12 months

4 months

5 months

-12 months

9 months old

3rd Year

8 months old

12 months old

4 months

12 months

8 months old

Taken from "Growing Gros Michel Bananas in Cocoa" - S.G. Harragin.
following manner:

(i) the area was cutlassed and cleared for living and the positions of the plants marked with stakes.

(ii) holes were dug 18 inches deep and 18 inches square.

(iii) material was planted after replacing in the hole about six inches of the topsoil, and the hole filled with the remaining soil.

(iv) draining was carried out if required.

Drains were usually 24 ft. apart and 18 inches - 24 inches deep.

On most soils in Trinidad only one mature plant and one follower is allowed per stool, all other suckers being pruned off when they are a foot high. On the more fertile soils and planting at 14 ft. x 14 ft. two suckers may be allowed per stool. Thus in the second year two bunches may be obtained per stool simultaneously. The quality of these bunches will depend very much on the fertiliser applications used. A diagramatic representation of the usual pruning cycle followed is given in Diagram 1.

On most estates in Trinidad and in Tobago bananas are grown with another crop. The two main crops to which bananas are subsidiary are cacao and coconuts. In the South Eastern part of Trinidad many estates are trying to establish banana cultivation under existing coconut plantations. This has been quite successful especially where mulching with coconut fibre dust (coir dust) has been carried out. Where this is done, coir dust is used as bedding for stock and when saturated with urine and faeces forms a good mulch for placement around banana stools. This practice should be recommended on other estates where light bunches are obtained and no mulching carried out. The soils of these estates are very similar being light sandy and free draining. It is probable that mulching in the above manner increases the proportion of roots near the soil surface, and increases the stability ...
stability of the plant against wind damage. If surface rooting is induced by mulching then there will be a tendency for the stool to grow "cut" of the ground, i.e. nearer the surface and consequently will become less stable to winds. Mulching with the stem of the banana plant after harvesting the bunch is common practice. The stem is cut up and spread around the stool.

Spacing of coconut lines is 25 ft. on most coconut estates and bananas are planted between the rows of coconuts.

On cocoa estates where bananas are used as a temporary shade for clonal cocoa, they may be produced for a number of years until the cocoa is finally established. The usual variety grown with cocoa has been the Mysore but as this is a non-exportable variety the Cocoa Board has been encouraging growers to use exportable varieties as shade for cocoa. The method of growing bananas as shade for clonal cocoa is illustrated in Plate 7.

*A planting plan for cocoa and bananas with a ground cover of food crops such as tannia, cassava is given in Diagram 2. This method of intercultivation is widespread over Trinidad and Tobago. The shade in use is mainly provided on flat poorly drained land by Bocare Immortelle (Erythrina glauca) and on hilly land with good drainage by Ananca Immortelle (E. poep-pigiana). Spacing is usually 24 ft. x 24 ft., but on at least one estate it is thought that spacings of 48 ft. x 48 ft. would...
be quite suitable, and this is being tried out.

Some figures for cost of production were obtained for an estate situated near Toco on the North Coast of Trinidad. The land was quite steep but soil type, a sandy loam and drainage offered no problems. Bananas were grown as a pure stand and in cocoa. Planting costs amounted to 4¢ per plant, and from planting to production of the first bunch cost was 80¢ per plant. Assuming that the stem produced weighed 40 lbs. and was sold to the Marketing Board for export return would be $1.60 on that stem, i.e. a profit of 80¢. In four months time a second bunch sold brings a return of $1.60 which is almost all profit so that from one stock a profit of almost $2.40 is made in the first year.

Few of the estate owners kept separate records of banana costings. In view of this fact an estimate only is here given of cost of production.

Assume a spacing of 10 ft. x 10 ft., i.e. a plant population of 435/acre.

<table>
<thead>
<tr>
<th>Operations</th>
<th>1st Year</th>
<th>Costs $ (B.W.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing land</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Ploughing and Forking (by machine)</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Forking (if only hand labour)</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>Liming</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Digging holes</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Cost of suckers - 435 @ 10¢</td>
<td></td>
<td>44</td>
</tr>
<tr>
<td>Planting</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Fertilisers and fertilising (with pen manure)</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Spraying</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Pruning (5 times)</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Circle Weeding</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Cutting and heading fruit</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Drain maintenance</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Total for hand work only</td>
<td></td>
<td>290</td>
</tr>
</tbody>
</table>

Yields: 150 bunches @ average weight of 50 lb., @ 4¢ per lb.

Profit $10

|  | | Second year ... |
2nd Year

<table>
<thead>
<tr>
<th>Activity</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilisers and fertilising</td>
<td>40</td>
</tr>
<tr>
<td>Spraying</td>
<td>45</td>
</tr>
<tr>
<td>Pruning</td>
<td>15</td>
</tr>
<tr>
<td>Weeding</td>
<td>10</td>
</tr>
<tr>
<td>Cutting and heading</td>
<td>20</td>
</tr>
<tr>
<td>Drain maintenance</td>
<td>10</td>
</tr>
</tbody>
</table>

Yields: 225 @ 50 lb., @ 4¢ per lb.

Profit $310

N.B. Yield will probably decline slightly after the second ratoon, due to reduction in stool number by disease, damage, etc.

These figures have been compiled from a number of sources, mainly figures provided by estate owners. No figures were available for costs of peasant production.

A problem that was met with on all estates visited was one of labour supply. On one estate near Sans Souci local labour is so unreliable that labourers have been engaged from St. Vincent. They are housed in a wooden barrack-type building and look after themselves. Local labour is unreliable in that men turned up for work sometimes only three days in every seven. This situation also occurs in Tobago.

Apparently the reason is not that wages are low but that they do not want work. A labourer will work for a long enough period to accumulate some money and then take a few days off to spend it. With this attitude to employment raising of wages might only aggravate the problem. The Vincentians came to Trinidad looking for work and are required to stay on the above estate for at least three years.

(b) Peasant production of bananas.

Peasant production covers both the local and export markets as compared with estate production which is solely for the export market. The importance of the small producer in the export trade at the present time is clearly indicated in Tables 9-12.
<table>
<thead>
<tr>
<th>District</th>
<th>1-2 Stems</th>
<th>3-5 Stems</th>
<th>6-10 Stems</th>
<th>11-20 Stems</th>
<th>21-50 Stems</th>
<th>51 Stems Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toco</td>
<td>133</td>
<td>154</td>
<td>66</td>
<td>19</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Sangre Grande</td>
<td>118</td>
<td>90</td>
<td>39</td>
<td>17</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Tamana &amp; Talparo</td>
<td>157</td>
<td>100</td>
<td>48</td>
<td>15</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Montserrat</td>
<td>71</td>
<td>64</td>
<td>34</td>
<td>28</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Rio Claro</td>
<td>220</td>
<td>180</td>
<td>79</td>
<td>21</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>699</td>
<td>588</td>
<td>266</td>
<td>100</td>
<td>49</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District</th>
<th>Average Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toco</td>
<td>1.5</td>
</tr>
<tr>
<td>Sangre Grande</td>
<td>3.8</td>
</tr>
<tr>
<td>Tamana &amp; Talparo</td>
<td>7.0</td>
</tr>
<tr>
<td>Montserrat</td>
<td>14</td>
</tr>
<tr>
<td>Rio Claro</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>5.3</td>
</tr>
</tbody>
</table>

1 in 3 delivered less than 4 Stems. 90% of suppliers or 9 out of 10 delivered 57% of bananas on an average of less than 4 Stems each.
TABLE 10. PURCHASE OF BANANAS FOR S/S "HILARY" 7/6/56

<table>
<thead>
<tr>
<th>Supplies of:</th>
<th>1-2 Stems</th>
<th>3-5 Stems</th>
<th>6-10 Stems</th>
<th>11-20 Stems</th>
<th>21-50 Stems</th>
<th>51 Stems Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Persons</td>
<td>Stems</td>
<td>Persons</td>
<td>Stems</td>
<td>Persons</td>
<td>Stems</td>
</tr>
<tr>
<td>Toco</td>
<td>104</td>
<td>170</td>
<td>117</td>
<td>578</td>
<td>111</td>
<td>837</td>
</tr>
<tr>
<td>Sangre</td>
<td>111</td>
<td>165</td>
<td>84</td>
<td>324</td>
<td>45</td>
<td>341</td>
</tr>
<tr>
<td>Grande</td>
<td>82</td>
<td>120</td>
<td>83</td>
<td>333</td>
<td>46</td>
<td>346</td>
</tr>
<tr>
<td>Biche</td>
<td>155</td>
<td>241</td>
<td>119</td>
<td>437</td>
<td>68</td>
<td>505</td>
</tr>
<tr>
<td>Tamana &amp; Talparo</td>
<td>151</td>
<td>72</td>
<td>291</td>
<td>350</td>
<td>24</td>
<td>361</td>
</tr>
<tr>
<td>Montserrat</td>
<td>52</td>
<td>80</td>
<td>72</td>
<td>291</td>
<td>50</td>
<td>383</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>Persons</th>
<th>Average Stem Per Person</th>
<th>Stems</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>507</td>
<td>1.5</td>
<td>776</td>
<td>8</td>
<td>53%</td>
</tr>
<tr>
<td>33</td>
<td>505</td>
<td>4</td>
<td>1,963</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>320</td>
<td>8</td>
<td>2,412</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>126</td>
<td>15</td>
<td>1,849</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>61</td>
<td>30</td>
<td>1,823</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>76</td>
<td>918</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1,531</td>
<td>6.3</td>
<td>9,741</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

87% of suppliers or 9 out of 10 delivered 53% of bananas; Average of 4 stems each.
## TABLE II

**PURCHASE OF BANANAS FOR S/S "HILDEBRAND" 5/7/56**

<table>
<thead>
<tr>
<th>Supplies of:</th>
<th>1-2 Stems</th>
<th>3-5 Stems</th>
<th>6-10 Stems</th>
<th>11-20 Stems</th>
<th>21-50 Stems</th>
<th>51 Stems Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Persons</td>
<td>Stems</td>
<td>Persons</td>
<td>Stems</td>
<td>Persons</td>
<td>Stems</td>
</tr>
<tr>
<td>Toco</td>
<td>111</td>
<td>179</td>
<td>173</td>
<td>668</td>
<td>110</td>
<td>827</td>
</tr>
<tr>
<td>Sangre Grande</td>
<td>131</td>
<td>199</td>
<td>126</td>
<td>498</td>
<td>54</td>
<td>439</td>
</tr>
<tr>
<td>Tamana &amp; Talparo</td>
<td>151</td>
<td>228</td>
<td>128</td>
<td>501</td>
<td>72</td>
<td>522</td>
</tr>
<tr>
<td>Montserrat</td>
<td>66</td>
<td>108</td>
<td>82</td>
<td>327</td>
<td>56</td>
<td>417</td>
</tr>
<tr>
<td>Rio Claro</td>
<td>236</td>
<td>350</td>
<td>189</td>
<td>729</td>
<td>105</td>
<td>761</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>695</strong></td>
<td><strong>1,064</strong></td>
<td><strong>698</strong></td>
<td><strong>2,723</strong></td>
<td><strong>397</strong></td>
<td><strong>2,986</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Persons</th>
<th>Average Stem Per Person</th>
<th>% Stems</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>695</td>
<td>1.5</td>
</tr>
<tr>
<td>34</td>
<td>698</td>
<td>4.0</td>
</tr>
<tr>
<td>19</td>
<td>397</td>
<td>7.0</td>
</tr>
<tr>
<td>8</td>
<td>159</td>
<td>11.0</td>
</tr>
<tr>
<td>4</td>
<td>79</td>
<td>29.0</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
<td>77.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,052</strong></td>
<td><strong>6.4</strong></td>
</tr>
</tbody>
</table>

87% of suppliers or 9 out of 10 delivered 52% bananas; Average of less than 4 stems each.
### Table 12. Comparison of Banana Suppliers for 3 Consecutive Shipments

<table>
<thead>
<tr>
<th>District</th>
<th>Suppliers for &quot;Hubert&quot; who also supplied &quot;Hilary&quot;</th>
<th>Total Suppliers for &quot;Hilary&quot;</th>
<th>Suppliers for &quot;Hildebrand&quot; who supplied for &quot;Hilary&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toco</td>
<td>90</td>
<td>312</td>
<td>139</td>
</tr>
<tr>
<td>Sangre Grande</td>
<td>80</td>
<td>223</td>
<td>85</td>
</tr>
<tr>
<td>Tamana</td>
<td>120</td>
<td>242</td>
<td>132</td>
</tr>
<tr>
<td>Montserrat</td>
<td>67</td>
<td>188</td>
<td>57</td>
</tr>
<tr>
<td>Biche</td>
<td>68</td>
<td>145</td>
<td>58</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>425</strong></td>
<td><strong>1,110</strong></td>
<td><strong>471</strong></td>
</tr>
</tbody>
</table>

*Figures obtained from the Marketing Board Returns. Unpublished.*

90% of suppliers or 9 out of 10 delivered 52½ bananas. Average of less than 6 stems each.
Tables 9 - 12. These concern three consecutive monthly shipments, and from the returns submitted it is seen that 87% - 90% of suppliers supplied from 51% - 57% of the fruit shipped. In Trinidad approximately 75% of export production is by peasant producers and in Tobago, 50%.

Thus the growth of the industry has been due almost entirely to smallholders.

Observations made during the course of the survey showed that few smallholders have cultivations on main or secondary roads. Also the majority of cultivations are split into two or three parcels of land that may be widely separated. Fruit for export has to be headed through cultivations and along bridle paths and often up and down hillsides for distances of half a mile or more, to a selling point. Few peasant producers own animals, and where donkeys are used for transportation owners seem unaware of correct methods of packing the bananas to prevent bruising. Plate 8 indicates the method sometimes used.

![Plate 8](image)

Although the lower stem of bananas is covered with a sack there is no real protection from the jarring motion of the animal. Also the top stems are exposed to the sun, an action to be strongly condemned with export fruit.

A further handicap to the peasant farmer who has a small estate of up to 50 acres appears to be shortage of labour, or assistance when required on his estate. In many cases a
peasant farmer cannot afford to pay labour even if it was available.

Where a peasant farmer has a small estate of this size the main crops grown are usually cocoa or coffee and bananas are subsidiary to these crops. Bananas are not usually lined and planted, but are planted between cocoa trees where space is available. There may be only 20-60 stools in an acre of cocoa. Most of the bananas are of the silk or Sucrièr varieties.

There are some areas of Trinidad notably on the North Coast between Matelot and Toco, and also in the Montserrat hills where peasant banana production is of a high standard. Also in Tobago near Charlotteville very good stands of bananas were observed. It so happens that these areas mentioned are situated on soils of good structure and fairly high fertility. But even in other areas where good soil is present banana production by the peasant farmer is poor due to lack of good cultural practices.

Thus some smallholders appeared to neglect their bananas entirely. They were allowed to grow without any sort of pruning being done, Plate 9.

Plate 9.

This applies particularly to the backyard type of production, where fruit is consumed on the premises or sold locally. Often the owner is engaged in some industry outside agriculture to make a living.

As stated above the region of Trinidad from Matelot
to Toco produces excellent stands of bananas and is probably the area of most efficient peasant banana production in Trinidad. Bananas are grown in pure stands and under cocoa. Before planting the area is lined out and the holes dug 18" square and 18" deep. Bananas are usually planted 12 ft. x 12 ft. on the hillsides and as close as 8 ft. x 8 ft. on flat land. The variety grown in greatest abundance is the dwarf Governor variety, and bunches of up to 12 hands and weighing up to 100 lbs. were being produced. Peasant producers cutlass the weeds beneath the bananas three times a year and circle weed the bananas regularly, i.e. clear weeds for a circle of 3 ft. diameter around the stool. Weeds were used to mulch the bananas with. Pruning seemed to be carried out properly and the bunches well attended to when developing, e.g. any leaves touching the fruit are bent away from the fruit.

It was unusual to find that after harvesting the bunch, the parent plant was cut down and chopped up and removed from the vicinity of the stool instead of being used as a mulch as is usual. The reason for removing the old pseudostem and leaves is to prevent spread of the heart rot, which usually sets in to old fruited stems, to the young developing suckers.

A probable reason for this area being more efficient in banana production is that the peasant population are strongly agriculturally minded. Agriculture has been consistently practiced for the past half century and has not been influenced by any attractions of alternative employment or an easier way of life. This is due probably to the general inaccessibility of the area, as well as to the existence of a favourable soil type.

In comparing peasant production in Tobago with that in Trinidad it appears that the general standards of production in the former are higher than in Trinidad. Although Tobago possesses soils of higher fertility and greater potential productivity than does Trinidad, standards of peasant cultivation are higher. Pen manure is frequently used on bananas, and in many cases...
artificial fertilisers as well, procedures not common to peasant producers in Trinidad. This does not mean that some peasant farmers in Trinidad do not use fertilisers for the better ones do, but they are in the minority.

The most widespread disease observed on peasant bananas was Cercospora leaf spot. At present no spraying is done but measures are being developed by the Department of Agriculture to set up an organisation to carry out spraying of peasant bananas. Details of such a scheme have not yet been completed, but will presumably be based on the considerations mentioned in Section II. 7. A photograph of peasant production is shown in Plate 10.

![Plate 10.](image)

The use of fertilisers and rates of application have so far not been mentioned and before doing so it is useful to consider the amounts of nutrients removed from the soil by bananas.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average for different varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂</td>
<td>20</td>
<td>58</td>
<td>45</td>
</tr>
<tr>
<td>P₂O₅</td>
<td>13</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>K₂O</td>
<td>85</td>
<td>210</td>
<td>190</td>
</tr>
</tbody>
</table>

It was found in experiments carried out in Queensland that the Gros Michel variety removed 85 lb. Nitrogen, 20 lb. P₂O₅...
P₂O₅, 288 lb. K₂O, from the soil as indicated by analysis of stem leaves and fruit. The ratio of nutrients removed varies from 2:1:5 to 2:1:10 according to Table 13.

Experiments carried out by Wood in Trinidad showed that addition of fertiliser increased the exportable bunches of 9 hands and over. The variety used in the experiment was Dwarf Governor; addition of Nitrogen alone gave 700 bunches/acre, addition of Nitrogen and Potash gave 1176 bunches/acre, and addition of Nitrogen, Potash and Phosphates gave 971 bunches/acre. Wood recommended that the following rates of straight fertilisers be applied to bananas:

- 3 - 5 cwts./acre of sulphate of ammonia
- 3 - 5 cwts./acre of super phosphate
- 4 - 6 cwts./acre of sulphate of potash

or 10 - 16 cwt./acre of a 9% N - 9% P₂O₅ - 20% K₂O mixture should be used. The current price in Trinidad for a (7.2% - 8.3% - 19% K) fertiliser is $8.70/cwt., and for (12-8-12) $8.15 per cwt. It has been found that if muriate of potash is used, the chloride prevents full development of the plant and of fruit. The potash content of a commercial banana fertiliser mixture comprises 80% of sulphate of potash with 20% muriate of potash. The sulphate is said to improve the keeping quality and also the transportability of the bananas.

Experiments carried out in Jamaica (Jamaica Agric. Bull. 19) showed that addition of fertiliser decreased the length of time from planting to reaping of the fruit, increased the length of finger and number of fingers per hand, and increased the leaf area with a consequent increase in fruit production. A slight tendency was found to increase the proportion of stalk to fruit. It was also found that application of fertiliser prior to the bunch being shot determined the grade of fruit. Any fertiliser applied after this only affected finger length.
A banana fertiliser mixture (8-10-8) is sold by the Marketing Board to growers in Trinidad and Tobago, and some use is made of this. It is common on estates to use \( \frac{1}{4} \) lb. of the mixture in the hole at time of planting and subsequent dressings of 1 lb. of fertiliser every three months is applied. Fertiliser is applied around the stool to cover the root area, i.e. fertiliser is broadcast over a circle of 3 ft. diameter. A practical guide to the root zone is the extent of leaf spread.

Addition of pen manure has been carried out since banana cultivation began in Trinidad but the conclusion reached from this survey is that growers do not appreciate its value in the present day. According to Hardy, a 10 ton dressing of Trinidad pen manure has the practical chemical equivalence of \( \frac{2}{3} \) cwt. of sulphate of ammonia, 6 cwt. of super phosphate, and \( \frac{1}{2} \) cwt. of sulphate of potash. Where pen manure is added at all to banana cultivation it is carried out by peasant producers. Most estates use artificial fertiliser only. Where bananas are grown under coconuts on a fine sandy soil, 4 lb. of a complete fertiliser is applied per stool three times a year, i.e. about 10 cwt. of fertiliser is applied/acre per annum, assuming a stand of 300 plants per acre. The quantity of fertiliser removed by the coconuts has also to be taken into account. The surface roots of the coconuts are cut back regularly within a 3 ft. diameter circle of the banana stool to reduce nutrient uptake by them. On most estates \( \frac{2}{3} \) lb. per stool per annum is the rate used.

It is important to remember that the ultimate size of the bunch produced is determined in number of hands developed. In order to get a large number of hands, fertiliser should be applied before primordia initiation. Thus the output in terms of extra hands per acre is considerably influenced by time of fertiliser application. Yields obtained from the best soils in Trinidad average 200 - 250 bunches/acre/annum.
Although this survey covers banana production in Trinidad and Tobago it may be of some value to include in this section a note on production of plantains. Three main varieties are grown solely for local consumption. These are

(a) The House or Horn Plantain - which produces approximately 5 hands a stem, of 30 lb. weight, and produces bunches in 8 months from time of planting. The stem is clean above the male inflorescence, i.e. there are no abortive fruit, and is very long.

(b) The French plantain - produces an 8 hand bunch of approximately 30 lb. weight in 10-11 months. The fruit stem retains abortive fruit just above the male inflorescence.

(c) The Giant Plantain - produces a bunch of 3-5 hands or more, of weight up to 140 lbs. in a period of 15 months.

Plantains are sold at 8¢ per lb. in the local market, but are only grown as an odd plant on peasant holdings. The demand is quite high and in fact plantains are imported to Trinidad from British Guiana.

II. 7. Pests and Diseases.

Bananas are subject to attack by pests and diseases in the field and as stored fruit. The most important diseases are contained in the former group.

(a) Diseases of bananas.

(i) Panama disease - caused by the fungus Fusarium oxysporium cubense.

This disease has had far reaching effects on the banana industry, not only in Trinidad, but in the West Indies. The disease first appeared in Panama in the 1900's and spread to the West Indies. The most susceptible variety is the Gros Michel variety, which happened to be the one possessing the ideal commercial characteristics of an export variety. Typical symptoms of the disease are:-

A rapid yellowing of leaf blades and petioles followed by wilting and buckling of the leaf. The withered leaves turn brown ...
brown and the plant gradually collapses. If a bunch has been formed it is small and of few hands. Plate 11 (a) shows typical symptoms in the stem, of a plant attacked by the disease.

Plate 11 (a)
Attack by Moko on left, Panama disease on right hand stem.

If the pseudostem is cut across, or a finger, a darkened ring of tissue is clearly visible, from which exudes a sticky mucilage. These symptoms are shown in Plates 11 (b) and 11 (c).

Plate 11 (b) Plate 11 (c)
Control of the disease has been attempted by destruction of infected plants and by planting resistant varieties. Soil sterilisation has been attempted using mercuric compounds. Although the fungus is killed and treated soil is free of the disease even after 9 months of weathering, the cost of such measures applied on a field scale would be prohibitive.
Reclamation of infected land in Honduras is done by flooding the area for six months. The fungus dies out as it cannot tolerate prolonged anaerobic conditions.

The disease has troubled the banana industry in Trinidad for over half a century. In 1912 it was reported that bananas were so affected by the disease that they were planted only as a catch crop and shade for young cocoa. In 1914 Panama disease was a limiting factor to exports of Gros Michel, and today the disease is still rampant. Of the varieties grown for the local market only Silk is attacked by the disease.

When an outbreak occurs on an estate the usual procedure is to cut down any plants that show symptoms, chop them up into small pieces and burn the debris. Lime is applied to the area of the stool. The stool may be killed by adding about half a gallon of crude oil, or hormone injection with 2,4-D. It has been found that the disease spreads quickest in acid soils and least in alkaline ones, hence the reason for the application of lime.

(ii) Leaf spot or Sigatoko disease.

This disease is also caused by a fungus - Cercospora Musae Zimmermann. The disease was widespread in Trinidad in 1934 and by 1937 had produced a serious effect on the banana industry, — Wardlaw (1934).

The fungus develops lesions or spots on the leaf of the plant and if large numbers of spots are produced whole areas of the leaf may be killed. This has an effect on the manufacture of food material by the plant and there is a consequent reduction in size and weight of bunch produced. Bad attacks of the disease also causes a softness at the tips of the fruit leading to premature ripening.

Two types of spores are produced - conidia and ascospores. The former infect the central or heart leaf of the plant, developing to produce spots. Under normal conditions conidia do not infect older leaves. Ascospores are produced from spots on the older ...
older leaves and deposited on the undersurface of the newly opened upper leaves mainly towards the tip, by air currents.

The pattern formed by the spots is characteristic of these two forms of infection. Line spotting is produced by conidia affecting the heart leaf and tip spotting by ascospore infection of the fully opened leaf.

Control of leaf spot disease has been greatest with the use of low volume spraying techniques. The quantity of liquid applied to the plants is only 2 gallons per acre and gives a very effective control. The nozzle of the machine is directed upwards, as shown in Plate 12, and the cloud of mist produced is dispersed by wind. A wind of 4 - 6 m.p.h. is suitable for this drift spraying, and an even distribution will be obtained.

Plate 12.

Oil instead of water is used as a base because it evaporates less rapidly and allows drift of the droplets for greater distances.

The spraying machines used in Trinidad and Tobago are Knapsack types carried on the back of the operator and operated by a small air cooled engine. The three main types in use are the Kiekens Dekker Knapsack sprayer of weight 33 lb., the Motoblo Knapsack sprayer of weight 33 lb. and the Mini-Matic Knapsack sprayer weighing 53 lb. Recently a lighter machine, the Micronette sprayer, has come on to the market. Its nett weight is 28 lb. and it is a promising machine for
further use in the control of leaf spot. The fungicide used to control the disease has been copper oxychloride but recent experiments have shown that an oil spray alone will give effective control. Further details of this are included in the section on research. The spraying cycle employed on all estates where spraying is carried out is a three-weekly one.

(iii) Moko Disease.

This disease is prevalent on heavy clay soils in Trinidad. It is a vascular wilt disease caused by a bacterium, Pseudomonas solanacearum. Symptoms are similar to that of Panama disease. Leaves droop and become flaccid and yellowed and the petioles give way just at the base of the lamina allowing leaves to hang down. They quickly die and dry out; the whole pseudostem then dying and rotting to the ground. A cross section of the pseudostem or fruit indicates a darkening of vascular tissue - Plate 10 (a) (b) and (c).

(b) Pests.

There is only one major pest of the crop on the field and that is the banana weevil borer - Cosmopolites Sordidus. The ravage of this pest are felt particularly during the early stages of growth of the plant sucker. The first indication of the pest is the shrivelling and subsequent death of the roll leaf, i.e. the unopened leaf as it emerges from the plant. If an infested plant is dug up and the corm cut open numerous tunnel Xs are seen, which may contain a grub creamy white in colour. These grubs feed on the cone tissue cutting off the food supply to the young sucker. If a sucker is well established before attack it will recover and fruit production will be unaffected. The adult beetle lays its eggs in the base of the pseudostem or on any decaying banana material left around. Control is obtained through good field sanitation and the use of aldrin or dieldrin. The rate of application is 2 - 2 1/2 lbs. of aldrin per acre. Often planting material is dipped in a solution of one of these compounds before planting out in the field.
Pests of lesser importance include a species of thrips (Franklinella spp) that causes a spotting of fruit by laying its eggs in the outer tissue. This lowers the export value of the fruit.

A common cause of rejection of export fruit is scar-ring of fruit by rats and lizards. The view is widely held that these animals climb down the rachis of the bunch and over the fruit to get at the "bell" or male end of the stem, for the juices present. In St. Vincent this damage is reduced by removal of the tip of the inflorescence as soon as the hands have opened. In Trinidad no measures are adopted to overcome the damage caused by these pests.

There are a few fruit rots on bananas in Trinidad and Tobago. One caused by Botryodiplodia theobromae rots the rachis causing the fruit to drop off. It also causes spotting of fruit and rotting of finger tips. The disease is common on stored bunches in the local markets.

An thrachose (Gloeosporium musorium) also causes a blackening and rotting of the fruit in storage. Its incidence is proportional to the damage caused to the fruit by bruising.
PLANTING PLAN FOR COMPLETE REPLANTING AT 12' X 12'

- Clonal Cocoa Plant. (12' x 12')
- Permanent Overhead Shade. (24' x 24')
- Banana or Fig.
- Cassava, Tannia, etc.
III. MARKETING

The banana crop is disposed of on the local market or by exporting to the United Kingdom and separate organisation is involved.

III. 1. Local Marketing.

This is either done privately or through the Marketing Board. Small producers often sell their own bananas at a roadside stall - Plate 13, or sell to "traffickers". These are middlemen who buy and collect bananas and sell to retailers in the larger markets at Port of Spain, Arima, San Fernando, etc., - Plate 14 below.

Plate 13

Trafficers often collect the fruit from the field saving the time and labour of the producer. The producer is paid 2¢ a lb. and the trafficer sells the fruit to a retailer at 4½¢ per lb. These latter usually sell the fruit at 6-8¢ per lb. Some of the traffickers interviewed maintained that a total of 2000 lbs. a day is often handled in this way. Assuming this figure to be correct it represents a gross income of $50 (B.W.I., per day. They stated that although the income is high, the running expenses of a vehicle is also high, and there is no guaranteed market. Often long distances have to be travelled before a full load of fruit is disposed of. Thus there is often a high wastage of ripe fruit.
Producers may also sell their fruit to the Marketing Board at their Ground Provisions Depots in the country districts. Those rejected on the roadside for the export market may also be sold to the Marketing Board at these depots. The price paid to the producer varies but there is a guaranteed minimum price of 1½¢ per lb. The usual price paid is 1½¢ to 2¢ per lb. The Marketing Board transports these bananas to the main depot at Port of Spain where any badly damaged or too thin fruit is sorted for sale as stock feed. Retailers come to this depot and buy bananas at a rate of 3¢ per lb. and provide their own transportation of fruit from the depot. Wastage at the Port of Spain depot is fairly high - 5% - mainly due to loss in weight of fruit by drying out.

III. 2. Export marketing.

Before describing the procedure of marketing for export it may be of use to define the terms in use and the quality of fruit exported. From 1950 to 1955 bananas were exported to the U.S.A. and for this purpose prices were agreed on certain grades of fruit. A "Count" bunch was one of 9 hands or more and received the highest price of approximately $2.86 (B.W.I.), an "eight" and a "seven" were eight and seven hand bunches respectively, and warranted prices of $1.87 and $1.24 (B.W.I.). No six hand bunches were accepted. With the cessation of the U.S.A. market and the commencement of shipments to the United Kingdom, the system of buying changed. For the United Kingdom market fruit is exported at 5.5¢ per lb., i.e. on a weight basis, no difference in price being paid for number of hands.

The grade of banana required by the export market is "3/4 full", i.e. the fruit has not filled out to the stage where the ridges on it cannot be felt and it has become rounded - Diagram 3 and Plate 5.
The Banana Control Ordinance.

The Marketing Board has a public monopoly over marketing of all bananas for export. This right was conferred on it by the Marketing Board ordinance of 1948. This referred specifically to the Gros Michel variety which at that time was practically the only variety accepted on the world export market. Since that time the market has accepted the Cavendish group of bananas. In its agreement with the Union International Company the Marketing Board is able to export the varieties, Lacatan, Dwarf Governor, Giant Governor and Robusta (also known as Poyo).

The Marketing Board entered into an agreement with the above company in November 1954 for a period of 15 years. The agreement is for a price of 5.5¢ per lb. of bananas F.A.S. (free alongside ship) at the Port of Spain wharf or the Quay Tobago. At the end of 5 years and also after subsequent 3 year periods, the price is subject to review. The minimum number of hands acceptable is 7, but a verbal agreement was made to accept 6 hand bunches until the export industry was established. No minimum weight per bunch is stipulated in the agreement but a minimum of 20 lb. has been fixed by the Marketing Board. Bananas are purchased for export by the Marketing Board at 4¢ (B.W.I.) per lb. at roadside or 4.55¢ per lb. if the producer delivers the fruit at the wharf. The difference of 1½¢ in the former case is collected by the Marketing Board to cover its operating expenses with respect to the banana export industry.

During the first year of the Agreement the Marketing Board had to ensure a minimum of 100 tons for one ship monthly from September 1955. It had also to try and increase shipments to a minimum of 300 tons/fortnight; a ship would be provided for fortnightly loading, when a minimum of 200 tons per fortnight was shipped.

The delivery of bananas by the Marketing Board is deemed...
deemed to have taken place after selection and weighing and
delivery of the fruit F.A.S. on the Port of Spain wharf or
F.A. Barge at the wharf at Scarborough, Tobago. This clause
has proved to be not satisfactory for it does not cover handling
of bananas in the hold, which is carried out by stevedores
employed by the shipping agents. Difficulties have arisen over
the responsibility for alleged bad handling of fruit in the hold.
Legally it appears that the responsibility for handling of fruit
in the hold is that of the Union International Company.

The organisation of export marketing is dealt with in
the next section on organisation of the Marketing Board.

Details of export marketing.

On the advice from the shipping agents cutting notices
are issued to banana producers 4-6 days before the actual ship-
ping date. Notices are placed in the press and announced over
the radio that cutting and buying will commence in certain
districts on certain days, Plate 14.

Cutting usually commences at about 6:00 a.m. and con-
tinues to about 10:00 a.m. Banana stems are cut so that 6" is
left on the stump of the fruit axis on either end of the bunch
to facilitate handling. Bunches are transported to the road-
side by head loading - Plate 16, or on the backs of donkeys,
mules or on carts or trailers. Producers are expected to deliver
fruit at the roadside or collecting point wrapped in banana leaf
straw and placed on a bed of banana leaves preferably in the
shade. The fruit is covered with banana leaf straw while await-
ing arrival of the collecting truck. During the course of this
survey it was found that in some cases bananas were left
uncovered and in direct sunlight. If accepted for shipment the
probability is that these bunches would be ripe before arrival
in England.

In an effort to reduce damage to fruit during transpor-
tation the Union International Company supply the Marketing Board
with polythene bags. These bags cost the Company 14-16¢ (B.W.I.) each F.O.B. London. These are 36" x 24" in size and have the sides perforated with holes 1" in diameter, to aid in air circulation around the fruit. The Marketing Board distributes these bags to its collectors and during collection for a shipment the bags are sometimes distributed along a collecting route early in the day and collected later when buying takes place. Occasionally it was observed that fruit had been placed in the polythene bags by the growers and left in the sun. This inevitably results in blistering of the fruit and is a practice that should be stopped.

The bananas are rejected during roadside purchase on the following factors.

I. Mechanical damage - bruised fruits, broken hands or fingers, or scarred fruit.

II. Stage of maturity factor - too thin, i.e. immature fingers - too full, i.e. overmature fingers - ripe

III. Size factors - bunches below 20 lb. in weight - 6 hand stems or less - short fingers and stems; or stems asymmetrical, e.g. spreading bunches

IV. Disease factors - any infection marking the fruit

V. Vauelat factors - off types, e.g. a non-exportable variety such as Mysore, Plantain, etc.

Selected bananas are placed in the polythene bags the ends of which are tied and weighed, Plate 16.

---

ATTENTION BANANA GROWERS AND COLLECTORS

The next purchase of bananas for the U.K. will be made on the following dates—
4th December, 1956—Tobago.
5th December, 1956—Toco, Tamana and Talparo, Montserrat, Bianchisseuse, Biche, Rio Claro, Mayaro and Moruga.

Growers are reminded that the grade required is 5¼-full, and that buying will commence at 8.00 a.m. as usual.
The weighing apparatus consisted of a Salter's spring
balance, weighing to 100 lb. and correct to ½ lb., suspended
from a rail on the truck. The number of stems accepted from a
producer and their weights are totalled and the producer is paid
by the banana collector. The stems are loaded on to trucks lined
with banana leaf straw on the floorboards and along the rails to
prevent bruising of the fruit. Stems are packed horizontally and
to a height of 6 layers from the front to the back of the truck.
The average stem weight is 30 lb. and so there is a strong
pressure exacted on the bottom layer of fruit.

Collection of fruit proceeds throughout the day and
often late at night. The upper layers of bananas are covered
with banana leaf straw.

At the present time only one estate transports its
bananas by rail to the wharf. This is the Union International
Company's estate at Rio Claro, where the fruit are graded and
packed on the estate and loaded on to the ship without any further
grading.

The trucks loaded with bananas usually arrive at the
wharf during the evening. The truck with its load is weighed and
the weights of bananas checked against the returns submitted by
the banana collectors.

The trucks are off-loaded on the wharf by a gang of men
under one man hired by the Marketing Board. The bananas are off
loaded, they are again graded by banana supervisors and the
number of stems for export counted by the use of a mechanical
counter operated by a push button. It was observed that on
several occasions the counter was incorrect, which may account
for the apparent discrepancies between number of stems shipped
and number of stems checked off the boat in England, which arise
from time to time.

As bananas are unloaded from the trucks the ends of the
stems are cut to within 4" of the fruit at the top end and 6" at
the basal end, and the cut ends are sprayed with a fungicide (Shirlan phenycyl anilide with a wetting agent) to protect the stem from fungal rot. Rate of application is 28 oz. / 100 gals.

Plate 17-20.

Plate 17

Loading used to be carried out by means of wooden crates - Plates 18 and 19.

Plate 18

Hoisting crate aboard.

Plate 19

Unloading in hold. Note slatted 'floor' on which bananas stacked.

These were loaded on the wharf by longshoremen and unloaded in the hold by the stevedores. Since February 1957 loading of one hold has been carried out with the use of a bucket type elevator - Plate 20.

Plate 20

Loading with elevator - spraying cut ends of stems as they are loaded.
The use of this method of loading speeds the process up considerably enabling a quicker turn around of the ship. It is hoped that before July 1957 another elevator will be in use for loading the other hold. Both elevators are supplied by the Union International Company.

The old method of loading was invariably very slow and bananas were stacked on the wharf waiting to be loaded. These stacks of bananas together with the rejected fruit caused a great deal of congestion on the wharf, especially when sometimes a dozen trucks were waiting to be off-loaded. The Marketing Board have since acquired a storage shed on the wharf, and plan to unload, grade and spray all fruit in that shed before the ship actually docks. On arrival of the banana boat fruit can be loaded directly from this shed on to the boat without time being used on grading, etc. However, Marketing Board trucks will have to be used to transport fruit from the shed to the elevators at the ship's side, and this operation will involve extra cost to the Marketing Board. Also the fruit will be handled more often with a consequent greater risk of damage by bruising.

Rejected fruit are removed from the wharf by the Marketing Board's trucks to the Port of Spain Marketing depot for sale to retailers. After loading of fruit and closing of hatches the temperature is reduced to 54.5°F, and should never fall below 53.5°F. Air should be changed frequently. These instructions are given to Masters of all boats. All decks are cooled to 50°F previous to opening hatches for loading.

Further observations on the working of the export marketing organisation:

(a) Handling of fruit.

The banana requires delicate handling for it bruises easily. This is especially so with all varieties other than the Gros Michel variety. It was clear, from observations made at roadside purchasing of fruit and also of handling on this wharf, that the delicate nature of the fruit is not realised by those handling...
### Table 14 (a)

**EXPORT BANANA REJECTS AND NUMBER OF STEMS SHIPPED FROM FEBRUARY 1956 TO MARCH 1957**

<table>
<thead>
<tr>
<th>Classes</th>
<th>Types</th>
<th>No. of Stems</th>
<th>% of Total Wharf checks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturity</td>
<td>Too thin</td>
<td>1,982</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Too full</td>
<td>3,396</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Ripe</td>
<td>1,043</td>
<td>0.4</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Bruised</td>
<td>1,071</td>
<td>0.4</td>
</tr>
<tr>
<td>Damage</td>
<td>Broken</td>
<td>930</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Scarred</td>
<td>147</td>
<td>0.05</td>
</tr>
<tr>
<td>Size</td>
<td>Small</td>
<td>734</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Short fingered</td>
<td>56</td>
<td>0.02</td>
</tr>
<tr>
<td>Diseased</td>
<td>Rust</td>
<td>313</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total rejects</strong></td>
<td><strong>9,756</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total Wharf checks</strong></td>
<td><strong>274,669</strong></td>
</tr>
</tbody>
</table>

Tables 14 (a) and (b)

Figures obtained from the Marketing Board Returns.
- Unpublished.
<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Stems Tailled</th>
<th>Delaware Barge</th>
<th>Total Stems</th>
<th>Total Small</th>
<th>Total Medium</th>
<th>Total Large</th>
<th>Percent Acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/1/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/2/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/3/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/4/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/5/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/6/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/7/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/8/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/9/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/10/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/11/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/12/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/13/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/14/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/15/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/16/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/17/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/18/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/19/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/20/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/21/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/22/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/23/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/24/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/25/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/26/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/27/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/28/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/29/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/30/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>10/31/56</td>
<td>20</td>
<td>100</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>
handling it. Roadside loading was often done roughly and little or no packing of banana straw placed between the layers of fruit or in some cases, even on the rails of the truck. Several times trucks loaded with bananas have been seen proceeding to Port of Spain with men sitting on top of the fruit. If caught by officers of the Marketing Board the owners of these vehicles can have their hire contracts with the Marketing Board cancelled, but stronger measures should be enforced.

Stacking of stems on the wharf under the eyes of the Marketing Board staff has often been done badly - when the stack reaches about 5 feet in height stems have been thrown on top and been observed to roll down to the ground and been thrown back up again. Such stems should be rejected for it is certain that before arrival in England the fruit will have ripened or gone bad.

These observations were made throughout the period that this survey was carried out - October 1956 to April 1957 - and no improvement in handling of the fruit was observed.

From reports received on every shipment arriving in the United Kingdom it appears that the percentage of bruised fruit is high - Table 14 (a). Also there has been an increase in bruised and broken fruit received at the wharf as shown in Table 14 (b). An investigation by a representative of the Union International Company found that the cause was mainly due to bad handling of the fruit. His investigation was carried out in 1955 and early in 1956 but the same state of affairs still exists in 1957.

(b) Collection of Fruit.

In some areas visited where peasant production was being investigated it was found that exportable varieties of bananas were being grown but that no services for collection were provided by the Marketing Board. This occurred in the Chickland Freeport and the Palo Seco-Erin areas. Fruit from the former area is marketed at Chaguanas; bunches of 12 hands...
were broken up to easily manageable portions for transportation to this market.

Under the system of roadside purchase of the fruit for export, there is no regular time for collection by the banana collectors. The truck routes cover distances of from 5 - 30 miles and collect 200 - 300 stems from 40 - 120 suppliers. Thus inevitably some producers have to wait long periods for their fruit to be picked up. If the producer is not with the fruit at the time that the collectors arrive it may not be collected. This was found to be the case particularly late at night.

The export marketing of fruit in Tobago follows a similar procedure to that in Trinidad. Fruit are graded on the wharf and loaded into lighters of a capacity of 1000 stems each. These lighters are towed by barge to Trinidad and the fruit unloaded directly into the hold of the ship - Plate 21 (a) and (b).

Plate 21 (a)  
Plate 21 (b)

Most of the banana producing areas in Tobago are fairly inaccessible and collection of fruit sometimes cannot be carried out, e.g. in heavy rain flooding of rivers has prevented fruit from being transported to Scarborough due to the fact that the rivers had to be forded on that particular estate.

As the banana industry in Tobago expands a problem will develop with respect to shipment of fruit to Trinidad.
Fig. 4: Exports of Bananas for the years 1951–1956.
Quay space is limited and the two lighters in use at present often have to wait for coastal steamers to sail before being able to load.

III. 3. Figures of Trade.

In 1946 there were more than \( \frac{3}{4} \) million stools in Trinidad and Tobago. Assuming that a stool produces at least 2 stems a year then the annual output should be in excess of 6 million stems. These figures include non-exportable varieties. Exports in 1954 were \( \frac{5}{2} \) million lbs., and assuming an average weight of 30 lb./stem, then the total stems shipped were less than 200,000, i.e. less than \( \% \) of the total production.

These figures were obtained by a member of the staff of the Department of Agriculture and it has not been possible to confirm them. However, as they were submitted in a report it is assumed that they are reliable. The same investigator found that 1500 - 2000 banana producers situated between Blanchisseuse and Moruga shipped between 10,000 and 13,000 stems for a particular shipment, but less than half of these producers supplied bananas for two consecutive monthly shipments. These figures taken in conjunction with those of Table 4 imply that export bananas are being supplied on a very small scale, that production is widely diffused and suppliers are very irregular.

From a study of the graphs of monthly exports in 1956 and in 1957 - Figure 1 - it is clear that the quantities of bananas produced for the export market are increasing steadily. The monthly and yearly production is correlated with rainfall as seen in Figures 3 and 4.
<table>
<thead>
<tr>
<th>Colony</th>
<th>Total</th>
<th>St. George</th>
<th>Caroni</th>
<th>Victoria</th>
<th>St. Patrick</th>
<th>St. Andrew</th>
<th>Mariva</th>
<th>Mayaro</th>
<th>Tobago</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>411,937</td>
<td>55,961</td>
<td>82,736</td>
<td>68,938</td>
<td>59,201</td>
<td>16,317</td>
<td>23,912</td>
<td>53,093</td>
<td>10,017</td>
</tr>
<tr>
<td>Farms 1 Acre and Over</td>
<td>13,514</td>
<td>1,162</td>
<td>4,289</td>
<td>11,403</td>
<td>4,825</td>
<td>37,899</td>
<td>507</td>
<td>3,099</td>
<td>3,968</td>
</tr>
<tr>
<td>Cultivated Land</td>
<td>23,874</td>
<td>5,859</td>
<td>2,749</td>
<td>11,760</td>
<td>2,226</td>
<td>7,551</td>
<td>14,420</td>
<td>1,027</td>
<td>1,037</td>
</tr>
<tr>
<td>Non-Cultivable Land</td>
<td>23,148</td>
<td>4,042</td>
<td>4,211</td>
<td>2,500</td>
<td>2,675</td>
<td>1,154</td>
<td>932</td>
<td>1,037</td>
<td>1,591</td>
</tr>
</tbody>
</table>

Source: Annual Statistical Digest, No. 5, 1955, Central Statistical Office, Government of Trinidad & Tobago.
IV. ORGANISATION OF THE INDUSTRY

The organisation of the banana industry is dependent on (a) the Department of Agriculture and (b) the Marketing Board.

IV. 1. The Department of Agriculture.

The department is composed of the following officers:

- Director
- Deputy (Crop Husbandry)
- Deputy (Research)
- Deputy (Animal Husbandry)

Senior Agricultural Officer

Research Staff

Veterinary Staff

Ag. Officer (North)

Ag. Officer (South)

Ag. Officer (Tobago)

Senior Agric. Assistants (2)

Senior Agric. Assistants (2)

Senior Agric. Assistants (2)

Agric. Assts (4)

Agric. Assts (4)

Agric. Assts (2)

Field Assts (20)

Field Assts (12)

Field Assts (9)

The areas in which these officers are stationed are shown on the Maps of Extension Activities for Trinidad and Tobago, as are also the positions of demonstration stations - Appendices VIII and IX.

The total area of land in farms of one acre and over, in each county in Trinidad is given in Table 15. Using these figures with the map of extension activities it appears that the four northern Counties of St. George, St. David, St. Andrew, and Caroni comprise some 208,105 acres of farm land, and the area is covered by four agricultural assistants and 18 Field Assistant Officers. The four Southern Counties, of Nariva, Mayaro, Victoria and St. Patrick comprise 160,068 acres of farm land and are administered by four Agricultural Assistants and 19 Field Assistants. Thus the Northern area of Trinidad with approximately 160,000 more acres of farm land has one field officer less than the Southern area. The County of St. David with approximately 16,000 acres of farm land has no field assistants in the area at all. To obtain a more uniform distribution of field assistants on the island and also to reduce the area covered by each, it is desirable to increase the staff...
of the Northern Counties by at least four field assistants, these
being stationed in the county of St. David. This is a county with
a strong agricultural background and their activities in the area
would probably be justified by the increase in agricultural
production from it.

The area of farm land per field assistant in Tobago
is only approximately half that for those in Trinidad, viz. 5000
acres approximately. However, the lack of communications along
the Northern side of the island and the sparse roads over the
island as a whole limit the area feasible for one field assistant
to cover efficiently. With the development of a better road
system, and the desirability of increasing agricultural produc­
tion to a level at least of producing sufficient food crops for
local demands, a larger number of field assistants will be required

Under the extension service district demonstration sta­
tions have been set up. Among their objects are:

(1) to demonstrate methods of crop production which peasant
farmers may copy,

(2) to be a centre for the distribution of seed, planting
material, etc.

In Tobago demonstration plots of bananas are set up
on peasant farms, and along the following lines.

A peasant farmer is selected that is known by the
Department of Agriculture officers, to be interested in banana
growing. Provided that his land is suitable for growing bananas
and is situated on a fairly prominent site in the public eye,
an area of approximately one acre is chosen for banana production.
The farmer is given planting material and fertilisers free of
charge for a period of three years but has to carry out all the
work on the demonstration plot himself under the guidance of the
staff of the Department of Agriculture in the first instance.

Bananas when harvested are sold by the peasant farmer for export
to the Marketing Board and this revenue he keeps.
Often these plots are situated on the roadside, with a wooden placard in the field stating the nature of the demonstration. It is hoped that the production from these plots will be of a high standard and serve to demonstrate to neighbouring farmers how improved yields may be obtained from use of fertiliser and correct cultural management. After a period of from three to five years the peasant farmers on whose land the plots are sited, cease to receive free fertiliser or planting material, and by this time it is hoped that they too are convinced of the benefits obtained from good management. This scheme has been in operation for two years and appears to be meeting with considerable success. During the period that this survey was carried out in Tobago it was found that these selected peasant farmers were encouraging their neighbours to visit their plots and were themselves keenly following the advice of the extension staff.

The major portion of extension work in Trinidad since 1954 has been the establishment of banana nurseries as a source of planting material. As stated previously in this report these nurseries have failed to satisfy the demand for planting materials. The Director of Agriculture for the colony stated in his annual report for 1954 that one of the limiting factors to the development of the banana industry was the supply of planting material. Bearing this in mind it is surprising that greater efforts have not been made by the Department to increase production from their nurseries. It is probable that limits have been imposed due to lack of staff, and also due to the poor land on which some of the nurseries were sited. One such nursery situated near the Churchill Roosevelt highway has now practically ceased to be of use, probably due to the low nutrient status and relatively poor structure for banana growing of the soil. When first visited the bananas on the area did not appear to be thriving.

Since the first visit to this nursery cambered beds have been built up and the general management has improved. It is probable that the poor growth of bananas hitherto was due to...
highly inefficient management with respect to grass and weed control.

All members of the extension staff are well trained and all above a Field Assistant grade are qualified with a degree or diploma. The minimum requirement for an Agricultural Assistant is a D.I.C.T.A. Field Assistants are given a practical training and as far as banana production is concerned have the duty of supervising selection of planting material, planting, manuring, pruning, weeding and the control of pests and diseases. Also of frequently visiting growers and advising them if required to do so. These remarks have been introduced at this stage, due to the fact that complaints have been made by banana growers of lack of training of selectors employed by the Marketing Board for selection of fruit, and to clearly define the standards of training required for the extension officer and the Marketing Board officers.

The Department of Agriculture has appointed a Banana Officer to work with the Marketing Board on production of bananas and who acts as liaison between the two departments.

IV. 2. The Marketing Board.

A full review of the origin and functions of the Marketing Board is given by Eme (1956). Suffice it to say that the Board commenced operations on October 1st 1949. The general organisation of the Board is as shown on the following pages including the export banana staff.

The Board

- Marketing Officer
  - Assistant M.O. (administrative)
  - Assistant M.O. (investigation)

- Depot Managers & Depot Staff
  - Banana Supervisors
  - Banana Collectors
  - Banana truck operators
As has been stated in the previous section on the Department of Agriculture, banana growers have been dissatisfied with the work of some of the staff on the Marketing Board and so their educational requirements and duties need to be fully explained.

The banana supervisor is required to have a basic agricultural knowledge and experience, to be of average intelligence, to have a full knowledge of their districts and to be able to recognise banana grades as maintained by the Board.

The duties of a banana supervisor are as follows:

(i) To carry out general propaganda work on banana marketing, e.g. advising producers on the standards of quality of bananas required by the Board, and on the technique of cutting, wrapping, packing and general handling of bananas.

(ii) To advise the growers as to time of cutting fruit for a shipment.

(iii) To hire motor trucks required for transportation of export bananas to the Port of Spain wharf.

(iv) To supervise banana collectors and train new collectors.

(v) To collect the necessary cash advances from the depot manager and to issue the advances to banana collectors for the buying of export bananas.

(vi) To control all equipment concerned with banana buying and transportation.

The Banana Supervisors are part of the Marketing Board's official staff and are weekly paid temporary staff. They are associated with the general marketing depots through which they are generally administered.

The Banana collectors are required to have a general agricultural knowledge and experience; to be able to recognise banana grades as maintained by the Board and to be adaptable to training. Their duties are:

(i) Buying of export bananas from the roadside in their districts.
(ii) Paying producers at time of purchase of bananas.

(iii) To supervise roadside bagging, weighing and loading of bananas into motor trucks.

(iv) To render the necessary returns covering purchases of bananas.

The banana collectors are not part of the Marketing Board's official staff but are commissioned buyers. They are paid at the rate of 8¢ per 100 lbs, and receive a bonus of 6¢ per 100 lbs, if the rejects at the Port of Spain wharf are not in excess of 5%. If rejects from their selected fruit are greater than 5% a penalty of 3¢ per rejected stem is imposed. The collectors are paid after each shipment.

The banana truck operators comprise one driver and three loaders. The capacity of the truck should not be less than five tons. These trucks are generally hired from truck owners in the different banana buying districts, and the truck owners provide the truck operators. It is also their responsibility to provide side and back railings to their trucks and to see that they are well padded with banana leaf straw to reduce bruising of fruit during transportation. The rate of hire depends on the distance of the banana district from the wharf at Port of Spain, or Scarborough in Tobago. The general rate is 30 - 60¢ per 100 lbs., the rate depending on the distance from wharf.

The necessity for padding the sides and front of the truck with banana leaf straw to prevent bruising of the fruit is often not realised by the truck operators. A reduction in the number of bruised and broken fruit could easily be attained by compelling truck owners to pad their vehicles with banana straw.
mattresses, as illustrated in Plate 22 below overleaf. The mattresses would also speed up the loading process which at present necessitates the spreading of banana leaf straw by hand along the sides of the vehicle.

The organisation for the exporting of bananas at the Port of Spain wharf is complicated by the fact that all materials shipped have to pass through the hands of the longshoremen. The services of this wharf labour and other services rendered to it by the Wharf Authorities, is paid by the Marketing Board in the form of an R.S.D. rent (i.e., receiving, storing and delivery rent). The existing rental was $1.50 (B.W.I.) per ton of bananas handled.

The Marketing Board also has a contract with one man, (selected by the M.B.), of 15¢ per 100 lbs. bananas handled for the off-loading of the trucks. This man finds his own labourers to work the trucks and fixes their rates of pay himself. Thus his labour gang of about 20 men are independent of the Marketing Board and of the longshoremen's Union. The Shipping Company (Union International Limited) also pays this foreman 2¢ per stem for the recutting of the ends and spraying with fungicide. The equipment and materials are provided by the Company. The Company have an Agreement with Messrs. Alston's Limited, the shipping agents for "Booth" and the "Blue Star" Lines, for loading of the bananas into the hold of the ship. These stevedores
are paid by the Company through Alston's Limited, the latter also paying an incentive to the men. This incentive is one of 3¢ per stem for every stem loaded over the rate of 375 stems per hour. These arrangements are still in operation even though an elevator is in use for loading the fruit and the number of stems loaded per hour can be increased considerably.

An illustration of the way in which the Department of Agriculture, the Marketing Board and the shipping agents co-operate for the exporting of bananas is as follows:-

The extension services of the Department of Agriculture submit to the Marketing Board a survey of an area that they consider to be a potential area for banana production for export. This is only done when a minimum of 200 stems would be marketable at any one time, i.e. the area has approximately 1500 productive stools. From this survey the Marketing Board will draw out a route for collection of the fruit.

The Marketing Board is supplied with a list of shipping dates for a period of 9 months by the shipping agents, and the Board has to submit an estimate of the number of stems to be shipped to the agents well in advance of any shipment. The agents then reserve the required amount of hold space on that ship. This method appears to be haphazard but functions quite well. If an excess of bananas is collected over the available shipping space the excess are sold locally by the Marketing Board at a loss to the Board. In the event of an excess the standard of selection on the wharf is higher. This fortunately does not occur often perhaps due to over estimation of stems to be shipped by the Marketing Board or reservation of ample room on the ship by the shipping agents.


As far as the marketing of bananas is concerned there are no co-operative organisations in Trinidad or Tobago. It has been stated earlier in this report that while the export marketing of bananas is quite efficiently organised, that for local
marketing is inefficient and very disorganised. To overcome this and also to relieve the burden on the Marketing Board, a Banana Producers Association might be set up. This could be run along the lines of the "Banana Growers Association" of St. Vincent, which was set up in 1955 and is functioning extremely well. Briefly, its constitution is made up of district committees from which delegates are elected to serve on the Board of Directors at an Annual General Meeting. The Superintendant of Agriculture is one of the Ex-Officio directors of the Board, and in addition two or three members may be co-opted to serve on the Board. The Association provides:

(i) Banana officers to advise growers on all aspects of production.

(ii) Transport for transportation of bananas to point of shipment.

(iii) Fertilisers available to growers on limited credit.

(iv) Spraying services against leaf spot disease.

The Association obtains its funds from a cess of 1/- (B.W.I.) per lb. on all bananas collected by it.

If the banana industry in Trinidad and Tobago continues to expand the need for such an organisation as the above will increase, and may become a necessity for the efficient organisation and production of the industry.

IV. 4. Breeding and Research.

Banana breeding really started as a result of the widespread devastation caused by Panama Disease, and the desirability of finding a variety resistant or immune to the disease, but possessing the same or similar commercial features as the Gros Michel banana. Although the variety Lacatan has replaced the Gros Michel due to its resistance to Panama Disease, it is very susceptible to leaf spot disease. Thus the future of the industry depends on either success in breeding a variety resistant to Panama disease, and also to leaf spot disease, or in the evolution of successful control of the latter. The former
aim is preferable due to the costs and labour involved in carrying out a regular spraying programme.

The first attempt at breeding new varieties of banana began at I.C.T.A. in 1922, with the aim of breeding a variety resistant to Panama disease. The first success was with the I.C.1 variety which was a good edible banana but not suitable for the export trade. The bunch was less symmetrical than that of the Gros Michel variety and it had fewer hands per stem, shorter fingers and a tendency to give seeds. The variety, however, was highly resistant to Panama disease.

Repetition of the same cross that led to the I.C.1 variety, gave rise to selection of one plant that had the closer desirable characters to a Gros Michel. This gave rise to the I.C.2 variety which was released for commercial trials in 1932. This variety is still grown in the Sangre Grande area but has not had much success commercially in Trinidad; due to a less compact bunch than Gros Michel, and short curved fingers; in British Honduras it forms the major part of export varieties. As far as breeding for resistance to Panama disease is concerned it may be regarded as an interim solution of the problem. A more detailed account of this work is given by Cheeseman (1949). The question is sometimes asked, why a variety immune to Panama disease is not taken as starting material and by breeding its commercial characters could be improved. In fact the most promising varieties for such a programme are sterile, and introduction of disease resistance is the simplest part of the problem. The most difficult part is to retain or obtain the commercially desirable characters. Disease resistance is usual in the fertile diploids and so it is desired to find the best male fertile diploid for crossing with the Gros Michel variety. This feature resulted in expeditions to Africa (1948) and to South East Asia (1954-5) in search of the best diploid for the purpose (Simmonds 1955). As a result of these expeditions wild strains of Musa acuminata promising for banana...
banana breeding were obtained.

The shorter term aim has been to try and find an efficient and economic control of leaf spot disease which is particularly serious on the Lacatan variety. A series of experiments are being carried out under the Department of Agriculture at the Central Experimental Station, Centeno, and also in different parts of Trinidad. Experiments are being done on (a) spraying-cycles and methods of application (b) the type of spraying solution - with and without Copper fungicides. Results from this experiment have shown that low-volume oil based sprays have given the best control. Experiments are now going on to test the efficiency of different oils, used as a low-volume spray, without the use of fungicides. The cheaper crude oils although controlling the leaf spotting, were also phytotoxic to the plant. Two oils that were of higher grade have given similar results to an orchard spray oil already tested. These results have been of no value in obtaining a cheaper oil to be used as a spray for leaf spot disease.

Experiments are also being carried out to try and control the banana weevil borer - Cosmopolites Sordidus using dieldrin and aldrin sprayed around the plants. The effect of dipping planting material in solutions of these compounds is also being tested. A further experiment on time of dipping in the solution and size of planting material has shown that a maximum limit of four hours for large plants and three hours for small plants should be observed to avoid impairment of germination.

Experiments on Moko disease have not been successful mainly due to the fact that the area believed to be infested with the disease and chosen for the experiment, was found to be free of the disease during the time the experiment was carried out.
V. CONCLUSIONS

V. 1. Summary,

The banana industry of Trinidad and Tobago is provided with two competitive markets, local and export. To the present time the farmer has been the most important to the producer. This is due to the fact that it will accept all varieties of fruit and makes no discrimination about size or blemish. Also it provides a regular day to day market. Traffickers often remove the fruit from the field, and thus avoid the cost to the producer of transportation to a selling point, for export marketing. Producers with-holding supplies for export suffer losses if shipments are irregular, (as they sometimes have been), and fruit ripens past the acceptable grade by the time shipping occurs. They will also then have lost contact with traffickers, who prefer to maintain connections with regular suppliers.

However, it has been seen through the course of this survey that the small producers are producing the bulk of the export fruit. Estate production has been slow to respond to the setting up of a guaranteed export market, with the exception of those estates owned by the Union International Company, where production is being forced ahead.

Although the export marketing of bananas is fairly efficient, that of local marketing is disorganised and very inefficient.

The main areas of Trinidad and Tobago where bananas are produced are shown on Appendices 5. It is clear that the areas suitable for extending production are limited by the soil types.

V. 2. Possible Improvements in the Operation of the Industry.

It is thought by the investigator that the industry has developed to a stage when it would be advantageous to set up a Banana Producers Association. One of the first tasks of such an Association would be to improve local marketing of the fruit,
fruit. It could also serve the small producer by providing him with a more direct contact with knowledge on methods of production, etc.

With respect to marketing of fruit for export the following suggestions are put forward:

(a) To decrease the risk of fruit ripening in transit to United Kingdom fruit from areas heavily infested with leaf spot should not be accepted for shipment. It has been shown that fruit from these areas infected with the disease ripen prematurely, and in so doing start the ripening process of other bananas.

(b) Spraying of the cut stems of fruit accepted for export could be carried out on the roadside, saving time and labour at the wharf. To be successful this, of course, would depend on the employment of reliable banana collectors and labour for spraying.

(c) To control the amount of bruising that occurs banana collectors should be given a reference number and labels to stick on stems so that those responsible for selection of bruised fruit could be traced and penalised for inadequate care in handling of fruit.

(d) Banana truck operators should be compelled to provide banana straw mattresses tied to the sides of the vehicle to reduce bruising of fruit. Also these operators should be fined for allowing labourers to sit on fruit on the trucks.

(e) A more thorough training of banana collectors should be carried out to reduce loss to the Marketing Board by acceptance of over mature fruit on the roadside, that is rejected on the wharf. It would be better if all banana graders should be trained at one centre, so that a uniform standard of training would be provided.

(f) Closer supervision should be carried out at all stages of export marketing.

(g) It may be of use to the industry to set up a Demonstration Farm of three or four acres, to show small producers how to produce good quality bananas. The farm should be operated by
good peasant farmer working under the supervision of the Department of Agriculture, but not subsidised in any way - to prove to the peasant community that banana production is an economic proposition.

**V. 3. Future Prospects of the Industry.**

The important aspects to be considered is the future of the export industry. The standards of quality of fruit shipped from Jamaica and the Windward Islands to the United Kingdom are higher than those of Trinidad fruit. This statement is based on reports by the Union International Company criticising the standard of fruit shipped from Trinidad and has to be accepted as true.

Thus if at any time in the future the market in the United Kingdom sharpened and accepted only best quality fruit, the exports accepted from Trinidad would fall.

The export market in Trinidad and Tobago has increased steadily, and it is time that an all out effort was made to establish an export industry marketing high quality fruit only. Rigorous selection should be practiced and only high grade fruit collected for export. If producers respond by improving methods of production the export industry may successfully compete with those of the other West Indian islands. If they do not do so, the export industry will not survive for very long in a competitive market.

Prospects of greater banana production, and hence a greater production of exportable fruit, in Tobago are good. It is proposed by the Trinidad Government to build a road along the North Coast of Tobago, which would render a large area of very good soil available for production of bananas. A further prospective area incorporating Moriah - Mason Hall - Caledonia - Hillsborough - Eastinfield Road, would come into banana production if it was made more accessible. Tobago is equipped with excellent soils for banana growing and a suitable climate, and in future years may possibly export more bananas than Trinidad.
The future of the export industry is also tied up with that of the cocoa industry. Nearly all soils suitable for cocoa production are capable of producing good bananas. Future production on cocoa estates, however, is dependant on cocoa prices. If these increase estate owners will be stimulated to increase production from their estates, and use of export varieties of banana as shade for clonal cocoa would increase banana production in the island considerably. If the reverse occurred, however, and cocoa estates went out of cocoa production, there is no indication at present that bananas would be accepted as an alternative crop.

Leaf spot on exportable varieties offers a less serious threat to the banana industry than formerly. Quite efficient control is being obtained at present by the use of the low volume spraying technique.

In conclusion it may be said that the banana industry of Trinidad and Tobago is well established, and that with a 15 year guaranteed market for export fruit the immediate future for the export industry is encouraging. The future of the industry beyond that period depends on too many factors for any accurate estimation of its status to be given at the present time.
ACKNOWLEDGEMENTS

The author wishes to express his thanks to the following:

Mr. R.H. Forster for encouragement, advice and criticisms.
Mr. St.G. Cooper of the Agricultural Department, St. Clair, for help and advice concerning the extension services.
Mr. F.A. Rawlings, Assistant Marketing Officer, for help on all aspects concerning Marketing.
Mr. J.F. Bell, Banana Officer on the Marketing Board, for constant co-operation and valuable advice.
Also to all estate owners and peasant proprietors for their kind co-operation.
BIBLIOGRAPHY

Carmody, 1912, Bull. No. 11, 19. Department of Agric. Trinidad and Tobago.


SOIL TYPES
- REDDISH-BROWN LATOSOL (Igneous)
- REDDISH-YELLOW PODZOL
- REDDISH-YELLOW PODZOL (Terra Rossa)
- BOG; HALF-BOG; HUMIC GLEY; LOW HUMIC GLEY
- PLANOSOL; GROUND-WATER PODZOL
- PERCHED GLEY (Calcareous)
- PERCHED GLEY (Non-calcareous)
- BROWN FOREST SOIL; RENDZINA
- REGOSOL; LITHOSOL
- ALLUVIAL SOILS
- BANANA PRODUCTION
MAP OF TRINIDAD
EXTENSION ACTIVITIES

KEY

- County Boundaries
- Senior Agricultural Assistants
- Agricultural Assistants
- Agricultural Officers
- Field Assistant
- Breeding Units
- Demonstration Stations
- Land Settlements

[Cities and locations marked on the map]