

# PROGRAMA SANIDAD VEGETAL

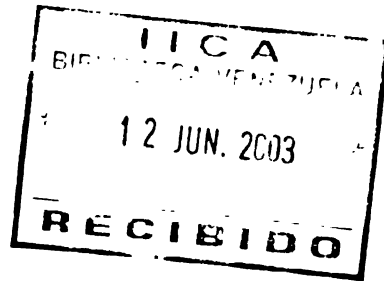


A REPORT TO THE FOOD AND AGRICULTURE  
CORPORATION OF TRINIDAD AND TOBAGO ON  
THE INCIDENCE OF PESTS AND DISEASES IN  
BANANA AT THE ORANGE GROVE NATIONAL  
SUGAR COMPANY

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1. Introduction

The Food and Agriculture Corporation of Trinidad and Tobago, an agency set up for corporate action in the agricultural sector under the aegis of the Ministry of Finance and Planning is cooperating with the Orange Grove National Sugar Company of Trinidad and Tobago in the development of a banana enterprise geared to the production of green bananas either for fruit market or for use as a basic carbohydrate food item to partially displace rice and other wheat-derived staples. Based on discussions with the Inter-American Institute for Cooperation on Agriculture (IICA) for close cooperation in technical matters, the Corporation sought the assistance of IICA through its national office in Trinidad and Tobago to evaluate the incidence of pests and diseases in the existing plantings of banana at the estate and to develop a strategy for management of these pests and diseases in the future. This assistance was considered as being provided in two phases covering the areas above and this report presents the findings of consultants who concentrated on the first phase of the work.

2. Scope of the Investigation

This investigation was carried out to obtain a preliminary assessment of the incidence pests and diseases (excluding nematodes) in the existing banana plantings which have the potential to be limiting factors in commercial banana production. Specifically the project aimed to assess the incidence of:



- (a) Yellow Sigatoka leaf spot disease (*Mycosphaerella musicola*)
- (b) Moko disease (*Pseudomonas solanacearum*)
- (c) Panama Wilt disease (*Fusarium oxysporum* f. sp. *cubense*)
- and (d) Banana borer (*Cosmopolites sordidus*)

### 3. Duration of work

The study was carried out during the month of May, 1983.

### 4. Consultants

The following persons were responsible for the following investigations:-

1. Dr. Chelston W.D. Brathwaite, Plant Pathologist, IICA investigated Yellow Sigatoka leaf spot disease
2. Dr. Gene V. Pollard, entomologist, University of the West Indies, investigated the banana borer infestation and
3. Mr. Frank McDonald, Plant Pathologist, Ministry of Agriculture, Guyana investigated the incidence of Moko disease and Panama disease.

### 5. Findings

The individuals reports of the specialists are attached to this summary. The following are the conclusions and recommendations. A report on a visit to St. Lucia and Grenada by Mr. McDonald are also included as they bear some relevance to the study and the sources of planting material for the proposed project.

### 6. Conclusions

1. The incidence of leaf spot disease and banana borer are low in existing plantings
2. Panama disease is present but Moko disease was not detected





## 7. Recommendations

1. Internal quarantine procedures should be strictly implemented to ensure that Moko disease which is currently not present at Orange Grove is not introduced. This recommendation would best be implemented by introducing planting material only from Moko free areas in Trinidad or elsewhere and having a plant pathologist available for consultation when ever material is to be introduced.
2. Panama disease is present and therefore only Cavendish types of Banana which are tolerant to Panama disease should be grown
3. Serious considerations should be given to the establishment of about 4.0 ha (approximately 10 ac.) nursery to provide disease-free planting materials on a continuous basis for there is always a high risk of the introduction of a major disease or pest to a locality during the movement of a large amount of planting material either within the country or from outside.
4. Self-sufficiency in the propagation of planting materials in the country to satisfy local needs has excellent logical benefits and opportunities including opportunities to (a) generate technology of the crop (b) reduce production cost (c) reduce the risk of disease spread and (d) assist the establishment of a disease-management strategy.
5. Should it become necessary to import planting material, only a limited quantity of treated suckers from a Moko-free area should be imported. The immediate or future expansion in acreage of banana and plantain should be governed to some extent by the amount of disease-free planting materials available at any one time and not by the consideration of rapid expansion of the enterprise.
6. A trained plant pathologist with experience in moko disease should make periodic visits to the project to provide advice on pest and disease control particularly during the expansion phases of the project.
7. The control of leaf spot will be necessary in the commercial production of the crop. It is recommended that an officer of the Orange Grove Company be allowed to spend about one month in one of the Windward Islands to acquire the techniques of forecasting and control of this disease.



8. The existing practice of leaving whole stems in field should be discontinued. These should be cut into pieces to limit the build up of banana borer.
9. All planting material for importation should be treated with an insecticide and a systemic nematicide prior to shipment. All necrotic plant tissue should also be removed. Similar treatment should be given to planting material from local sources.
10. A training programme in pest and disease management of banana should be implemented soon for banana workers at the Orange Grove National Sugar Company.
11. A nematode survey of the area should be carried to assess the need for nematode control in commercial production.



INCIDENCE OF YELLOW LEAF SPOT OF BANANA (*Mycosphaerella musicola*)  
AT ORANGE GROVE NATIONAL SUGAR COMPANY AND STRATEGIES FOR ITS CONTROL

by

Chelston W.D. Brathwaite  
Plant Pathologist  
Inter-American Institute for Cooperation  
on Agriculture

Introduction

Yellow leaf spot (yellow Sigatoka) of banana caused by the fungus *Mycosphaerella musicola*, is widespread throughout banana growing areas of the world. In the Windward Islands, the control of this disease is the most costly item in crop protection. The disease is widespread and attacks all cultivars of banana. The disease is controlled by fungicidal sprays based on forecasting methods which have been very carefully worked out.

Situation at Orange Grove

The banana planting at Orange Grove were examined on May 9th, 1983. The planting did not show a particularly high incidence of leaf spot, but all cultivars were infected. The low incidence of the disease might have been due to (a) the rather dry conditions at the time of the visit and several weeks before (b) the fact that some leaf pruning appeared to have been carried out and since the disease is most prevalent on lower older leaves some of these might have been removed. While the incidence of the disease is low, it is certain to increase during the wet season and could reach epidemic proportions if not controlled. The cost of leaf spot control will have to be considered as a factor in the cost of production of bananas at Orange Grove. The disease is controlled in the Windward Islands using Benlate and methyl-thiophanate at 123g/a.i per hectare and 237g/a.i. per hectare, respectively.



The disease is forecasted in the Windward Islands by the use of a combination of climatic data and infection levels and since spray intervals may vary from as low as 2 weeks to 10 weeks there is the need to monitor the incidence of the disease in order to reduce waste of money and materials in unnecessary pesticide applications. A good monitoring system has been developed in St. Lucia and can be adopted without sophisticated equipment or extensive training and has the double benefit of reducing costs and limiting the amount of pesticide released into the environment. For successful commercial production of the crop, the disease must be controlled.

REFERENCE

Cronshaw, D.K. 1982. Management of banana leaf spot (Sigatoka) disease in the Windward Islands. Tropical Pest Management 28:136-146.





An Assessment of Banana Weevil  
(*Cosmopolites sordidus* Germ.) Infestation  
at the Orange Grove National Company Limited  
and Strategies for its Control

1. INTRODUCTION

The Orange Grove National Company Limited has been involved in the cultivation of sugar cane and the production of sugar over a number of years. However, as part of the national thrust in the diversification of the sugar industry, the company has now become involved in the production of certain food crops. Production is still essentially on a small scale and, in some instances like banana, experimental as well.

As part of the initial studies aimed at establishing the feasibility of large scale banana production at Orange Grove, investigations were undertaken to determine the current status of various pest and disease problems.

This particular study attempts to:

- (i) determine the incidence of the banana borer or weevil, (*Cosmopolites sordidus* Germ), in existing banana holdings at Orange Grove.
- (ii) evaluate the possible effect of the borer on future expansion of banana production.
- (iii) develop a strategy for borer control in existing and proposed banana plantings.



## 2. THE STUDY AREA

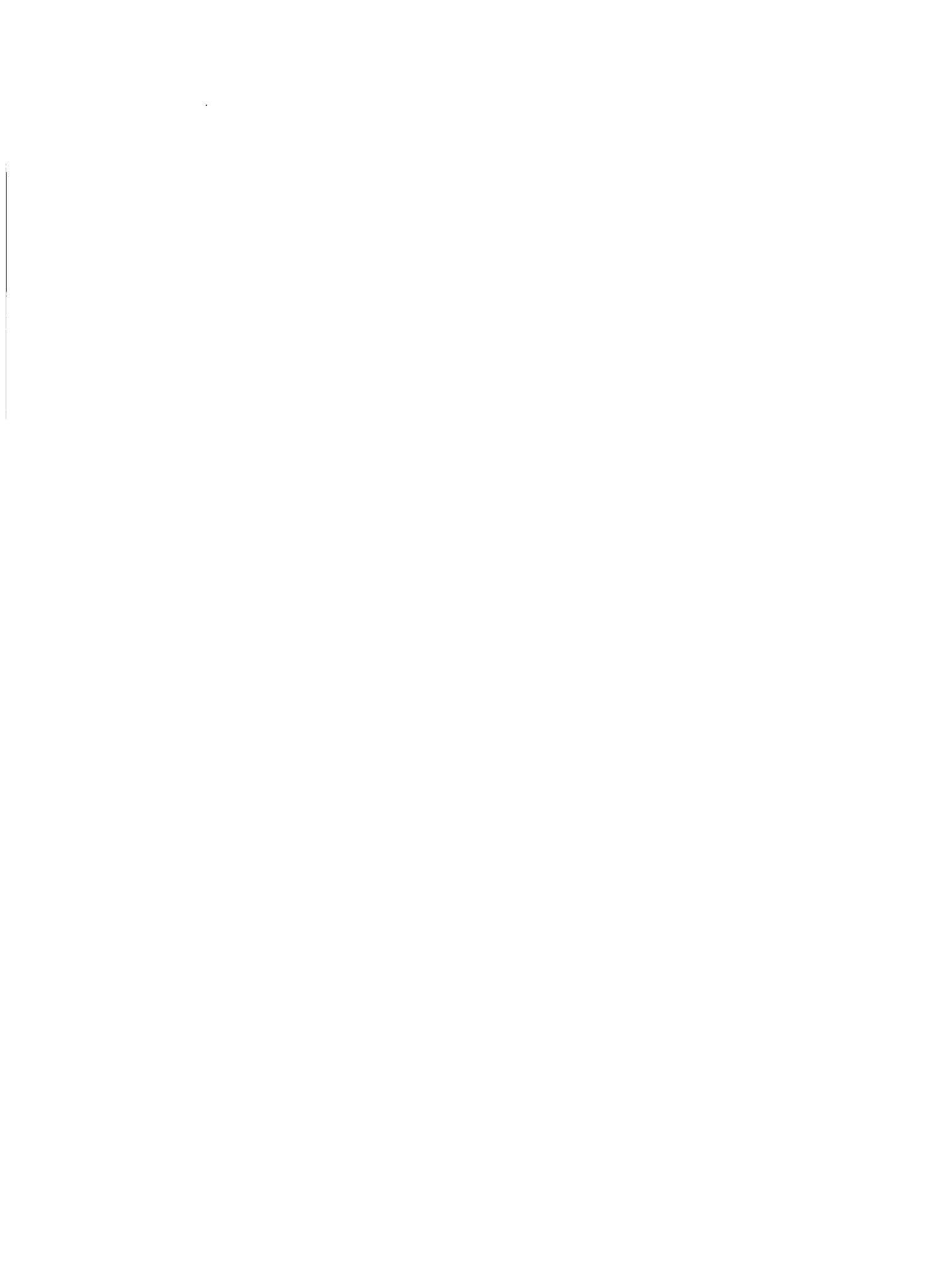
The area studied comprised 5.4 ha and was planted in September, 1981. This was the first attempt at a fairly large scale trial by the company. There was a shortage of planting material of any one variety from the outset with the result that the field consisted of a mixture of eight known cultivars and some which are still undetermined.\* The known cultivars planted belong to the following ploidy groups:

1. AA group
  - Sucrier
2. AAA group
  - Gros Michel
  - Cavendish sub-group:
    - Lacatan
    - Robusta
    - Valery
    - Giant Cavendish
3. AAB group
  - Plantain
  - Silk Fig

The majority of the plants appeared to belong to the AAA Cavendish sub-group, with plantains the next most common. The usual cultivation practices appeared to have been followed. There was some degree of weed control. However large pieces of cut stems of already harvested plants were observed between the rows of standing plants. This could have important implications for borer infestation levels.

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\*According to Mr. L. Mungal, Agronomist, Orange Grove National Co., Ltd.



### 3. THE INCIDENCE OF C. SORDIDUS IN EXISTING HOLDINGS AT ORANGE GROVE

#### 3.1 Methodology

Infestation levels of the banana weevil were assessed according to the method described by Vilardebo (1965)\*. This method allowed for a fairly rapid assessment of field infestation and subsequent establishment of a "rate of infestation" upon which a decision whether to treat a field or not could be reasonably made. The method is outlined as follows.

##### 3.1.1 To establish a "rate of infestation"

1. A banana plant which had been harvested within the last two weeks was cut down at a height of 10-15 cm above ground. Alternatively some plants were sampled which had been blown down by high winds. These plants had borne mature bunches of fruit.
2. The corm was removed from the ground and pared to a depth of 2-3 cm so exposing any borer tunnels.
3. The extent of any damage over the exposed surface of the corm was assessed and rated according to the following formula (Table 1).

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\*Vilardebo, A. (1965). How to assess banana weevil borer infestation, pp. 184-185, "The Banana Industry and Research. Developments in the Caribbean". A selection of papers prepared for the Banana Demonstration Tour held in Guadeloupe, Feb. 17-25, 1964, Puerto Rico, Caribbean Organization.



TABLE 1

Infestation Rating of Banana Corms  
Based on the Percent Tunnelling on the  
Exposed Surface of the Corm (after Vilardebo, 1965)

Condition of the Corm	Rating
No tunnelling	0
Tunnelling on 25% of surface	20
Tunnelling on 50% of surface	40
Tunnelling on 75% of surface	60
Tunnelling over entire surface	100

4. The procedure was repeated for 10 corms within a radius of 50-75 m. Two replicates were done, a total of 20 corms being assessed.
5. An average rate of infestation was then determined.
6. Based on the average rate of infestation an index of the extent of damage could now be determined. Vilardebo (1965) suggested a correlation between the average rate of infestation and the degree of damage for fields of Gros Michel and Robusta bananas (Table 2). However as indicated above the field under study here consisted of at least eight different cultivars though the majority appeared to belong to the Cavendish sub-group. Hence Vilardebo's recommendations for Robusta are followed.





TABLE 2

Correlation Between the Average Rate of Infestation of Banana Corms and the Extent of Damage by *C. sordidus* together with Recommended Control Measures (after Vilardebo, 1965)

Average Rate of Infestation		Extent of Infestation	Control Measure Recommended
Gros Michel Field	Robusta Field		
0	0	Nil	Nil
0-10	0-5	Very Slight	Nil
10-20	5-10	Slight	Routine
20-50	10-30	Average	Routine
50-80	30-50	Heavy	Emergency
>80	>50	Very Heavy	Emergency

### 3.2 Results

Table 3 gives the results of corm examinations to assess the rate of infestation.

TABLE 3

Rates of Infestation in Two Replicates (10 Plants Each) in Banana Plantings at Orange Grove

Corm No.	Rating	
	Replicate 1	Replicate 2
1	0	20
2	0	0
3	20	0
4	40	20
5	0	0
6	0	0
7	0	20
8	0	0
9	20	0
10	0	0
	Total 80	60
	Mean 8.0	6.0



The overall average rate of infestation was 7.0.

### 3.3 Discussion

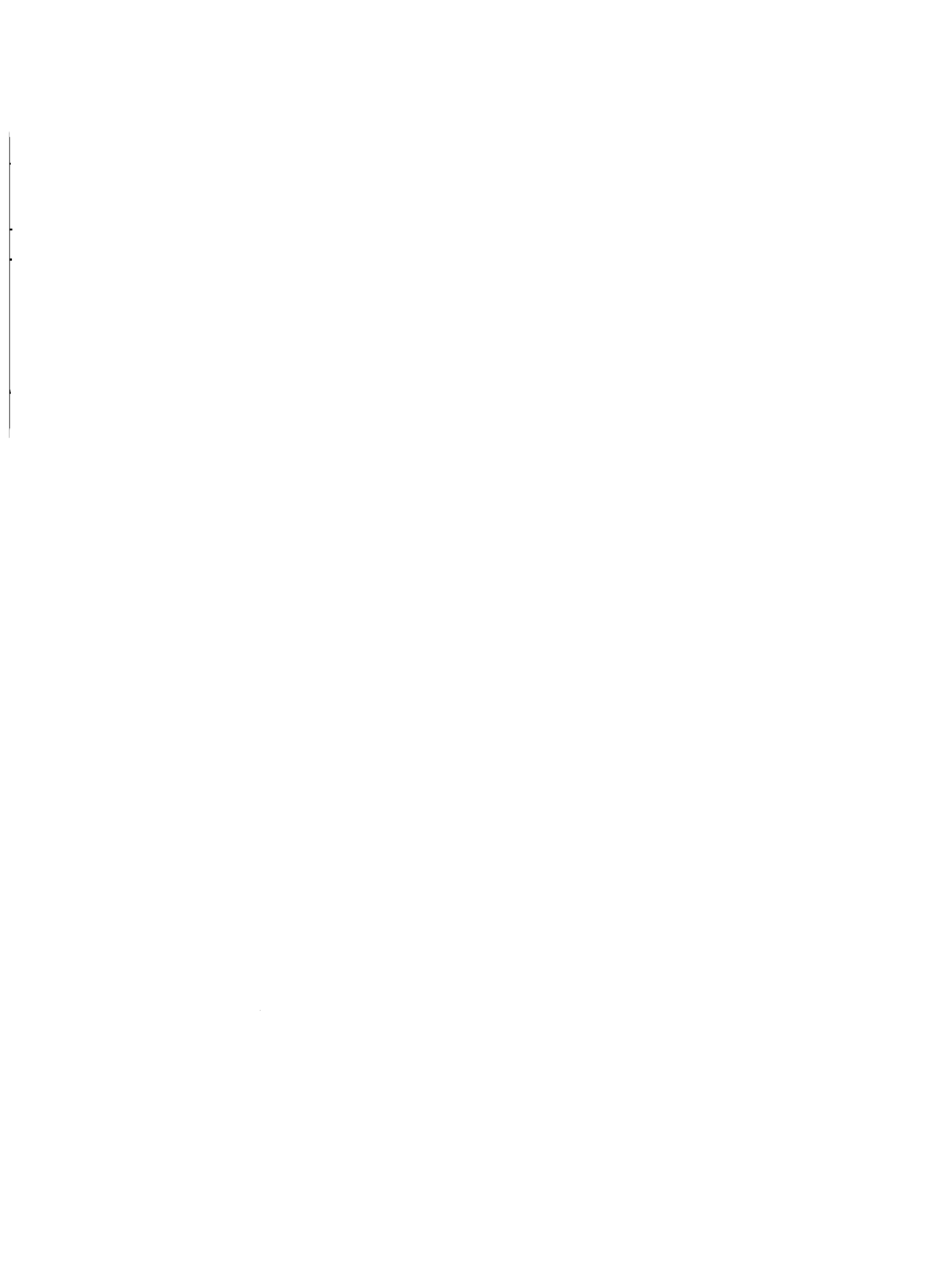
With an observed average rate of infestation of 7.0 (Table 3) the extent of damage in existing plantings at Orange Grove was classified as slight (Table 2). Such damage levels would normally require only routine control measures. Such measures presently comprise of a preplant dip of the corm in aldrin (1 tbsp in 1 gal water) together with a sprinkling of Furadan in each plant hole (10g/hole)\*.

The low infestation levels recorded might either suggest some degree of success of the existing control strategy or alternatively that with the first large crop of bananas in this area borer populations have not as yet built up to sufficiently high infestation levels to cause an economic loss. The status of *C. sordidus* at present might well be a combination of both these factors but more so the latter in the writer's opinion.

There is certainly the potential for the development of higher infestation levels than exist at present. In fact of the corms sampled those which were selected from toppled trees showed higher rates of infestation than those selected from plants which had been harvested but part of whose stems were still standing. The average rate of infestation of the latter was 3.0 while that of corms selected from toppled stems (Table 3, Corm numbers 3,4,7,10 of Replicate 1 and 1, 4 of Replicate 2) was approximately 17.0. While this might not be

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\*L. Mungal, Agronomist, Orange Grove National Company Limited.



regarded as a conclusive comparison it does indicate a trend which perhaps should be regarded as a signal that needs monitoring. The existing practice of leaving cut stems in the field is one which would certainly encourage the build-up of borer populations with time.

#### 4. SUMMARY

Arising out of such a short study as this a few generalisations and projections may be made. This will relate to the objectives as outlined in Section 1.

- (i) The data suggest that at present infestation levels of the banana borer, *C. sordidus*, in existing banana plantings at Orange Grove are slight.
- (ii) There is the potential for infestation levels to increase with future expansions in production especially if the existing practice of leaving cut stems in the field is continued.
- (iii) However a proper pest management programme should serve to inhibit the build-up of borer populations and maintain them at sub-economic levels. A management programme should comprise the following components:
  - 1. Routine control practices should be maintained as presently performed i.e. a pre-plant treatment of the corm with aldrin together with another treatment at planting with a good



soil insecticide, used as recommended.

Furadan is presently used but this could be rotated with other chemicals recommended for borer control e.g. Mocap or Primidid.

2. Apart from the use of chemicals the first line of defense must be cultural control strategies. These would include:
  - (a) the use of borer-free planting material. This is especially important given the target of 125 ha of bananas projected, with the temptation to use any planting material available;
  - (b) effective and efficient phytosanitary measures especially the proper disposal of cut pseudostems. Hill (1975\*) recommends cutting old pseudostems into small pieces for use as a mulch.
  
3. Finally there needs to be a system of regular monitoring of the status of borer populations in the field. This could be effectively determined utilising traps made of cut 50 cm lengths of the split pseudostem. Such traps were most attractive for a period of up to one week (Simmonds and Simmonds, 1953)\*\*.

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\*Hill, D. (1975). Agricultural Insect Pests of the Tropics and their Control. 516 pp, London, C.U.P.

\*\*Simmonds, N.W. and Simmonds, F.J. (1953). Experiments on the banana borer, Cosmopolites sordidus, in Trinidad, B.W.I. Tropical Agriculture, Trinidad 30: 216-233.





Alternatively, the direct assessment of the extent of damage as described by Vilardebo (1965) and outlined in Section 3.1 above may be utilised.

A handwritten signature in black ink, appearing to read 'G.V. Pollard'. The signature is written in a cursive style with a horizontal line underneath the name.

G.V. Pollard  
1 June 1983



**INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE**

**A PRELIMINARY STUDY OF MOKO DISEASE**

**OF**

**PLANTAIN AND BANANA**

**IN**

**TRINIDAD, GRENADA AND ST. LUCIA**

**F.D. McDonald**

**MAY, 1983.**



## ACKNOWLEDGEMENTS

The writer is pleased to acknowledge the kind assistance rendered by several groups of people attached to the Orange Grove National Company Limited in Trinidad, Windward Islands Banana Growers' Association Research Station, St. Lucia and Staff of IICA OFFICES both in Trinidad and Tobago and in Grenada during my assignment.

Special thanks are expressed to Dr. E.D. Reid, WINBAN Research and Development Division, St. Lucia and Mr. J. Marrast for their invaluable assistance.

F.D. McDonald.



A PRELIMINARY STUDY OF MOKO DISEASE OF PLANTAIN  
AND BANANA IN TRINIDAD, GRENADA AND SAINT LUCIA

**INTRODUCTION**

The writer was asked by the Inter-American Institute for Cooperation on Agriculture (IICA) Office in Trinidad and Tobago to do a preliminary study of Moko Disease of Plantain and Banana in Trinidad, Grenada and Saint Lucia.

In connection with the study, the writer's Terms of Reference were set out as follows:

- 1) to determine the incidence of Moko Disease in selected areas of Trinidad, Grenada and Saint Lucia (if present);
- 2) to develop a strategy for control of the disease utilising plant quarantine approaches to limit the spread of the disease;
- 3) to propose ways of how the disease may be managed in situations in which it now exists.

For clarity, the report is divided into sections dealing specifically with each country - visit from which the information is derived.





## TRINIDAD

MAY 8 - 12, 1983

Officials with whom discussions were held included:

- Dr. C.W.D. Brathwaite - Director of IICA Office in  
Trinidad and Tobago
- Mr. C. Dindial - Administrative Manager (Ag.)  
Orange Grove National Company  
Limited (OGNC)
- Mr. L. Mungal - Orange Grove National Company Ltd.
- Mr. K. Fortuné - Manager/Field Operations (OGNC)
- Mr. K.E. Hoesten - Agronomist/Food & Agric. Corporation  
Trinidad and Tobago (FAC)
- and Dr. G.V. Pollard - Entomologist and Lecturer  
University of the West Indies.

### BRIEF REVIEW OF THE FOOD CROP PROJECT - ORANGE GROVE NATIONAL COMPANY LTD. AND THE FOOD AND AGRICULTURAL CORPORATION OF TRINIDAD AND TOBAGO.

The primary concern of the Orange Grove National Company Ltd. has been sugar-cane cultivation until recently when a decision was made to get into food crop production: plantain and banana, corn, cassava, etc.

The Food and Agricultural Corporation is to provide Orange Grove National Company Ltd. (OGNC) with technical assistance support in the establishment of mainly the banana crop on an extensive scale.

Dr. Brathwaite of IICA was asked to provide specific assistance in the area of pest and disease management of plantain and banana. The technical assistance included disease survey and assessment of moko disease in the project area, for which the writer was asked to conduct his study.



The Orange Grove project started in 1981. The present acreage in plantain and banana is 10.3 ha (about 25.5 ac.) and includes 7.1 ha (17.5 acres) of banana and 3.2 ha (8 acres) of plantain.

The sources of the planting materials for establishing the existing acreage were farmers located in various parts of the island known to be infested with moko disease. Very little attention was paid to certification of the stolons with respect to disease-free planting material and general plant quarantine procedures. It ought to be pointed out that moko disease has been reported to be endemic in Trinidad. This fact therefore demands strict certification and the adoption of plant quarantine measures to prevent spread and/or delay introduction of moko disease, if not exclude the disease in the project area. "Moko" known to be epiphytotic can jeopardise the progressive development of the project.

The projection of OGNC is to establish 20 ha (50 ac.) of banana in 1983 and a further 125 ha (over 300 ac.) by 1986.

#### Survey of OGNC Cultivations

The present cultivation sites, alluded to in the report were inspected and a preliminary survey was done in company with Mr. B. Batchoo, Field Foreman/OGNC.

Field No. 24 Macoya is comprised of about 3.2 ha (about 8 ac) of banana of mixed varieties (Giant Cavendish, Dwarf Cavendish, Lacatan and Valery) along with a small amount of plantain. At the moment, this field represents the largest single block under banana and plantain cultivation.



The survey was done by traversing the field in a systematic manner using transects as units for detection of the moko disease.

The survey showed that moko disease is not yet evident neither are there present any diagnostic field symptoms of "moko". The writer feels that it might be premature to state with any confidence that the present project area is free of the disease. Bearing in mind that moko disease is endemic in Trinidad and that the planting materials were procured at random from wherever possible, the writer feels that at this point in time, the results of the preliminary survey must be taken with caution. It must also be noted that the age of the present cultivation is less than two years. Constant monitoring and periodic survey of the project site should follow this initial effort in order to detect any early occurrence of "moko" (Pseudomonas solanacearum race 2 strain ?).

The survey showed a very low incidence of Panama disease (Fusarium Wilt) in the surveyed field.

#### RECOMMENDATION

Following his findings through the survey of the Orange Grove banana and plantain cultivation and based on the projections and plans of the Food and Agricultural Corporation in the joint venture with the Orange Grove National Company Ltd., the writer recommends that:

- (a) internal quarantine procedures should be strictly followed to certify disease-free planting materials with particular reference to moko disease;
- (b) the findings showed that Panama disease is present and therefore only the growing of tolerant varieties - Cavendish types of banana should be encouraged;



- (c) serious considerations should be given to the establishment of about 4.0 ha (approximately 10 ac.) nursery to provide disease-free planting materials for there is always a high risk in the introduction of a major disease or pest to a locality during the movement of a large amount of planting materials from within the country or without.

Self-sufficiency in the propagation of planting materials in-country to satisfy local needs has excellent logical benefits and opportunities: (1) to generate technology of the crop, (2) reduction of production costs, (3) reducing the risk of disease spread and (4) the establishment of a disease-management strategy;

- (d) should it become necessary to import some amount of the required planting materials, only a minimum acreage should be planned for based on sound reasons given at (c);
- (e) any immediate or future expansion in acreage of banana and plantain must be governed by the amount of disease-free planting materials available at any one time and not only by the consideration to hasten expansion;
- and (f) a trained plant pathologist with experience in moko disease should make periodic visits to advise on monitoring and detection studies particularly during the expansion phases of the project.





## SAINT LUCIA

MAY 13 - 14, 1983

### BACKGROUND

The visit to St. Lucia was to determine the occurrence of Moko disease of banana and was intended to be part of my study. Circumstances beyond my control prevented me from fulfilling the Terms of Reference with respect to the study in St. Lucia.

The duration of my stay in St. Lucia was curtailed and no particular visit was made to banana cultivations on the island. Hence, no assessment could have been done by me. Moko disease has not yet been reported in St. Lucia and according to the technical personnel of WINBAN Research and Development Division, the disease is not yet present. I have no evidence to the contrary and to dispute the views of the technical personnel of WINBAN/St. Lucia.

The trip to St. Lucia proved useful still and afforded me the opportunity to exchange ideas with those working with the banana crop and the discussions revolved around Moko Disease in Grenada and its implications to the rest of the WINBAN Islands.

It was a bit unfortunate not having the opportunity to meet Dr. J.E. Edmunds, Director of Research and Development Division, WINBAN and discuss with him several points on the approach of the EDF Moko Disease Control Programme in Grenada (in particular) and in the rest of the WINBAN Islands (in general).

Notwithstanding this I had very useful discussions with Dr. Errol D. Reid and Mr. Everton Ambrose of WINBAN Research and Development Division located in St. Lucia. The trip to St. Lucia also allowed me the opportunity to fully understand the implications with regards to the Orange Grove National Company Ltd. (OGNC) in conjunction



with the Food and Agricultural Corporation (FAC) banana project in Trinidad. I am therefore in a position to further advise FAC on the project at Orange Grove, and also the information received during my short stay in St. Lucia strengthened the recommendations made by me on the OGNC - FAC joint venture.

## FINDINGS

In the absence of the Director of Research and Development Division, Dr. Reid made a few disclosures pertinent to the project at Orange Grove in Trinidad. The following should then be noted that:

- (1) FAC is still to formalise the request made on the telephone by an Officer on behalf of the Corporation.
- (2) WINBAN cannot take the responsibility of getting the requested planting materials for FAC.
- (3) WINBAN is however willing to assist FAC by making the necessary contact with individual farmers who can supply but it will be the responsibility of FAC to reach agreement with farmers on terms of sale - price, treatment of suckers, shipping, etc.
- (4) Dr. Reid is awaiting a positive response from FAC with respect to the first order and purchase of banana stolons from farmers in St. Lucia.

The lack of communication caused a little embarrassment to Dr. Reid. Upon receiving the request from FAC on the telephone, a farmer was identified and started immediately to set aside planting materials of the Giant Cavendish banana type. But having not heard



anything further from Trinidad, the farmer went ahead to utilise the suckers for his own purpose.

and (5) There is no guarantee of getting more than a few thousand stolons of Giant Cavendish for this banana variety is not commonly grown in St. Lucia. Only a few farmers do grow this banana type.

Other banana varieties readily available are: Robusta, Cavendish (Dwarf) and Valery.

#### CONSIDERATIONS

Based on my recommendations that there are always inherent risks accompanying the movement of a large amount of planting materials, it is once again suggested that only an adequate amount of selected propagative materials should be brought in to satisfy about 2 - 5 ha. (5 - 10 ac.) and a nursery be established at an appropriate site (on advice). The nurseries can apply one of the rapid multiplication techniques, methods of which are available.

The writer has gone over in his recommendations the many benefits that can accrue in the establishment of a nursery by the project personnel (on advice) to provide certified planting materials.

#### OTHER ACTIVITIES

As mentioned before, Dr. Edmunds was unavailable and Dr. Errol D. Reid however made himself available to give me a sight-seeing tour of WINBAN Research Station.



The on-going EDF financed Moko Disease Control Programme in Grenada (in particular) and the rest of the WINBAN Islands (in general) was discussed. The writer made some comments on the approach in the control programme. These comments have been forwarded to the Director of Research and Development for his considerations.

It was agreed that consultations would continue between the writer and WINBAN technical personnel.





## GRENADA

MAY 15 - 19, 1983

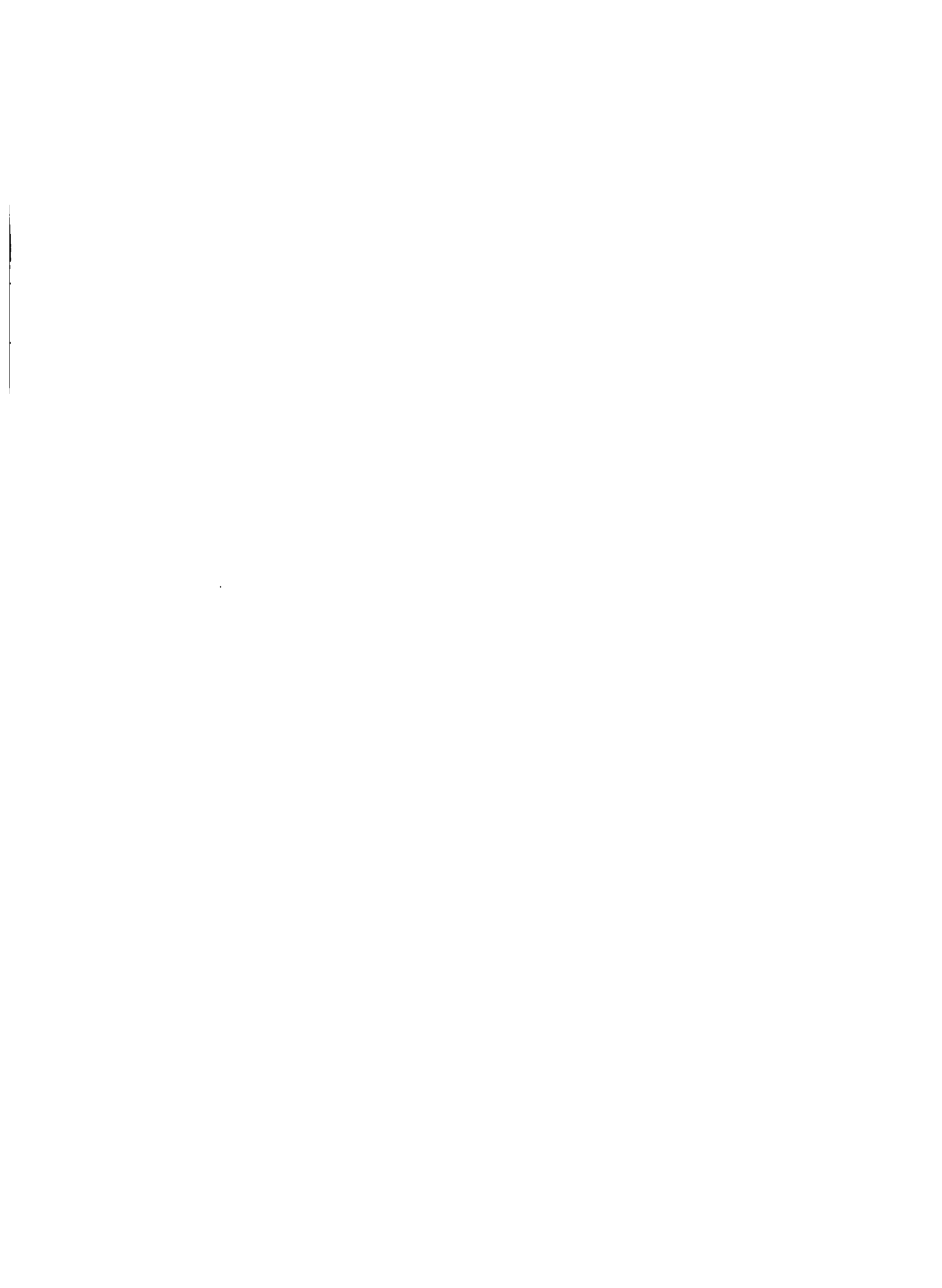
### BACKGROUND

The Terms of Reference of my trip to Grenada were to determine the incidence of Moko Disease in selected areas of Grenada, to develop a strategy for the control of the disease utilising plant quarantine approaches to limit spread of the disease and to propose ways of how the disease may be managed in situations in which it now exists.

The Moko disease situation in Grenada is a complex one and requires in-depth studies. The European Development Fund (EDF) Project on the Control of Moko Disease of Banana in the Windward Islands in general, and in Grenada in particular, is on-going and seems to lay emphasis on the eradication of moko disease in Grenada. It was obvious that this part of the project is a direct continuation of the previous F.A.O Moko Disease Eradication Project (TCP/GRN/890 IM) which was implemented in 1980 in Grenada. The Ministry of Agriculture continued the exercise even after the FAO/TCP project came to an end.

Equipment, materials and a Land Rover funded by FAO were used in the extended eradication project during 1981.

In November 1982 when the EDF project was implemented it was able to draw on trained manpower and carry-over resources of the FAO project - materials and equipment. Two Land Rovers with trailers, funded by EDF, were procured for the Project making now a fleet of three (3) Land Rovers and two (2) trailers.



The eradication attempt involves the identification of infected mats and the injection of Roundup (Glyphosate) into the diseased or buffer zone mats. A recommended insecticide and weedicide were used to spray buffer zone mats. Appropriate sanitation was also carried out (Small, 1981). A buffer zone of 15 ft. around diseased plants was also created and found to be adequate.

Ambrose in 1981, introduced a more efficient injector, 'the Spot Gun', which replaced the "Morton" meat pump used by the FAO Consultant. The buffer zone of 25 ft. was found to be more effective than the 15 ft. one (Ambrose, 1981).

The on-going eradication exercise in Grenada precluded the writer from doing an accurate assessment of disease incidence during the two-day visit to the banana farms. There would have been a large error in the assessment as diseased mats are continuously eliminated from the fields on a very large scale by the Roundup injection method. Apart from this logistic, the limited time available to the writer also contributed to the non-determination of the moko disease incidence. The writer, however, in his preliminary survey and visits made to a number of farms observed remains of bare fields in St. Patrick, St. Mark and St. Andrew Parishes supposedly decimated by moko disease. In some cases a rough estimate of disease intensity was over 90%.

This part of the report therefore consists of:

- i ) the status of moko disease of banana (bluggoe and plantain) in Grenada;
- ii) a brief review of the present exercise in moko disease eradication and disease containment;
- and iii) recommendation.



## APPROACH

The writer held preparatory discussions with Mr. C. Joseph, Country Professional/IICA Office in Grenada and Mr. J. Marrast designated as Quarantine Officer to the EDF Project. Mr. Marrast recently appointed as Crop Protection Officer in Grenada was seconded to WINBAN to work on the implemented EDF Moko Disease Project in 1982.

The writer made known the purpose of the trip to Grenada and precise lines of action were decided on to achieve the objective of the visit.

In the company of Mr. Marrast, the writer visited several areas infested with Moko Disease. The following locations were visited:

Drumnity, St. Patrick  
Plaisance Estate, St. Patrick  
River Antoine Estate, St. Patrick  
Samaritan, St. Patrick  
Malagon, St. Patrick  
Diamond Estate, St. Mark  
Waltham, St. Mark  
Belmont Estate, St. Mark  
Paradise Estate, St. Andrew

## STATUS OF MOKO DISEASE OF BANANA (BLUGGOE AND PLANTAIN)

Since the first report of moko disease occurrence in Grenada by Cronshaw and Edmunds in 1980 and following the FAO/TCP Moko Disease Eradication Project in the same year, the disease spread has been rapid. In 1978 the disease was first reported in the parish of St. Patrick in an area of approximately 4.9 km<sup>2</sup> roughly bounded by lines



joining Snell Hall Estate, Plaisance Estate and Chantimelle (Cronshaw and Edmunds, 1981). From 1979 to the end of 1980 survey data also indicated that the spread of the disease was very rapid. It is only a matter of conjecture whether the disease was wide-spread in Grenada before the actual confirmation and reporting. The disease is however now present far and away from its original foci and there is enough evidence that the disease has reached epidemic proportions. Recent observations showed that moko disease of banana is now endemic in the parishes of St. Patrick and St. Mark. The disease is found in all major banana cultivations in the two areas. In St. Andrew the disease is spreading in a southerly direction and there has been at least one confirmed incidence of "moko" in St. David.

There may be evidence of reduction of disease incidence and disease intensity due to the on-going eradication exercise but there are also substantive indications of increase of disease spread. In summary, the writer would describe moko disease as endemic in Grenada in general and epiphytotic in given locations.

#### BRIEF REVIEW OF PRESENT MOKO DISEASE ERADICATION AND DISEASE CONTAINMENT EXERCISE

The method developed by Small in 1980 and later improved by Ambrose (Ambrose, 1980) using Roundup (Glyphosate) method along with spraying the buffer zones with Gramoxone (Paraquat) and a recommended insecticide is still currently being used in the eradication programme.

During the F.A.O. Consultancy of Dr. Small, he drafted legislation to have "Moko" proclaimed as a Notifiable Disease in Grenada. Specific provisions were enacted in the proclamation.





Ambrose (1981) outlined the many constraints to the eradication measures which have made the exercise very difficult viz. number of small holdings, topography of the cultivated lands, the mixed cultivations commonly found in Grenada, fallowing and its implications with respect to revenue loss to farmers.

All the above drawbacks, as cited, to the eradication exercise are real and affect the success of the entire control programme. Apart from these factors, there is the need for the mounting of a control and containment programme which must be well supervised and continuously managed, probably along the lines of the FAO/TCP project of 1980 with the addition of a research component. It was observed that the eradication team is still adopting some of the "old" and ineffective techniques previously used in the roguing out method during the period prior to the institution of the F.A.O Consultancy. For example, the eradication team of workers is still splitting corms, pseudostems and infected fruit in small fragments in the areas surrounding the mat treated with Roundup. There are specific methods in the treatment of fruit cases, or secondary infection cases. All infected fruit should at least be burned completely.

The Plant Protection (Moko Disease) proclamation drafted by the F.A.O Consultant and its provisions therein are sadly not applied and there is still movement of suckers from infected farms to other areas. Planting is on-going and farmers seem prepared to take the high risk of cultivating a new banana crop long before the prescribed period of two years following the eradication of moko disease mate. Bluggoe (Musa ABB) a cooking banana and highly susceptible to moko disease is constantly moved around by farmers, hence contributing to the disease spread.



There seems at present no real systematic method to study epidemiology of the disease despite the initial efforts of Dr. K. Cronshaw in 1978 and 1979. This is essential of any disease control study particularly an epidemic disease.

Farm records on disease incidence, treatment of mats, data collection and data retrieval, all need improvement. Even at the moment, during the life of the EDF project there seems no precise approach used in the surveys, and in fact, it can be said no methodological survey is now on-going.

#### RECOMMENDATION

The writer's recommendations are specific to the terms of Reference in his service contract but he has taken the liberty to make other recommendations based on his observations, knowledge and experience of moko disease. I, therefore, herein also recommend further action plan of Moko Disease research in Grenada.

A. With regard to the present Moko Disease eradication and disease containment exercise, it is suggested that:

- (1) A more effective bananacide should be sought to give a quicker kill of diseased mats. The Roundup weedicide presently used in the eradication programme takes 5 - 6 weeks for elimination of the mats and nothing is known of the effects of the Roundup material on the bacterial pathogen (Pseudomonas solanacearum E.F. Smith).
- (2) With assistance of the Ministry of Agriculture in Grenada and the Government itself, all quarantine measures and regulations should be strictly applied and policed.



- (3) Disease surveys should be re-instituted island-wide on a sound basis to allow constant monitoring and mapping of infected areas.
- (4) Consideration be given to the establishment of nurseries for the provision of disease-free materials by WINBAN, the Grenada Banana Co-operative Society (GBCS) and the Ministry of Agriculture.
- (5) Precise methods particularly relating to treatment of:
  - i ) fruit cases
  - ii) treatment of secondary cases
  - iii) treatment of buffer plants
  - and iv) treatment of cases without buffer.Sanitation principles should always be adhered to.
- (6) An efficient system be instituted for collecting farm records and all data collection - disease incidence, treatment of mats, data retrieval, etc.
- (7) Continuing training of field staff and farmers in moko disease detection.

B. With regard to future action plan of moko disease research in Grenada, the writer recommends that:

- (1) Studies be undertaken on methods of early detection of disease probably at onset of disease so that disease symptomatology and disease syndrome can be better understood.
- (2) Management strategies using buffer zones comprising of the Pelipita resistant plantain cultivar should be researched.



- (3) Intensive research should be conducted to study epidemiology of the disease, the role of Bluggoe cooking banana as a means of spread of "moko" in Grenada and in the assessment of disease incidence.
- (4) The need to undertake a historical review of Moko disease in Grenada in an attempt to understand some of the social implications and impact of the disease. This study can prove vital in developing meaningful management strategies.
- (5) The need to do research in providing an alternative cropping system during the two-year fallow period following eradication of diseased mats. The selection of suitable crop or crops would certainly be an incentive to farmers to adopt the introduced cropping system without which the introduction would be impractical and doomed for failure.

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