INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE

– IICA OFFICE IN TRINIDAD AND TOBAGO

# THE PLANT PROTECTION PROGRAMME FOR THE CARIBBEAN REGION

## 1980 – 1984

by

Dr. Chelston W.D. Brathwaite
Regional Plant Protection Specialist and
Director of the IICA Office in Trinidad and Tobago



IICA

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IICA - Port-of-Spain
October, 1984

## ACKNOWLEDGEMENTS

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i) Ministries of Agriculture in the Caribbean Region.

ii) University of the West Indies, Faculty of Agriculture.

iii) Caribbean Agricultural Research and Development Institute (CARDI).

iv) Food and Agriculture Organization of the United Nations.

v) Consortium for International Crop Protection (CICP).

vi) IICA Offices in Grenada, Barbados, Haiti, Dominican Republic, Suriname, Trinidad and Tobago, Jamaica, Guyana and St. Lucia.

vii) Animal and Plant Health Inspection Service of the U.S. Department of Agriculture (APHIS/USDA).

viii) Danish Government Institute for Seed Pathology in Developing Countries, Copenhagen, Denmark.

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## 1. WHAT IS IICA

The Inter-American Institute for Cooperation on Agriculture - IICA - is an international, inter-governmental organization specialized in agriculture. It is governed by its own Convention and has been recognized as a specialized Inter-American Agency under the Charter of the Organization of American States.

The purposes of IICA are to "encourage, promote, and support the efforts of the Member States to achieve their agricultural development and rural well-being".

The Institute was founded in 1942 as the Inter-American Institute of Agricultural Sciences. On December 8, 1980, a new Convention was ratified. Under this new Convention, the Institute changed its name to the Inter-American Institute for Cooperation on Agriculture, expanded its purposes and altered its institutional structure.

IICA has 29 Member States: Argentina, Barbados, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Suriname, Trinidad and Tobago, United States of America, Uruguay and Venezuela.

Twelve Observer Countries contribute to Institute activities: Austria, Belgium, Egypt, France, Germany, Israel, Italy, Japan, Korea, the Netherlands, Portugal and Spain.

IICA has a technical staff of 180 international professionals. Around 1,200 persons are working for the Institute throughout the hemisphere.

IICA's resources flow from annual quotas which the member countries commit themselves to pay each year. Funds also derive from agreements, contracts, contributions, and grants for which the Institute signs with other national and international organizations. For 1984, the Institute's highest governing body, the Inter-American Board of Agriculture, has approved a budget of 37 million dollars.

IICA's Director General is Venezuelan scientist and educator, Dr. Francisco Morillo Andrade. The Deputy Director is Dr. Quentin M. West of the United States.

## 2. WHAT IICA DOES

IICA concentrates its action in ten hemisphere-wide programs, which provide a framework for the annual performance of over a thousand activities. These activities are carried out through agreements reached with the Governments of the Member States, and are in the hands of decentralized technical teams covering the 29 Member Countries.

IICA's hemisphere-wide programs are: Formal agricultural education; Support of national institutions for the generation and transfer of agricultural technology; Conservation and management of renewable natural resources; Animal health; Plant protection; Stimulus for agricultural and forest production; Agricultural marketing and agro-industry; Integrated rural development; Planning and management for agricultural development and rural well-being; and Infromation for agricultural development and rural well-being.

The specific objectives over the medium term have been defined in accordance with the general objectives and overall strategy of IICA, and on the basis of the concepts of agricultural development and rural well-being that are put forth in the guidelines for the Institute's general policies. These specific objectives include cooperating with the Member States through:

a. Bringing about the growing, effective participation of rural dwellers, especially the low-income strata, in decision-making on projects affecting them, seeking to incorporate them fully into the benefits of economic and social progress.

b. Developing human resources by promoting formal and non-formal training, to improve productive efficiency and promote the participation of the rural population in processes for achieving rural well-being.

c. Developing and consolidating national systems for the generation and transfer of technology, in order to help each country fit itself into the regional and world technological framework. This would be done for the purpose of improving both agricultural and forest production and productivity, preventing and reducing losses to pests and diseases in crops and herds, and maximizing the use and conservation of renewable natural resources.

d. Developing policies, mechanisms and tools for stimulating the efficient production and marketing of inputs and of agricultural, livestock and forest products, domestically and internationally.

e. Reinforcing regional and integrated rural development institutions for planning and implementing integrated projects, so as to coordinate institutional action and provide for the effective participation of beneficiaries.

f. Reinforcing public and private institutional systems in the many facets of setting national goals, planning, and implementation at all levels, on the basis of the retrieval and analysis of information for better defining and implementing policies and programs of agricultural development and rural well-being, and for establishing IICA's own priorities for action.

## 3. THE PLANT PROTECTION PROGRAMME

### 3.1 Introduction

The Ministers of Agriculture attending the VII Inter-American Conference of Agriculture held in Honduras in 1977 expressed their concern regarding the disease problems of plants and animals throughout the Western Hemisphere. Two of the ten recommendations made at this conference refer to this subject. The Special Committee of the Eighteenth Annual Meeting of IICA Board of Directors held in October, 1978 recommended that the Director General of IICA study a proposal aimed at the establishment of a mechanism for the coordination of efforts to fight pests and disease problems affecting animals and plants and which are the cause of significant losses in the Hemisphere.

As a result of these directives, IICA has established a Hemispheric Plant Protection Programme designed to prevent, control and if possible, eradicate diseases and pests which cause economic damage to crops in the Hemisphere and which threaten to spread to other regions.

The programme is made up of a Programme Director stationed at IICA headquarters in San Jose, Costa Rica and four Plant Protection Specialists, one stationed in each of the four regions of the Hemisphere. The Plant Protection Specialist for the Caribbean is Chelston W.D. Brathwaite, Plant Pathologist stationed in the IICA Office in Trinidad and Tobago.

In accordance with IICA's basic strategy, this programme is directed towards strengthening national and regional efforts being carried out by other organizations. It is designed to support, coordinate and collaborate with other International, regional and subregional institutions working in this area and in no case will duplicate or replace existing institutions.

The programme recognises that the spread of pests, diseases, and weeds that affect basic food and export crops aggravate the food, foreign exchange and energy needs of the Latin American and Caribbean countries. Coordinated international action can contribute to reducing the spreading and incidence of these pests, weeds and diseases, since the individual capabilities of national plant protection institutions are usually limited by low levels of physical, human and financial resources with which to attain their objectives.

### 3.1.1 General Objective of the Programme

To promote and support the efforts of the countries to prevent and reduce crop losses caused by pests, diseases and weeds.

### 3.1.2 Specific Objectives of the Programme

To cooperate with the countries in expanding and improving their institutional capability to:

a. Update and standardize national and international legal provisions and regulations governing plant protection.

b. Identify, detect and estimate the damage caused by the main crops pests, diseases and weeds.

c. Plan coordinate and implement programs for reducing the incidence and preventing the spread of the main crop pests, diseases and weeds.

d. Plan, coordinate and implement research and technical exchange programs on crop pests, diseases and weeds.

e. Generate mechanisms for upgrading the physical, human and financial resources of plant protect institutions, according to the levels of responsibility that have been assigned them.

### 3.1.3 Strategy of the Programme

To promote and support:

a. The updating and standardization of national and international legal provisions and regulations governing plant protection (quarantine and pesticides).

b. The formulation implementation and evaluation of multinational projects that involve economically important pests and diseases of mutual interest to several countries.

c. The formulation, implementation and evaluation of high-priority projects at the national level.

d. The use of technical and human resources from other IICA programs, from CATIE, and from national and international institutions with experience in this field.

e. The operational and technical reinforcement of national and international institutions working in this field (OIRSA, FAO, CIP, NAPPO, CIAT, CIMMYT).

f. Coordination with other international agencies.

g. The organization and promotion of meetings, seminars and other events for consultation and orientation to establish working guidelines and priorities for action.

h. The organization of scientific associations for plant protection, that can provide a forum for studying plant health problems in the countries, the subregions and the hemisphere.

i. The participation of farmers' organizations, field workers and the rural population in campaigns to control pests and diseases, as well as in quarantine measures.

The Heads of Plant Protection of IICA Member States in the Caribbean met in San Jose, Costa Rica from 15 - 17th August, 1979 and again from July 27 - 29th , 1980 in Barbados. The objectives of these meetings were to formulate a plan of action for the Caribbean within the Hemispheric Plant Protection Programme.

The meeting in Barbados had as its objectives:

1. To analyse the programme objective to make them more precise, more limited in scope and more realistic in relation to the financial resources of IICA.

2. To establish lines of priotiry from among the various proposals made at the meeting in Costa Rica.

3. To establish mechanisms for coordination with regional and international plant protection organizations.

The result of this meeting formed the basis for the orientation of the programme at the regional level. The priorities identified included:

1. Training courses in Plant Quarantine and General Plant Protection.
2. Strengthening post entry quarantine facilities.
3. Control and eradication of new pests and diseases.
4. Establishment of a Society for Plant Protection in the Caribbean.
5. Establishment of a regional Newsletter.

All the subsequent meeting of Heads of Plant Protection which was held in Jamaica in 1981, a strong recommendation was made for the implementation of a Regional Plant Quarantine Training Course. A third meeting was held in Caracas, Venezuela as part of the third Hemispheric meeting of Plant Protection. A progress report on the programme in the Caribbean is presented below.

Lack of trained personnel in Plant Protection and Plant Quarantine is recognised as one of the limited factors in achieving effective pest control programmes in the region. The following training activities were initiated during the period considered.

## 3.2 Establishment of a Regional Plant Quarantine Training Course

Effective Plant Quarantine is necessary for the safe movement of agriculture produce in regional and international trade. The Heads of Plant Protection in the Caribbean recognized that there is an urgent need for trained plant quarantine inspectors in the region. Consequently, a regional plant quarantine training course was established. The course was held in Trinidad and Tobago in 1982 and in Barbados in 1983.

The course objectives were as follows:

1. To develop and foster among Plant Quarantine Inspectors of the region an awareness of their mutual responsibility to keep the Caribbean free from foreign pests and diseases.

2. To improve the skills of Plant Quarantine Inspectors in the detection and treatment of plant pests and diseases which pose a threat to Caribbean Agriculture from either regional or extra-regional sources.

3. To improve communication between Plant Quarantine Inspectors of various territories of the region.

4. To form the basis for the preparation of a Caribbean Plant Quarantine Training Manual.

The course was designed primarily for inexperience Plant Quarantine Inspectors and dealt with the general principles of plant quarantine and the duties, responsibilities and requirements of Plant Quarantine Inspectors.

Plant Quarantine Inspectors trained in the Regional Plant Quarantine training course, are as follows:

## BARBADOS

| | |
|---|---|
| Allan Alleyne | Ministry of Agriculture, Food & Consumer Affairs<br>Plant Pathology Division<br>Graeme Hall<br>Christ Church<br>Barbados |
| Livingston Brathwaite | Ministry of Agriculture, Food & Consumer Affairs<br>Entomology Division<br>Graeme Hall<br>Christ Church<br>Barbados |
| Margaret Devonish | Ministry of Agriculture, Food & Consumer Affairs<br>Entomology Division<br>Graeme Hall<br>Christ Church<br>Barbados |
| Yosif Greenidge | Ministry of Agriculture, Food & Consumer Affairs<br>Graeme Hall<br>Christ Church<br>Barbados |
| Everton Hunte | Ministry of Agriculture<br>Plant Pathology Division<br>Barbados |
| Sylvester Jones | Ministry of Agriculture, Food & Consumer Affairs<br>Entomology Division<br>Graeme Hall<br>Christ Church<br>Barbados |

## DOMINICA

| | |
|---|---|
| Mervin Mason | Melville Hall Airport<br>Dominica |
| Michael Thomas | Agricultural Assistant<br>Botanical Gardens<br>Roseau<br>Dominica |

## GRENADA

| | |
|---|---|
| Winston Alexander | Ministry of Agriculture<br>St. George's<br>Grenada |
| George Phillip | Ministry of Agriculture<br>St. George's<br>Grenada |

## GUYANA

| | |
|---|---|
| Janice Gittens | Central Agricultural Station<br>Mon Repos<br>East Coast Demarara<br>Guyana |
| Caleb Pompey | Plant Quarantine Division<br>Ministry of Agriculture<br>Guyana |

## HAITI

| | |
|---|---|
| Sainphor Balthazar | Service Recherche Agricole<br>Port-au-Prince<br>Haiti |

## JAMAICA

| | |
|---|---|
| Gleemore Knight | Ministry of Agriculture<br>Plant Protection Division<br>Hope Gardens<br>Kingston<br>Jamaica |
| Jascintha Simpson | Plant Protection Division<br>Ministry of Agriculture<br>Hope Gardens<br>Jamaica |

## ST. KITTS

| | |
|---|---|
| Ireta Joseph | Department of Agriculture<br>La Guerite<br>Basseterre<br>St. Kitts |

## ST. LUCIA

| | |
|---|---|
| Guy Mathurin | C/o Union Agricultural Station<br>Ministry of Agriculture<br>Castries<br>St. Lucia |

## SURINAME

| | |
|---|---|
| Sardjoesharan Persad | Afdelmg Plantenbescherming<br>Kankanbriestraat No. 9<br>P.O. Box 160<br>Paramaribo<br>Suriname |
| Harryson Tevrade | Plant Quarantine Inspector<br>Department of Agriculture<br>Paramaribo<br>Suriname |

## TRINIDAD AND TOBAGO

| | |
|---|---|
| Mohasan Aziz | Plant Quarantine Division<br>Ministry of Agriculture<br>Trinidad and Tobago |
| Emmanuel Charles | Plant Quarantine Division<br>Ministry of Agriculture<br>Trinidad and Tobago |
| Churaman Omadath | Plant Quarantine Division<br>Ministry of Agriculture<br>Trinidad and Tobago |
| Antonio Prevatt | Plant Quarantine Division<br>Ministry of Agriculture<br>Trinidad and Tobago |
| Patrick Ragoo | Department of Crop Science<br>Faculty of Agriculture<br>University of the West Indies<br>Trinidad and Tobago |
| Ragoobir Singh | Plant Quarantine Division<br>Ministry of Agriculture<br>Trinidad and Tobago |

The IICA Programme also collaborated with the Food and Agriculture Organization of the United Nations in a training programme in St. Lucia from August 26 - 31, 1984 and assisted in training the following Plant Quarantine Inspectors.

## ANTIGUA AND BARBUDA

| | |
|---|---|
| Evans Bennett | Agricultural Extension Officer<br>Agricultural Extension Division<br>Kentish Road<br>Antigua and Barbuda |

## BARBADOS

| | |
|---|---|
| Simon Henry | Entomological Assistant<br>Ministry of Agriculture<br>Graeme Hall<br>Christ Church<br>Barbados |

## DOMINICA

| | |
|---|---|
| Wilfred Dyer | Plant Quarantine Officer<br>Post Office Portsmouth<br>Commonwealth of Dominica |
| Marvin Mason | Plant Quarantine Officer<br>Lyon's Estate<br>Marigot<br>Commonwealth of Dominica |

## GRENADA

| | |
|---|---|
| Winston Alexander | Agricultural Assistant<br>Ministry of Agriculture<br>St. George's<br>Grenada |

## ST. CHRISTOPHER & NEVIS

| | |
|---|---|
| Earl Thomas | Agricultural Assistant<br>Department of Agriculture<br>Basseterre<br>St. Christopher and Nevis |

## ST. LUCIA

| | |
|---|---|
| Dunley Auguste | Crop Protection Unit<br>Research Division<br>Ministry of Agriculture<br>St. Lucia |
| Floyd Alexander | Agricultural Assistant II<br>Ministry of Agriculture<br>St. Lucia |
| Luicus Alexander | Agricultural Assistant II<br>c/o Ministry of Agriculture<br>Castries<br>St. Lucia |
| Calistus L. George | Agricultural Assistant<br>Bath Plant Propagation Station<br>Soufriere<br>St. Lucia |
| Gillian A. James | Agronomist<br>Union Research Station<br>Ministry of Agriculture<br>Castries<br>St. Lucia |
| Quene Bernard James | Agricultural Assistant<br>Beausejour Plant Propagation Station<br>Vieux Fort<br>St. Lucia |
| George Squires | Agricultural Assistant<br>Ministry of Agriculture<br>St. Lucia |

## ST. VINCENT AND THE GRENADINES

| | |
|---|---|
| Sylvester Lynch | Agricultural Instructor<br>c/o Ministry of Trade, Agriculture and Industry<br>Kingston<br>St. Vincent and the Grenadines |

## SURINAME

| | |
|---|---|
| Johannus Hardaw Tapsi | Plant Quarantine Officer<br>Ministry of Agriculture, Husbandry, Fishery and Forestry<br>Welgedacht B. No. 34 District<br>Suriname |

In addition to the above, the programme facilitated training of two Plant Quarantine Inspectors (Mr. Sherwin Lewis and Mr. Stephen Gopaul), in the detection of pests in containerised cargo (U.S.A and Puerto Rico. 1983) and trained one Plant Quarantine Inspector (Mr. Stephen Gopaul) in fumigation procedures in Puerto Rico.

## 3.3 Establishment of a Regional Plant Protection Newsletter

The Newsletter was designed to facilitate communication among plant protection personnel in the region and disseminate recent research findings. Four editions of the Newsletter were produced. Four hundred and fifty copies of each Newsletter were distributed to individuals and organizations throughout the region. The general response has been one of satisfaction and suggestions for improvement. The publication is generally considered as filling a most important need in plant protection. Copies of the four editions are included as appendix two.

## 3.4 Production of a Bibliography of Plant Disease Investigations in the Caribbean from 1880 - 1980

This publication which contains references to over 3,000 publications on plant disease work in the Caribbean, is intended to serve as a reference source for Plant Pathologists, Nematologists, Agronomists, Research Students and other persons interest in agriculture in the Caribbean.

The Bibliography covers all aspects of plant diseases and their control, including diseases caused by Fungi, bacterial, viruses and nematodes. The geographic area covered by the references includes all the territories of the Commonwealth Caribbean. The material covered by the Bibliography dates from the 1880's to 1980.

The entries were compiled mainly from primary sources, many of which have not been indexed previously. It would be impossible to list all the titles searched; however, the main sources of information were Agricultural News, Tropical Agriculture, West Indian Bulletin, The Journal of the Jamaica Agricultural Society, the Journal of Agricultural Society of Trinidad and Tobago, and the Annual Reports and Publications of the Departments and Ministries of Agriculture throughout the region. The Secondary sources included regional bibliographies on agriculture and related topics and computerised literature searches of the Commonwealth Agricultural Bureau data bases.

## 3.5 Preparation of a Book on Plant Disease Diagnosis

This 39 page booklet was prepared by the Specialist to provide Plant Protection personnel with an introductory handbook for the practical study of plant diseases. The book outlines the basic steps, facilities and procedures which are necessary for the accurate diagnosis of plant diseases.

This publication is especially valuable to students who are being introduced to Plant Pathology for the first time, to give them the rudimentary principles and techniques which are required for plant disease diagnosis.

## 3.6 Preparation of Guidelines for the Harmonization of Pesticide Legislation

A meeting to discuss the harmonization of pesticide legislation in the Caribbean was held in Trinidad and Tobago from 2nd August to 5th August, 1983. The meeting had as its objectives:

- to examine and analyse the concepts of pesticide legislation and considered laying the foundation for standardized requirements on pesticide safety and pesticide registration;

- to become familiar with measures currently in operation and to recommend others for standardizing the diverse requirements for pesticide use;

- to provide guidelines to those countries that need to enact legislation to regulate the use of guidelines, norms and technical procedures (chemical, analytical, biological, toxicological);

- to examine the status of establishment or acceptance of the maximum residue levels of pesticide (tolerances) in food in each country;

- to analyse the environmental impact of the large scale application of pesticides in the Caribbean;

- to stimulate training in pesticide registration procedures and in the safe and efficient use of pesticides.

Forty-five delegates from throughout the Caribbean and from regional and international organizations attended the meeting.

The meeting recommended, among other things, that the Pesticide and Toxic Chemicals Act of Trinidad and Tobago should be used as a model in the formulation of regional pesticide legislative actions. Follow-up action to this is now being taken in the development of a regional training programme in pesticide safety in collaboration with the World Bank and the University of Miami, School of Medicine. A 263 page document has been prepared as a result of the meeting.

## 3.7 Training in Integrated Pest Management

In collaboration with CARDI, the University of the West Indies, Faculty of Agriculture and the Consortium for International Crop Protection (CICP) a two week training programme on Integrated Pest Management was held

at the Faculty of Agriculture, University of the West Indies, St. Augustine, Trinidad from August 10th-21st, 1981. The seminar was attended by 21 participants from 13 countries in the region and together with participants from Trinidad and Tobago there was an average daily attendance of 35 persons. Lecturers were drawn from the Consortium for International Crop Protection, the University of the West Indies, Ministry of Agriculture of Trinidad and Tobago, the Commonwealth Institute of Biological Control, the Caribbean Agricultural Research and Development Institutes, Caroni Limited and IICA. The course dealt with the basic concepts of integrated pest management and their application to the solution of pest and disease problems of crops grown in the Caribbean. While most participants expressed a high level of satisfaction with the training programme, it was the opinion of all that a more sustained effort and long-term training in this area was necessary. Certificates were presented at the end of the course.

Those who participated in this course are as follows:

| | |
|---|---|
| Muhammad Munir Alam | Entomologist<br>Sugar Technology Research Unit<br>Edgehill, St. Thomas<br>Barbados |
| Porfirio Alvarez | Calle Ira No. 24 Urb<br>Las Avenidas, Santo Domingo<br>Republica Dominica |
| Carl S. Barfield | Associate Professor<br>Department of Entomology and Nematology<br>Building 175<br>University of Florida<br>Gainesville<br>Florida, U.S.A. 32611 |
| S. Batterby | Caroni Research Station<br>Carapichaima<br>Trinidad |
| Peter Bell | c/o Ministry of Agriculture<br>Graeme Hall<br>Christ Church<br>Barbados |

| | |
|---|---|
| F.D. Bennett | Commonwealth Institute of Biological Control<br>Gordon Street<br>Curepe<br>Trinidad |
| Sham Bissessar | c/o Caroni (1975) Limited<br>Agricultural Services Department<br>Waterloo<br>Trinidad |
| C.W.D. Brathwaite | Regional Plant Protection Specialist<br>Inter-American Institute for Cooperation on Agriculture<br>Port of Spain<br>Trinidad |
| Claude A.A. Browne | c/o Department of Agriculture<br>P.O. Box 272<br>The Grove<br>Plymouth<br>Montserrat |
| Kenneth U. Buckmire | Entomological Toxicologist<br>CARDI<br>c/o Ministry of Agriculture<br>St. George's<br>Grenada W.I. |
| Rosenda Bustamante | Bureau of Plant Industry<br>Malate, Manilla,<br>Phillipines<br>c/o Commonwealth Institute of Biological Control<br>Gordon Street<br>Curepe<br>Trinidad |
| Donald Calvert | CICP<br>2288 Fulton St. Suite 310<br>Berkeley<br>California 94704<br>U.S.A. |
| Bill Clarke | Agricultural Manager<br>Geo. F. Huggins & Co. Ltd.<br>South Quay<br>Port of Spain<br>Trinidad |
| Hannan Clarendon | Crop Protection Officer<br>Division of Agriculture<br>Botanic Gardens<br>Roseau<br>Dominica W.I. |

| | |
|---|---|
| M.J. Cock | Commonwealth Institute of Biological Control<br>Gordon Street<br>Curepe<br>Trinidad |
| L. Cross | Ministry of Agriculture, Lands & Food Protection<br>Chaguaramas Agriculture Development Project<br>Trinidad |
| W. Des Vignes | Research Entomologist<br>Caroni Research Station<br>Carapichaima<br>Trinidad |
| David Dolly | Department of Agricultural Extension<br>Faculty of Agriculture<br>U.W.I.<br>Trinidad |
| A.F, Donelan | Agronomist<br>Caroni Research Station<br>Carapichaima<br>Trinidad |
| Fabian Edman | Plant Protection Officer<br>Ministry of Agriculture<br>Kingston 6<br>Jamaica |
| Richard L. Farnsworth | USDA/ERS/NRED<br>500 12th Street, Room 408<br>Washington D.C. 20009<br>U.S.A. |
| Eustace L. Glasford | c/o Department of Agriculture<br>Springfield<br>Basseterre<br>St. Kitts, W.I. |
| Tyrone J. Gopee | c/o Caroni Research Station<br>Waterloo Road<br>Carapichaima<br>Trinidad |
| Flores D. Griffith | Crop Protection Officer<br>Union Research Station<br>Ministry of Agriculture<br>St. Lucia, W.I. |
| Reginald Griffith | Red Ring Research Division<br>Ministry of Agriculture, Lands & Food Production<br>Centeno via Arima P.O.<br>Trinidad |

| | |
|---|---|
| Mona T. Jones | Central Experiment Station<br>Ministry of Agriculture,Lands & Food Production<br>Centeno via Arima P.O.<br>Trinidad |
| Jean-Robert Leger | (IICA) Institute Inter-American des Sciences Agricoles del 'Oea en Haiti Pour le Department del 'Agriculture des Resources naturelles et du development rural (DARNDR)<br>Port au Prince<br>Haiti |
| Sylvester Lynch | P.O. Box 779<br>Kingston<br>St. Vincent, W.I. |
| Raymond C. Mahadeo | c/o Caroni Research Station<br>Waterloo Road<br>Carapichaima<br>Trinidad |
| G. Cynthra Persad | Plant Pathology Department<br>Central Experiment Station<br>Centeno via Arima P.O.<br>Trinidad |
| G.V. Pollard | Department of Biological Sciences<br>The University of the West Indies<br>St. Augustine<br>Trinidad |
| Garth L. Rajnauth | Department of Plant Pathology<br>Central Experiment Station<br>Centeno via Arima P.O.<br>Trinidad |
| Janice Reid | c/o CARDI<br>P.O. Box 113<br>University Campus<br>Mona, Kingston 6<br>Jamaica W.I. |
| Gale Richardson | Red Ring Research Division<br>Ministry of Agriculture, Lands & Food Production<br>Centeno via Arima P.O.<br>Trinidad |
| Merolyn Rodrigues | Entomology Unit<br>c/o Ministry of Agriculture & Supply<br>Long Street<br>St. John's<br>Antigua, W.I. |

| | |
|---|---|
| Lois Vincent-Sealy | Department of Biological Sciences<br>The University of the West Indies<br>St. Augustine<br>Trinidad |
| A.K. Sinha | Central Agricultural Station<br>Mon Repos, East Coast Demerara<br>Republic of Guyana |
| J. Suah | c/o CARDI<br>P.O. Box 113<br>University Campus<br>Mona, Kingston 6<br>Jamaica, W.I. |
| Kelvin Swanston | c/o Department of Agriculture<br>Charlestown<br>Nevis, W.I. |
| George Teetes | Department of Entomology<br>Texas A & M University<br>College Station, Texas 77843<br>U.S.A. |
| Daniel P.T. Thompson | Chaguaramas Agriculture Development Project<br>Ministry of Agriculture, Lands & Food Production<br>Trinidad |
| Reginald A. Thompson | c/o Central Agriculture Station<br>Ministry of Agriculture<br>Mon Repos, East Coast Demerara<br>Republic of Guyana |
| William Washington | Agricultural Department<br>Caroni (1975) Limited<br>Usine Ste Madeleine<br>Trinidad |
| Florence A. Young | Plant Protection Division<br>Ministry of Agriculture<br>Hope, Kingston 6<br>Jamaica |

## 3.8 Establishment of a Society for Plant Protection in the Caribbean

A Society for Plant Protection in the Caribbean was identified by the Heads of Plant Protection as one of the mechanisms which could assist in the coordination and harmonization of plant protection activities in the region. IICA assisted in the establishment of the Society for Plant Protection in the Caribbean at the second Regional Meeting of Plant Protection in Latin America and the Caribbean held in Mexico City in October 1980. The Society has as its objectives:

- to strengthen inter-governmental and inter-institutional cooperation in plant protection in the Caribbean;

- to establish a forum for the discussion of plant protection issues affecting Caribbean Agriculture;

- to act as a forum for the exchange of ideas and information among plant protection personnel in the Caribbean;

- to promote and stimulate research and teaching in plant protection subjects, viz, Entomology, Plant Pathology, Weed Science, etc. and to ensure that these are integrated into the discipline of plant protection;

- to stimulate discussion and actions to ensure that the Caribbean environment remains free from contamination by pesticides;

- to carry out all other activities which may be associated with preserving the plant genetic resources of the Caribbean from destruction by pests and diseases as may be defined by the Executive Committee.

The Society has held two meetings so far. In 1981 it met in Jamaica and discussed urgent plant pests and disease problems in the Caribbean. In 1983, it met in Trinidad and Tobago and discussed the harmonization of pesticides legislation in the Caribbean. The Society now has 121 members in the Caribbean. A document describing the society has been prepared.

## 3.9 Assistance to the Food and Agriculture Corporation of Trinidad and Tobago

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 corporating 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 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 on technical matters, the Corporation sought the assistance of IICA through its national office in Trinidad and Tobago to evaluate the incidence of pest 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. The study was carried out during the month of May, 1983.

The following are the conclusions and recommendations:

a. 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.

b. Panama disease is present and therefore only Cavendish types of banana which are tolerant to Panama disease should be grown.

c. Serious considerations should be given to the establishment of about 4.0 ha (approximately 10 acres) 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.

d. 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 to the crop; (b) reduce production costs; (c) reduce the risk of disease spread; and (d) assist the establishment of a disease management strategy.

e. 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 planting should be governed to some extent by the amount of disease-free planting material available at any one time and not by the consideration of rapid expansion of the enterprise.

f. 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.

g. The control of leaf spot will be necessary in the commercial production of the crops. 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.

h. The existing practice of leaving whole stems in the field should be discontinued. These should be cut into pieces to limit the build up of banana borer.

i. 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.

j. A training programmes in pest and disease management of banana should be implemented soon for banana workers at the Orange Grove National Sugar Company.

k. A nematode survey of the area should be carried to assess the need for nematode control in commercial production.

## 3.10 Assistance to Jamaica in the establishment of a Surveillance System for Mediterranean Fruitfly

Mr. E.L. Ayers and Ing. J. Reyes were contracted by IICA to assist Jamaica in setting up a system for the early detection of Mediterranean Fruitfly. This assistance was provided at the request of the Ministry of Agriculture. The following activities were carried out by the Consultants:

1. Ministry of Agriculture personnel were trained in Mediterranean Fruitfly trapping procedures.

2. 110 Jackson traps were installed between September 23-26 around sea ports, airports, population centres and along major highways circling the island.

3. Observation was made as to host availability and desirability of climate in Jamaica and it was determined that Jamaica has an ideal climate for rapid reproduction and that preferred hosts such as Tropical almond, star apple, guava and oranges are well distributed throughout the island.

4. The 110 Jackson traps previously installed were inspected September 28-29 with negative findings indicating apparent freedom from Medfly infestation in Jamaica. However, trapping over six months will be needed to confirm this since populations vary greatly depending upon the season.

5. A seminar on Medfly was presented with the participation of the Ministry of Agriculture, Customs and Public Health Officials.

6. A four part document was prepared giving a brief history of Medfly invasion in Central and North America trapping techniques, trapping recommendations and technical diagrams.

Based upon the activities carried out and observations made during this mission the following recommendations were made:

a. The Ministry of Agriculture should give full support to quarantine efforts to keep the Medfly from entering Jamaica.

b. The Ministry of Agriculture should provide necessary manpower, trapping supplies, and vehicles in order to be able to detect Medfly at the earliest possible moment should it breach your quarantine barriers.

c. The Ministry of Agriculture should extend the trap lines established September 23 - 16 as outlined in the attached document at a high level (1048 traps).

d. One person (such as Mr. Williams or Mr. Rhodes) should be designated to oversee the trapping operation training, and be responsible for identification procedures.

e. The Ministry of Agriculture should plan steps to be taken if Medfly is detected in Jamaica. This implies:

1. that the library should obtain and maintain up-to-date information on Medfly, eradication programmes;

2. sending a professional employee to gain experience in determining infestations, fruit sampling, applications, establishment of domestic quarantines etc.;

3. stocking sufficient trapping supplies and chemicals to respond immediately to an infestation.

## 3.11 Assistance to Grenada in the Control of Thrips of Cocoa

Thrips have been recognized as a severe problem in cocoa production in Grenada. The Government sought the assistance of IICA and Dr. Eslie Alleyne, Entomologist, was contracted by IICA to provide technical assistance in Grenada. Dr. Alleyne's recommendations for the control of thrips in Grenada have been taken seriously by the Ministry of Agriculture authorities and the Chief Plant Protection Officer has now been seconded to Grenada Cocoa Association to manage the thrips problem on full time basis.

## 3.12 Technical Assistance to Haiti in Control of Smut of Sugarcane and Lethal Yellow Disease

Information on the methodology for screening sugarcane plants for resistance to smut disease was provided to Haitian authorities. This resistance was provided by the specialist on the basis of his experience with sugarcane smut and information obtained from Caroni Limited, Trinidad and Tobago. In addition, arragements were made for Haitian authorities to visit Jamaica to obtain first hand information on the control of lethal yellowing diseases of coconuts.

## 3.13 Technical Assistance to Jamaica in the Detection of Potato Viruses

The Director of Plant Protection in Jamaica, Mr. Walter VanWhervin visited the International Potato Center, Lima, Peru from February 22-26, 1982 to obtain information and observe techniques for the detection of viruses in potato. The director also participated in the Bicentennial Congress on potato in the year 2000.

## 3.14 Technical Assistance to Trinidad and Tobago in the Detection of Pests and Disease in Containerized Cargo

Two officers of the Plant Quarantine service of Trinidad and Tobago visited the ports of New York, U.S.A. and San Juan, Puerto Rico during the week August 15-21, 1982 for training in the detection of pests and diseases in containerised cargo. The training was carried out by personnel of APHIS.

## 3.15 Technical Assistance to Guyana and Jamaica on Pesticides

Arrangements were made for delegates from Jamaica and Guyana to attend a meeting on pesticides held in Mexico in March, 1982.

## 3.16 General Technical Assistance

During the period, the Plant Protection Specialist provided assistance and service which does not normally depend on official requests.

These include:

a. Technical assistance to the Plant Protection Division, Ministry of Agriculture, Jamaica on the design and analysis of plant protection experiments.

b. Suggestions for strengthening plant quarantine in Guyana.

c. Diagnosis of diseases of sugarcane in Haiti.

d. Suggestions for studies on yellow spot disease of sugarcane, Caroni Limited Trinidad and Tobago.

e. General advice to Plant Protection Personnel in the region on quarantine and other problems.

## 3.17 An analysis of Plant Quarantine Systems in the Caribbean

The Regional Plant Protection Specialist and Mr. John Thaw, Section Leader, International Training Section of the Animal and Plant Health Inspection service of U.S.D.A. visited Barbados, Grenada, Guyana, Jamaica and Trinidad and Tobago in May, 1982 and observed the plant quarantine systems in these islands as a basis for preparation of the first course for plant quarantine Inspector in the region.

The plant quarantine systems in Barbados, Grenada, Guyana, Jamaica and Trinidad and Tobago were examined as a basis for assisting these systems by the presentation of regional course. The systems vary considerable from a situation in Grenada where plant quarantine is almost non-existent to Barbados where the system seem to function reasonably well. All the systems suffer from the following deficiencies:

1. Poor record keeping.
2. Untrained Inspectors.
3. Outdated legislation.
4. Lack of facilities, including books and microscopes.
5. And except for Trinidad and Tobago, lack of an adequate number of personnel.

All Plant Quarantine Inspectors endorsed the organization of a regional plant quarantine course. As a result of the analysis which was carried out the curriculum for the regional course was developed.

## 3.18 Exchange Visits

### 3.18.1 Heads of Plant Protection in Barbados visits Trinidad and Tobago

As part of the communication process, the programme initiated the exchange of technical personnel between countries of the region. Dr. E.H. Alleyne, Head of Plant Protection, Barbados, visited Trinidad from June 1-5th, 1981. The objectives of this visit was to observe Afro-Brazilian bees and Frog-hopper in Trinidad.

The Ministry of Agriculture, Lands and Food Production in Trinidad and Tobago welcomed Dr. Alleyne's visit and arranged a programme for his stay. Dr. Alleyne noted in his report that the visit was worthwhile and that it clearly indicated that there was much relevant information in the region which was not disseminated. In addition to seeing Africanized bees and frog-hopper, Dr. Alleyne was able to hold useful dialogue with entomologists in Trinidad at the University of the West Indies and CARDI.

### 3.18.2 Head of Plant Protection of Guyana visits Trinidad and Tobago, St. Lucia and Grenada

Mr. F.D. McDonald, Head of Plant Protection in Guyana was sponsored by the programme to visit Trinidad and Tobago, St. Lucia and Grenada from May 8 to 19th, 1983 to assess the incidence of Moko disease in these areas and to hold discussions with plant protection personnel in the three countries. Mr. McDonald provided useful recommendations on the control of Moko disease in Trinidad and Tobago and Grenada and suggested strategies for keeping the disease out of St. Lucia.

### 3.18.3 Head of Plant Protection in Jamaica visits Peru

The programme facilitated the visit of Mr. Walter VanWhervin, Head of Plant Protection of Jamaica to Lima, Peru for consultations with scientists at the International Potato Centre on the detection of virus disease in potato. Mr. VanWhervin also attended an International conference on potato in the year 2000. This visit took place from February 22-26, 1982.

### 3.19 Meeting to discuss Ethylene Dibromide as a Post-harvest Fumigant

The Plant Protection Programme of the Inter-American Institute for Cooperation on Agriculture (IICA) convened a Working Group of Research Scientists from Latin American countries and U.S. actions to restrict the use of the pesticide "Ethylene Dibromide" (E.D.B.) on citrus and tropical fruits

in and entering the United States and to develop recommendations for research plans for alternative post-harvest quarantine treatments. Research officials from Brazil, Costa Rica, Guatemala, Jamaica, Mexico, Panama, Saint Lucia and Trinidad and Tobago, met with experts from the Environmental Protection Agency (EPA), the Department of Agriculture of the United States (USDA) and the U.S. Agency for International Development (AID).

During the meeting, EPA Officials outlined the reasons for the Agency's decisions to phase down residue levels of E.D.B. in domestic and imported citrus fruits and papaya that will lead to a zero tolerance level by September 1st, 1984 and to delay action temporarily on mangoes and a few other tropical fruits and vegetables awaiting additional information.

The U.S.D.A. Representative discussed U.S. quarantine requirements and reviewed the status of and research information available on alternative quarantine treatments for papayas, mangoes, and citrus fruits. AID Officials outlined measures the agency is undertaking and considering for assisting countries in the development of alternative treatment approaches. Research officials from Latin American countries described their countries plans for exporting fruit products; treatment alternative and the impact E.D.B. restriction would have on them.

The experts discussed the research on alternative treatment methods and recommended additional research that was needed for the development of post-harvest quarantine treatments. These include short-term methods for reducing E.D.B. residue, chemical alternatives such as Gamma irradiation. Follow up action to this meeting is now being planned.

## 3.20 A Report on the Economic Impact of Moko Disease on the Economy of Grenada

A study on the economic impact of Moko disease on the economy of Grenada was carried out by Dr. Gene Pollard of the University of the West Indies for the Plant Protection Programme.

Moko disease of banana has been reported for the English-speaking Caribbean for nearly 150 years being first described in Guyana. Trinidad until recently was the only other English-speaking country with the disease. This distribution pattern changed with the discovery of Moko in Grenada in 1978 (Cronshaw and Edmunds, 1980) although there is the view that the disease may have been present in the island for at least two or three years prior to this discovery.

The discovery of Moko, a most serious disease of bananas, is of great concern not only for Grenada but also the other Windward Islands (St. Vincent, St. Lucia, and Dominica) since banana contribute significantly to foreign exchange earnings of these islands - approximately 30 percent of GDP in Grenada. In Guyana losses due to Moko disease have been put at between 10-40 percent (McDonald, 1982) while Small (1982) suggests that Moko may have been the major contributory factor for the decline of the banana industry in Trinidad. Losses in Central and South America are also quite significant.

Since the discovery of the disease in Grenada in 1978 there has been a concerted and fairly sustained attempt at eradication especially since the disease was initially confined to a small area of 4.9 $km^2$ in the North-East parish of St. Patricks, however, by 1980, pockets of diseased plant were identified in four of the six parishes, all in the upper two-thirds of the island. These included, in addition to St. Patricks, St. Mark, St. John, and St. Andrews (Small, 1982).

The status of the disease in Grenada and early attempts at developing and implementing a strategy for eradication have been well documented by Small while Ambrose has outlined the various problems associated with the eradication programme. Since the period covered by these reports (February 1978-July 1981) the eradication programme in Grenada has been modified and extended. The programme was initially funded by the Food and Agriculture Organisation (FAO) of the United States for a 12 month period up to July 1981. At the end of this period the programme was seriously disrupted due to lack of funding. The Grenada Banana Co-operative Society attempted to fill the breach for a six month period up to October 1982. From November 1982, however, a new phase of

the eradication programme was initiated with the aid of funding from the European Development Fund (EDF) and this phase is scheduled to run for an 18 month period.

This report attempts to assess the economic impact of moko disease in Grenada since the first discovery in 1978. While it has been possible to obtain direct cost inputs for major aspects of the eradication programme and even in some instances to arrive at certain indirect costs by some extrapolation there are other factors which are difficult to cost given the available time for this study. These are indicated in the body of the report. The report concludes that the disease has costed Grenada about 5 million E.C. Dollars so far and will not be easily eradicated.

## 3.21 An Analysis of Seed Pathology Training and Research Needs in the Caribbean

Dr. S.B. Mathur, Director of the Danish Institute of Seed Pathology for Developing Countries in Denmark visited the Caribbean from May 14 - June 3rd 1983, at the invitation of the Plant Protection Programme and carried out an analysis of the current state of seed pathology in five countries of the region. Dr. Mathur visited Barbados, Guyana, Jamaica, Suriname and Trinidad and Tobago. As a result of his visit Dr. Mathur made the following recommendations:

### 3.21.1 Teaching and Research

Seed Pathology should be introduced in the curriculum of B.Sc. degree in Agriculture as part of Plant Pathology Courses at the Campuses of St. Augustine, Trinidad and Kingston, Jamaica. Students must be encouraged to take up research on seed-borne diseases of economically important crops of the Caribbean Region at Masters and Ph.D levels.

### 3.21.2 Seed Production and Certification

Seed crops must be examined for seed-borne diseases in seed production programmes. Tolerances for seed-borne diseases should be established for accepting and rejecting seed crops. Harvested seed must be examined for seed-borne infections of important pathogens using internationally accepted seed health testing methods.

### 3.21.3 Plant Quarantine

a. There is an immediate and urgent need for introducing legislation in the Caribbean countries in order to provide a framework for restricting spread of pests and diseases by seeds. To achieve this it is proposed that an ad-hoc committee of scientists and administrators be convened to draw up a list of those pests and diseases transmitted by seed which exists in the region and of those which are exotic and can become a threat to agriculture and horticulture of the region. This committee could be convened under the auspecies of IICA with technical assistance from local and foreign experts.

b. Plant Quarantine Laboratories must be equipped to carry out seed health testing for bacteria, fungi, nematodes and viruses, as well as with post-entry quarantine facilities for raising plants in glasshouses and isolation plots.

c. It is proposed that a two to three weeks course in seed pathology should be organized for the Caribbean countries in 1985. This course should be conducted under the umbrella of IICA in cooperation with the National Plant Protection and Plant Quarantine Organizations of the Caribbean countries, with professional help from the scientists, of the Danish Institute of Seed Pathology for Developing Countries, Copenhagen, Denmark. The proposed course should be run on similar lines as the FAO/DANIDA Seminar on Quarantine for Seed

for Developing Countries in Africa and Asia, which was held in New Delhi, India during 19 September to 2nd December 1980. (See Appendix 2).

### 3.21.4 Symposium

A symposium on Seed Pathology for the Caribbean Region should be held late 1984, with the help of National and Regional Plant Protection Organizations, IICA and the Danish Government Institute of Seed Pathology for Developing Countries, to focus attention on the problems of Seed Pathology in the Caribbean. Representatives of the Ministry of Agriculture, governmental and private seed production agencies, seed testing scientists and technicians, plant pathologists belonging to different agricultural organizations and plant quarantine inspectors should be invited.

### 3.21.5 Training

Scientists and technicians who will be responsible for carrying out seed pathological work at Universities, research institutions, seed production programmes, seed testing and plant quarantine should be trained in seed pathology.

### 3.21.6 Achievements

As a result of Dr. Mathur's visit to the Caribbean, two scientists from the region have recently been trained in seed pathology at the Danish Institute for Seed Pathology in Developing Countries.

## 3.22 Pests Risks Associated with the Movement of Agricultural Produce in the Caribbean

A study to determine the pest risks associated with the movement of agricultural produce in the Caribbean has been initiated. Dr. Pollard, entomologist of the University of the West Indies, prepared a preliminary study on the pests risks associated with the movement of agricultural produce via the inter-island schooner trade. A 23 page document was prepared. The study was summarised as follows:

a. Preliminary investigations were initiated on the attendant pest risks associated with the movement of agricultural produce from St. Vincent and Grenada to Trinidad.

b. The concept of a pest risk analysis was first described.

c. There appeared to be no great risk associated with produce entering Trinidad from Grenada and St. Vincent. The fact that there were very few interceptions of insect pests from produce coming from the latter two countries by Plant Quarantine Officers in Trinidad adds support to this view.

d. The greater risk was thought to be more likely the introduction of certain pests and diseases from Trinidad into Grenada or St. Vincent. Tephritid Fruit Flies, *Anastrepha spp.* the sweet potato moth borer, *Megastes grandalis*, Moko disease of bananas and leaf-cutting ants were seen as major threats to Grenada and St. Vincent, all of which could be introduced to these countries from Trinidad via the intra-regional movement of produce.

e. The lack of an adequate 'technical backstop' was identified in Grenada and St. Vincent.

## 3.23 Proposals for an Integrated Pest Management Programme for the Caribbean

The specialist collaborated with scientists from CARDI, UWI and Ministries of Agriculture in the region in preparing documents in support of an integrated pest management programme for the Caribbean. Project documents on the integrated pest management of coffee berry borer, screw-worm, fruitflies and other pests have been prepared. The specialist prepared a document on "A draft project proposal for the development of an integrated pest management information network system for the Caribbean". The documents are being considered by an international aid agency for funding.

## 3.24 Preparation of a Bibliography of Insect Pests of Crops in the Caribbean

A bibliography of insect pests of crops grown in the Caribbean is being prepared by entomologists of the University of the West Indies, the Caribbean Agricultural Research and Development Institute and Ministries of Agriculture in the region. This bibliography should be completed by 1985.

## 4. PUBLICATIONS

1. ALLEYNE, E. A report on a visit to Grenada to advise on the control of cocoa thrips (*Solenothrips rubrocinitus*) on cocoa. 1981. Mimeo 16 pp.

2. ANON. An Investigation of the incidence of pest and disease at Orange Grove National Sugar Company, Port-of-Spain, Trinidad and Tobago, IICA Office, 1983. 13p.

3. ANON. The Society for Plant Protection in the Caribbean. Its Origin, Constitution and current membership. Port-of-Spain, IICA Office, 1982. 19pp.

4. BRATHWAITE, C.W.D. The role of pesticide in food production in the Commonwealth Caribbean. In Seminar and Workshop on Pest and Pesticide Management in the Caribbean, Bridgetown, Barbados, 1980. Proceedings. Bridgetown, USAID, 1980. v.z. pp. 30-38.

5. BRATHWAITE, C.W.D. An introduction to the diagnosis of plant disease. Inter-American Institute for Cooperation on Agriculture. Series Book and Education Materials No. 47. 1981. 49p.

6. BRATHWAITE, C.W.D. Disease of pigeon peas in the Caribbean area. International Crop Research Institute for the Semi-Arid Tropics 1:129-136. 1981.

7. BRATHWAITE, C.W.D. Perspectives for plant protection in the Caribbean. Port-of-Spain, Trinidad and Tobago, IICA Office, 1981.

8. BRATHWAITE, C.W.D.; ALCOCK, M. and SOODEEN, R. A bibliography of plant disease investigations in the Commonwealth Caribbean 1880-1980. Inter-American Institute for Cooperation on Agriculture Miscellaneous Publication No. 328. 1981.280p. (ISSN-0534 -5391).

9. BRATHWAITE, C.W.D. and POLLARD, G.V. The essential role of pest and disease control in crop production in the Caribbean. Agricultural Extension Newsletter (Trinidad and Tobago). 12:32-36. 1981.

10. BRATHWAITE, C.W.D. The challenge for plant protection in the Caribbean in the 1980's and beyond. In Meeting of the Society for Plant Protection in the Caribbean. 1st, Kingston, Jamaica, 1981. Urgent plant pest and disease problems in the Caribbean. Edited by Chelston Brathwaite and Gene Pollard. Inter-American Institute for Cooperation on Agriculture Miscellaneous Publication No. 378. 1982. pp.7-19.

11. BRATHWAITE, C.W.D. Crop protection in the 1980's - an analysis of present alternative technologies. Port-of-Spain, (Trinidad and Tobago). 12:32-36. 1981.

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13. BRATHWAITE, C.W.D. Pest and diseases of onion. In Workshop on Onion Production and Research for the Eighties, Bridgetown, Barbados, 1983. Proceedings. Inter-American Institute for Cooperation on Agriculture Miscellaneous Publication No. 378. 1982. 260p.

14. CARIBBEAN PLANT PROTECTION NEWSLETTER. Vol.1 Nos. 1-4 1981-1984. Edited by Chelston W. D. Brathwaite. Port-of-Spain, (Trinidad and Tobago), IICA Office.

15. Meeting of the Society for Plant Protection in the Caribbean, 1st, Kingston, Jamaica, 1981. Urgent plant pest and disease problems in the Caribbean. Edited by Chelston W.D. Brathwaite and Gene V. Pollard. Inter-American Institute for Cooperation on Agriculture Miscellaneous Publication No. 328. 1982. 260p.

16. Meeting on the Harmonization of Pesticide Legislation in the Caribbean, Port-of-Spain, (Trinidad and Tobago), 1983. Proceedings. Edited by Chelston W.D. Brathwaite. Inter-American Institute for Cooperation on Agriculture Miscellaneous Publication No. 379. 1984. 253p.

17. POLLARD, G.V. The economic impact of Moko disease on the economy of Grenada. Port-of-Spain, (Trinidad and Tobago), IICA Office, 1983. 14p.

18. POLLARD, G.V. 1983. Report on a vist to Grenada, St. Vincent and St. Lucia to investigate the potential pest risks associated with the movement of agricultural produce via the inter-island schooner trade. Report to IICA, Port-of-Spain, Trinidad November 1983. 23pp.

19. SMALL, L.W. The legal framework of plant quarantine systems in the Caribbean.

## 5. FUTURE INITIATIVES

1. Preparation of project proposals for a survey of fruitflies in the Caribbean.

2. Preparation of field guides to plant pests and diseases of importance in the Caribbean.

3. Development of Third Regional Plant Quarantine Training Course.

4. Survey of the incidence of mango seed weevil in the Caribbean.

5. Workshop on the detection of pests and diseases of fruits in the Caribbean.

6. Proposals for a joint meeting of the Society for Plant Protection in the Caribbean and the Organization of Tropical American Nematologists.

7. Establishment of Regional Training Programme in Pesticide Safety.