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Ministry of Agriculture, Lands,
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Windward Islands Banana
Growers' Association



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TECHNOLOGICAL MODERNIZATION OF THE BANANA INDUSTRY IN THE CARIBBEAN

Nov 30 - Dec 2, 1992
Castries, St Lucia

Workshop Proceedings

IICA OFFICE IN ST LUCIA

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**Ministry of Agriculture, Lands,
Fisheries & Cooperatives**



**Windward Islands Banana
Growers' Association**



TECHNOLOGICAL MODERNIZATION OF THE BANANA INDUSTRY IN THE CARIBBEAN

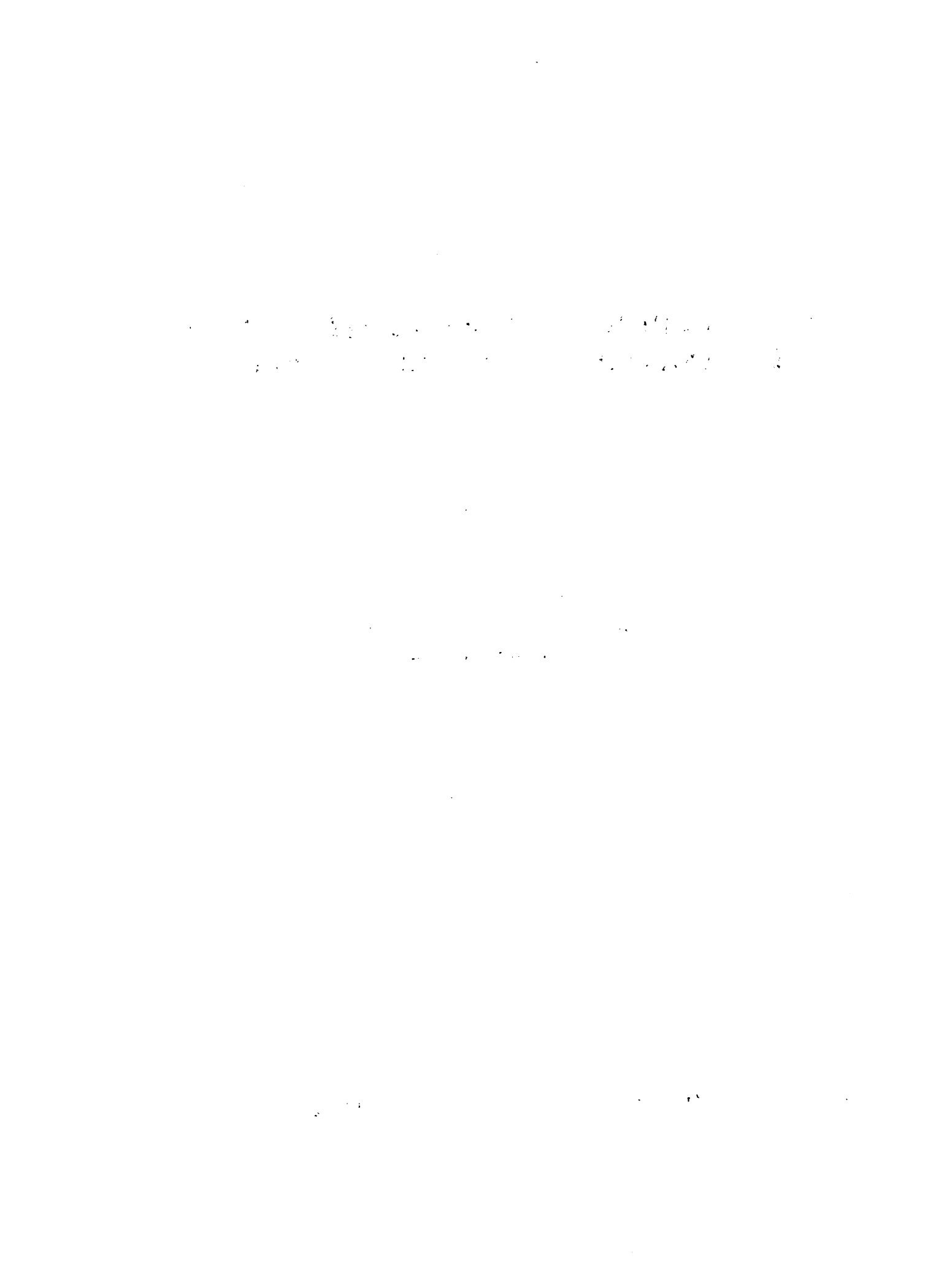
Workshop Proceedings

**November 30 - December 2, 1992
Castries, Saint Lucia**

Compiled by:

**Antonio M Pinchinat
Errol D Reid**

IICA OFFICE IN SAINT LUCIA



The workshop was a cooperative activity jointly organised and undertaken by the Ministry of Agriculture, Lands, Fisheries and Forestry of St Lucia, the Windward Islands Banana Growers Association and the Inter American Institute for Cooperation on Agriculture.

**REPORTS, RESULTS AND RECOMMENDATIONS
FROM TECHNICAL EVENTS SERIES**

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**“The views expressed in signed articles are those of the authors
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ACRONYMS AND ABBREVIATIONS

BGA	Banana Growers' Association
CBEA	Caribbean Banana Exporters Association
CARDI	Caribbean Agricultural Research and Development Institute
EO	Extension Officer
IICA	Inter-American Institute for Cooperation on Agriculture
MOA	Ministry of Agriculture
R/D	Research and Development
UWI	University of the West Indies
WINBAN	Windward Islands Banana Growers' Association

**I. SUMMARY OF TECHNOLOGICAL AND
NON-TECHNOLOGICAL ISSUES RAISED**

1. PESTS AND DISEASES

- **Need for more cost effective methods of control**
- **Need to apply integrated pest and disease management approach**
- **Need for external funding to carry out breeding and crop requirement**
- **Need to develop and use pesticides from natural sources**

2. WATER

- **Inadequate Water Supply**
 - **need to apply irrigation for low rainfall areas or periods**
 - **need to develop national water supply projects for storage and delivery of water to banana farmers**
- **Flooding, water logging, and related unfavourable conditions**
 - **need to apply proper (cost effective) drainage and to undertake research development on soil and water management**

3. PLANT NUTRITION

- **Need to refine fertilizer recommendations through validation and modification under local conditions**
- **Need to examine interaction between soils, rainfall, terrain**

4. FRUIT QUALITY

- **Need to reduce**
 - **high rejection rates resulting from**
 - **peel rot**
 - **mechanical damage (scarring, burning)**
 - **crown rot**
 - **latex stains**
 - **premature ripening**
 - **underpeel discoloration**
- **Lack of effective quality control/assurance programmes, particularly on farm.**

5. FARM PRODUCTIVITY

- **Need to Improve ratoon rate**
- **Need to extend productive life of plantation**

6. TRANSPORTATION

- **Poor paved road conditions**
- **Unpaved roads**
- **Inadequate transport system to facilitate movement on farm**
- **Inadequate transport handling of fruits**

7. TECHNOLOGY TRANSFER

- **Inadequate technology transfer mechanism**
- **Shortage, lack of trained/qualified Extension Officers (EOs)**
- **Low adoption/acceptance of new technology by farmers**
 - **management of extension systems should include accountability of EOs**
- **Need of environmentally friendly technology**
- **Need to examine who will benefit from the adoption of the technology**
 - **management of the technology by EOs and farmers should be monitored**
- **Extension Officers to be reorientated to take an enterprise management approach in delivering technology.**

8. LAND

- **Tenure**
- **Availability**
- **Management of marginal lands and cultivation on slopes/hillside**

9. LABOUR

- **Insufficient availability**
- **High cost**
- **Low productivity**
- **Poor work ethics**
- **High manual labour need**

10. MECHANIZATION

- **Need to examine cost effectiveness**
- **Need of appropriate technology to suit topography in banana-producing areas**
 - **(eg cableway system within farm)**

11. COMMUNICATION AND LINKAGES

- **Inadequate communication and operational linkages between Researchers, Extension Officers, farmers, and other stakeholders**
 - **need for greater collaboration between banana-based institutions intra and extra-regionally**

12. HUMAN RESOURCES

- **Shortage of qualified human resources for technology research/development and transfer**
- **Frustration of Extension Officers**
- **Insufficient commitment and motivation of Extension Officers**
- **Insufficient management and communication capability of Extension Officers for transferring technology as well as farm management capability to farmers**
- **Insufficient experience of Extension Officers**
 - **need to upgrade qualifications of research/development and technology transfer personnel**
 - **in adequate management skills at all levels in the banana industry**

13. FINANCIAL RESOURCES

- **Inadequate planning in the use of funds**
- **Dwindling of funds at local and international levels**
 - **need to formulate projects properly to seek funding**
- **Need to prioritize assignment of financial resources**

14. OTHER CONSTRAINTS

- **High cost of production**
 - **need to make production systems more efficient**
 - **need to increase yield per unit area so as to maximize profits**
- **Inconsistent supply of inputs**
- **Lack of correlation between supply and demand of bananas**
 - **need to utilize forecasting system**
 - **need for better scheduling of banana production**

II. WORK GROUP DISCUSSIONS AND RECOMMENDATIONS

GROUP A - TECHNOLOGY TRANSFER

1. PROBLEM

1.1 Low level of technology adoption at farm level.

2. PROBABLE MAJOR CAUSES

2.1 Insufficient understanding of farmer goals and perception.

2.2 Low educational levels of farmers.

2.3 Doubtful appropriateness of technology to specific farming systems.

2.4 Insufficient farm management skills and business perception of farmers.

2.5 Inadequate application of the cost/benefit orientation in technology transfer.

2.6 Inadequate database on cost/benefit of technology transferred.

2.7 Wavering recruitment policy implementation affecting Extension Officers.

2.8 Insufficient preparedness of Extension Officers to perform tasks.

2.9 Inadequacy of incentive structures to motivate Extension Officers.

2.10 Insufficient institutional strengthening to recognize the importance of extension in technology transfer.

3. GOALS

3.1 To significantly upgrade the level and managerial capabilities at the farmer level, thereby bringing about greater economic productivity of farms.

4. OUTPUTS

4.1 Greater adoption of technology at farm level, resulting in increased yields, improved quality of product and satisfactory farm income.

4.2 Institutional strengthening of extension organisation and delivery system.

4.3 Establish data collection mechanism to ascertain farm performance and guide farm management.

5. KEY ACTIVITIES

5.1 Farmer training.

5.2 Establishment of demonstration plots.

5.3 Extension staff training to understand farmer and environment.

5.4 Increase number and improve quality of training manuals for farmers.

- 5.5 Introduce farm management system training which includes data collection, analysis and feedback.**
- 5.6 Adapt communication materials to farmer educational level and economic activities.**
- 5.7 Establish incentive mechanism for EOs.**
- 5.8 Provide management training to EOs.**

6. OPERATIONAL STRATEGY

- 6.1 Forge research/extension linkages (collaboration)**
- 6.2 Foster collaboration amongst extension services (eg through joint training, programming, reciprocal visits).**
- 6.3 Conduct performance appraisal of Extension staff, based on results achieved by farmers rather than activities conducted by staff.**
- 6.4 Allocate adequate funding for activities of extension programmes.**
- 6.5 Hold periodic review/planning meetings between key participants at technical and specialist levels, involving: WINBAN, UWI, MOA, BGA, CARDI and other Research/Development (R/D) Institutions, Funding Agencies and IICA.**
- 6.6 Enter Memorandum of Understanding, Cooperation or Collaboration among interested parties, in which institutional responsibilities are clearly defined.**
- 6.7 Capitalize on comparative functional strengths of cooperating parties to achieve banana industry goals, such as:**
 - technology transfer capability of BGAs and MOAs**
 - applied research capability of R/D institutions to supply and adapt cost effective technologies for transfer to producers and processors**
 - training and basic research capabilities of higher education institutions (local and regional), and**
 - funding potential of public and private sector institutions or agencies to spur technological modernization of banana industry in the Caribbean**

GROUP B - TECHNOLOGY RESEARCH/DEVELOPMENT

1. PROBLEMS

- 1.1 Low Productivity Levels**
- 1.2 Unsound Post-Harvest Fruit Quality Management**
- 1.3 Deficient Transportation Systems**

2. PROBABLE MAJOR CAUSES

2.1 Productivity

- 2.1.1 Inadequate selection of planting material (considering primarily genetic, physiological and physical aspects)**
- 2.1.2 Inappropriate fertilizer use practice (composition and quantity)**
- 2.1.3 Poor pests and diseases management**
- 2.1.4 Lack of adequate land/soil/water management practices**
- 2.1.5 Insufficient application of labour-reducing methods**
- 2.1.6 Inadequate input/farm management**
- 2.1.7 Haphazard crop cycle management**

2.2 Post Harvest Fruit Quality Management

- 2.2.1 Fruit handling system, including harvesting, field transport, processing/packaging, shipping and merchandising by wholesalers and retailers are not always implemented in a manner to adequately protect the quality of the product.**

2.3 Transportation System

- 2.3.1 Deficient handling of fruits from farm to dock (including transportation system and at fruit reception centres).**
- 2.3.2 Possible inadequacies in ship-board environment which cause rapid degradation in the quality of fruit.**

3. GOAL

- 3.1 To increase banana fruit yield and improve export quality.**

4. OUTPUTS

- 4.1 More effective and efficient management of pests and diseases, including especially, black and yellow sigatoka.**
- 4.2 Generation of pesticides from natural products.**
- 4.3 Generation of resistant varieties through breeding, including the application of novel biotechnologies.**
- 4.4 Improved irrigation/drainage management.**
- 4.5 Designing and application of improved soil and water conservation measures.**
- 4.6 Localized validation of plant nutrient requirements.**
- 4.7 Improved fruit quality control, covering mechanical damage, under-peel discoloration, peel rot, crown rot and latex staining.**
- 4.8 Improved ratoon rate.**
- 4.9 Improved rationalization of human labour use, considering costs quality and work ethics, output and efficiency.**
- 4.10 Mechanization of some labour-intensive operations.**
- 4.11 Greater availability of trained human resources.**
- 4.12 Greater attention to the planning and programming of technology research and development in an environment of shrinking financial resources.**

5. OPERATIONAL STRATEGY

- 5.1 The Chairman will request the Secretary of the CBEA to place Banana Research Development and Training on the Agenda of the next Committee Meeting of the CBEA.**
- 5.2 Participants in Working Groups and from BGAs will send the results of their deliberations to IICA in order that three (3) project proposals could be formulated.**
- 5.3 Project proposals at 5.2 will be used to solicit funding for individual R&D activities therein by the respective agencies.**
- 5.4 WINBAN and Jamaica Banana Board should move to establish a regional framework for the coordination of banana research in the Region.**
- 5.5 Representatives will communicate to National Leaders the decisions of the Workshop.**
- 5.6 Representatives will communicate to extension agents the decisions of the meeting with respect to improving productivity and marketability of bananas.**

GROUP C - STRATEGIC PLANNING

1. PROBLEM

- 1.1 Inadequate capacity to compete effectively in a free market banana trading environment.**

2. PROBABLE MAJOR CAUSES

2.1 Land

- **Poor quality leading to low yield per acre.**

2.2 Labour

- **Inefficient**
- **High cost**

2.3 Capital

- **High costs of inputs**
- **Unfavourable credit terms**

3. STRATEGY

3.1 Management

3.1.1 Increased level of managerial capability of producers.

3.1.2 Facilitate greater interaction between different stakeholders in the industry, including especially stronger inter-institutional linkages between R/D and higher education entities.

3.1.3 Stress the importance of the industry to the socio-economic well-being of the region.

3.1.4 Reorganize the industry to make it better able to accommodate/respond to changes in the international market place, including supporting a thrust towards agroindustry.

3.1.5 Establish land tenure policies that encourage investment and sustainability (economic viability) of the industry.

3.1.6 Review/formulate statutes that can serve to adequately guide the development of the industry.

3.1.7 Develop technology to reduce the drudgery in banana farming.

3.1.8 Offer incentives that can attract persons to the industry.

3.1.9 Rationalize the internal transport system.

3.1.10 Put in place well-structured monitoring and evaluation mechanisms to guide the comprehensive development of the industry, considering socio-economic and ecologic sustainability.

3.2 Marketing

- 3.2.1 Establish proper control measures over in-land and ex-land transport systems.**
- 3.2.2 Oversee pricing system to improve net income of producers.**
- 3.2.3 Establish and enforce highest quality standards for the marketed product.**
- 3.2.4 Allow production flexibility to cope with changes in market demands.**

III. INAUGURAL ADDRESSES

WELCOME REMARKS

**by
Mr Cosmos Richardson**

**Permanent Secretary, Ministry of Agriculture, Lands, Fisheries and Forestry, Saint Lucia
Minister of Agriculture, Lands, Fisheries and Forestry, Hon Ira d'Auvergne, Managing Director
of WINBAN, Mr Cyril Matthew, Technology Generation and Transfer Specialist, IICA,
Dr Antonio Pinchinat, Members of the Diplomatic Corps, Distinguished Guests, Ladies and
Gentlemen:**

**We are gathered here this morning to witness the official Opening Ceremony of the
workshop on Technological Modernization of the Banana Industry; a workshop which has
seen the collaboration of the Ministry of Agriculture, IICA and WINBAN. All of us here share
one common concern and one objective and that is, the longterm economic survival and
sustainability of the Caribbean Banana Industry in a changing international environment.**

**The Banana Industry in these parts has prospered against a background of specific
economic circumstances and there can be no doubt about the fact that our countries, individually
and collectively, have made numerous strides under these conditions. Unfortunately, as much
as we would have liked those conditions to continue, we have to recognize that we do not live
in a static world.**

**The dynamic nature of the World Economy, and of international commodity markets, of
international trade means that we have to gear ourselves for change; change over which we have
no control, and very little ability to influence. The relative sizes of our economies make us merely
on-lookers in a wider World Market.**

**Nevertheless, we have to respond to these changes if we are at all going to be able to
survive these new circumstances. We have to realize that it is an extremely different ball game,
and we have to strategically place ourselves in a position so that we can adjust to those changes
with the minimum disruption to our agricultural sectors and our economies, generally.**

**And so we are gathered here in a spirit of shared responsibility to coordinate our efforts
in the area of technology and modernizing the Banana Industry; to share our experiences and to
engage in dialogue and finally to map out a strategy that will contribute to the long term
sustainability of the industry. Such sessions are important for the dissemination of information,
for avoiding duplication of effort and for ensuring that we all are moving in the same direction.**

And so it is in this context and against this background, that I have great pleasure in welcoming all of you to this Opening Ceremony and to the Workshop.

I would like, in particular, to welcome our overseas participants, some of whom have travelled long distances to ensure that they are here with us today. This, no doubt, is indicative of the importance that is attached to this workshop. Many of you are not newcomers to our shores, but I would still like to wish all of you a fruitful, productive and enjoyable stay here.

My role from now on would be merely to introduce the main speakers at this Opening Ceremony.

WORKSHOP BACKGROUND

by

Dr Antonio M Pinchinat
Regional Specialist, Technology Generation and Transfer, IICA

Chairman, Mr Cosmos Richardson, Permanent Secretary in the Ministry of Agriculture, Lands, Fisheries and Forestry, Minister of Agriculture, Honourable Ira d'Auvergne, Mr Cyril Matthew, Managing Director WINBAN, Members of the Diplomatic Corps, Distinguished Guests and Participants, Ladies and Gentlemen.

The Ministers of Agriculture from banana-producing countries in Central America and the Caribbean, who met in Costa Rica in March 1992, recommended that IICA should cooperate towards the sustainability of the banana industry by preparing a project to facilitate links in banana technology development and transfer.

In response, the Director General of IICA, Dr Martin E Pineiro, approved a Short-Term Action to promote and support horizontal reciprocal cooperation between Central America and the Caribbean, for technological modernization of the banana industry.

One of the first activities of the Short-Term Action is this Intra-Caribbean Workshop aimed at harmonizing strategies and means to achieve that goal, including external funding to support joint activities.

The Workshop is a cooperative effort undertaken by the Ministry of Agriculture, the WINBAN Research Centre and the IICA Office in Saint Lucia. It gathers banana industry delegates from seven key Caribbean banana-exporting countries, comprising:

- **Belize**
- **Dominica**
- **Grenada**
- **Jamaica**
- **Saint Lucia**
- **St. Vincent and the Grenadines and**
- **Suriname**

They are accompanied by high-level representatives of policy-making, technical, educational and financial institutions or agencies which support technological modernization and socio-economic development of the banana industry in the Caribbean.

The Workshop focuses on the urgent need to ensure marketing competitiveness and financial sustainability of the industry.

It aims at drawing up a common agenda for horizontal reciprocal cooperation in technology research, development and transfer, to improve fruit quality, boost yields and increase income of banana producers.

IICA is pleased to enrol in this effort and stands ready to assist in the implementation of the recommendations that will arise from the Workshop in pursuit of that goal.

ADDRESS

by

**Cyril Matthew
Managing Director, WINBAN
on behalf of CBEA Vice President, Mr Elisha Marquis**

WHAT IS THE CBEA?

When it was first incorporated in 1972, the acronym CBEA meant - "The Commonwealth Banana Exporters' Association". By unanimous agreement, this was changed at its last Annual General Meeting to "The Caribbean Banana Exporters' Association". This change reflected the realities of changes in geographical inter-relationships as the prominence of the British Commonwealth gave way to narrower regional concepts in Europe and the Caribbean.

The members of the CBEA when it was incorporated in 1972, comprised the Windward Islands Banana Growers' Association (WINBAN) and the Jamaica Banana Board (BANBOARD). Its Articles were however, so designed to allow access to membership, if that became necessary, to other English territories and, indeed, even the French Department (DOM) of Martinique and Guadeloupe. The Belize Banana Growers Association, and Surland NV of Suriname were granted full membership in 1979 and 1992, respectively. The Jamaica Banana Exporters Company replaced BANBOARD as the latter's successor-in-title.

The Current members are:

- WINBAN
- The Jamaica Banana Exporters Company
- Belize Banana Growers Association; and
- Surland, NV

The objects of the CBEA are principally:

- to promote, foster, encourage and institute measures for the well-being of the Banana Growers within its membership
- to protect and promote their common interests
- to ensure that members take steps to satisfy (in quantity and quality) the banana requirements of the U.K. market as well as to explore and secure markets for members' bananas.

HOW WELL HAS THE CBEA ACHIEVED THESE OBJECTS?

The CBEA has functioned more or less as a consultative body from its inception and until 1979.

The rapid increase of Windward Islands bananas from 1983 and the production projections of Jamaica, Belize and to a lesser extent Suriname, were of growing concern to WINBAN. As a result, in 1985 WINBAN attempted to revitalise the CBEA and re-establish a forum for discussion and for coordination among Caribbean producers. WINBAN, Belize and Jamaica representatives met in Miami in December 1986 for the first time since 1979. This was an informal meeting, the primary purpose of which was to discuss future developments as regards supplies projection from the member countries and projections of UK demand for bananas. An invitation was extended to Suriname as an observer. The get together proved later to be timely and of great significance. It provided first an update on the structure of country industries, production and prices to growers; production estimates up to 1991 and the level of demand for bananas in the UK. Production of the four member countries was expected to increase from 287,000 tons in 1986 to 512,000 tons by 1991. According to a feasibility study by Ogiloy Benson & Mather Ltd in 1979, demand was not expected to be 400-450,000 tons.

Hitherto, a problem in placing all exportable bananas on the UK market at fair prices, did not arise since the CBEA members' production was below demand levels and had to be supplemented by dollar bananas. Increasing volumes soon eroded that supply gap and it would not be long before members country supplies would be posing problems among themselves.

The members had to begin thinking and planning to avoid a war among themselves if and when their production exceeded demand. Since the question of restricting supplies was out of the question, the only other options were to generate an expansion of demand and, if necessary, access other markets. Both of these means have been successfully explored.

The CBEA and their marketing agents considered the possibility of a generic banana campaign to be funded by the EEC. The EEC funded a preliminary study by Sema Metra which, among other things, supported promotion and advertising campaigns.

The urgency of the situation called for quick action which did not appear forthcoming by normal time required for project presentation and processing of application for EEC funding. The CBEA members and marketing agents, therefore, decided to organise their own generic banana campaign. This proved a wise move and by all accounts was considered to be a success. It contributed to the increase in imports from 309,000 tonnes in 1984 to 489,000 tonnes in 1991. UK banana consumption per head rose from 5.48 kg. in 1984 to 6.8 kg in 1988 and 8.5 kg in 1991.

All members and their agents contributed £1.30 per ton to the campaign. This was suspended at the end of 1991 as it was felt that demand was outstripping the supply potential of CBEA countries and more emphasis could be placed on the promotion of brands.

Both WINBAN and Jamaica have separately pursued development of other markets. WINBAN realized that their only secure share of the UK market was that held by Geest - (40-42%). WINBAN bananas at the time accounted for 50-60% of UK market share. With signs of all out effort in the other CBEA countries to increase production to fill the 60% of market share held by Fyffes and Jamaica Producers, WINBAN decided to make arrangements to seek outlets elsewhere and subsequently agreed to ship bananas to Italy. This provided the added advantage of reducing large winter surpluses and left back fruit arising from imbalances between our winter production and UK winter demand. This has worked relatively well except for the prices realized. Jamaica shipped to E. Europe second grade fruit which was not acceptable for the UK market.

Apart from the issue of market demand and members' production, the CBEA members have focused on cooperation in Banana Research and Development and lobby activities related on Lomé IV and the Single European Market. For example, WINBAN and Jamaica prepared and submitted through CARISEC a joint project proposal for the improvement of the Jamaica Banana Breeding Scheme. We understand that this project has been included among project proposals submitted to the EEC through CARICOM.

The most intense participation of members as one group was experienced in activities related to the negotiation of Lomé IV Convention and EEC obligations of that Convention within a single European Market.

Specific lobby activities were initiated in 1988 when members and their marketing agents agreed, in principle, to employ a specialist lobby firm to monitor, report and advise on related developments in Brussels and other capitals in Europe. Simultaneously, the CBEA decided that closer links should be forged with neighbouring Martinique and Guadeloupe as well as African traditional exporters of bananas.

Without blowing our own trumpets, we believe that the coordination and monitoring done by the CBEA and the CBEA specialist group in London played an indispensable part in setting the stage for the later intervention of Windward Islands, and other, Prime Ministers.

In brief, the intense involvement of WINBAN, Jamaica, Belize and Suriname as a group - the CBEA - included many meetings with similar exporting groups such as SICABAM, GIPAM and ASSO BAG in the French Islands, in Paris, Brussels, Miami, Jamaica or wherever else it was convenient to meet, at whatever fora which were best suited to achieve the end. The two groups meet among themselves, with representatives of Governments of EC Member Countries; with the Interservices Group of the Commission; with the ACP Council.

The CBEA members would like to cherish the thought that they have made a worthy contribution towards an acceptable resolution of a protective regime for bananas.

WHERE DO WE GO FROM HERE?

The future role of the CBEA is not definable at this time. We can start by taking stock of past opportunities and to what extent they have been maximized. Integration initiatives in the Caribbean have had limited success and many who have looked back tend to speculate that this is a result of pre-occupation with national short-term issues and each going his own separate ways without regard to future challenges which require a wider regional perspective. We seem to spend much of our time weakening each other rather than working together in synergism for our common good.

While the CBEA can claim to be party to meaningful progress in certain respects, one might ask how much more could its members have achieved within a policy which encompassed a wider involvement.

The CBEA's activities were related to the immediate and short-term periods. Now we must begin to prepare for the long-term after year 2002 and use the medium term between now and then to provide answers for sustainable agricultural systems in the region.

We must be mindful of the general view of regional political and economic analysts who have concluded that even the combined resources of the English speaking Caribbean countries may not provide the critical mass for sustainable economic activity in a world of free trade.

Our horizon in the banana industry must, therefore, now seriously include the CBEA and the DOMs as we attempt to find measures to bring greater benefits and security to banana and other crops. The entire field to market chain must be re-examined and we must find solutions. But we must not stop here. We must also discover avenues through which we can fully exploit those solutions. We expect this workshop to generate many ideas. Those ideas will have to be translated in effective action plans. We hope that the Organization will continue to cooperate to ensure that these plans are successfully implemented.

KEYNOTE ADDRESS

by

**The Honourable Ira d' Auvergne
Minister for Agriculture, Lands, Fisheries and Forestry, Saint Lucia**

INTRODUCTION

Mr Chairman, Managing Director of WINBAN, Mr Cyril Matthew, Technology Generation and Transfer Specialist from IICA, Dr Pinchinat, Distinguished Guests, Ladies and Gentlemen.

It is, indeed, a profound pleasure for me to have been afforded the opportunity of sharing some of my thoughts with you on the occasion of the official Opening Ceremony of this workshop on Technological Modernization of the Banana Industry.

I know that the Chairman has already welcomed all of you to this opening ceremony and to the workshop; nevertheless, I wish, in particular, to invite our overseas participants to find some time within their busy schedule to savour the hospitality and numerous attractions available in this country of ours.

Mr Chairman, to simply say that this workshop is important would be an understatement. It is one of the most critical workshops to be held in this part of the world in recent times. I say this because the challenge which faces not only the Banana Industry, but Caribbean agriculture in general can be summarized in the two words, Technology and Modernization.

BACKGROUND

The Banana Industry in the Caribbean, more particularly in the Windward Islands has played a pivotal role in the social fabric of these islands. It has been, since the 1950's, the basis upon which economic and social advancement have taken place. From its modest beginnings in the 1950's, the Industry in the Windwards reached a peak production in 1988 of over 282,000 tonnes and in 1990 record earnings of about \$390 millions were achieved. Unfavorable weather conditions led to a fall in output of almost 20% in 1991, compared to 1990, to 226,000 tonnes. However, production in 1992 is expected to increase to a level of around 270,000 tonnes.

The economic progress that has been achieved in these island has been largely a result of the Banana Industry. Advances in health, education and other indices of the quality of life can be directly linked to the industry. Over twenty-five thousand farmers and farm families in the islands depend directly on the Industry. In addition, thousands of other persons, in one way or another, depend on the Industry as a means of livelihood. Over 60% of foreign exchange earnings in the four islands emanate from the Industry.

Generally, therefore, it can be said that when the Banana Industry prospers, St Lucia and the other Windward Islands prosper. When the Banana Industry stagnates, the Islands stagnate. Against this background, therefore, one can well understand the anxiety and concern that are likely to emanate from the Islands, if the Banana Industry is threatened.

The growth and the progress that I have outlined above, have been achieved under preferential conditions. They have been achieved in an environment where the Islands enjoyed a protected status in the United Kingdom market place; conditions which guaranteed access to the market. Perhaps these guarantees might have made us complacent, in the hope and expectation that these conditions will last forever.

However, it has been evident for some time now that the guarantees which we have almost taken for granted in the past have a limited lifespan.

With the breaking down of barriers within Europe and the coming into being of the Single European Market, it is clear that the life of these guarantees is limited. Whilst we in the islands have argued for continuation of these preferences, at least in the short term, to enable us to adjust to conditions in the single market, it is clear that whatever concessions are extended will not be indefinite.

The world around us is becoming more and more competitive. Against this background, we cannot continue to sit back on our laurels and expect whatever preferences which we have enjoyed will continue.

To be able to survive economically, we must take steps to modernize our Agricultural Sector, in general, and our Banana Industry, in particular. This is why, Mr Chairman, I am of the view that this workshop is a very timely occurrence, and when the Inter-American Institute for Cooperation on Agriculture (IICA) approached the Ministry of Agriculture in St Lucia with the idea of such a workshop, we readily embraced it.

DEFINITION OF MODERNIZATION AND TECHNOLOGY

Mr Chairman, before proceeding any further, I think it is necessary for me to define what I mean by the terms Modernization and Technology. By Modernization in Agriculture, I mean increasing the capacity of farms and/or farm related enterprises, to achieve self reliance, to increase production and income, and to grow in number under competitive conditions. Whilst in such a context, modernization should not be predicated upon subsidies, it is nevertheless essential, that an environment which provides supporting institutions and policies to facilitate the modernization process are in place.

In its simplest form, technological progress results from new and improved ways of accomplishing traditional tasks. In most developing countries, new agricultural technologies and innovations in farm practices are pre-conditions for sustained improvements in levels of output and productivity.

TECHNOLOGICAL MODERNIZATION IN THE CONTEXT OF THE BANANA INDUSTRY

There can be no doubt that over the years, the Banana Industry has experienced rapid technological change. There have been changes in the ways in which we harvest bananas, in response to the demands of the market. Use of inputs, namely fertilizers, chemicals etc. has increased. New and improved varieties of planting material that are disease resistant or more tolerant of certain conditions have been introduced. The way in which we handle bananas at the ports have changed etc.

However, if we are to survive in a competitive situation, we need to modernize and adopt new technology at an even more rapid pace. Our competitors in Latin America principally, enjoy natural conditions that are far superior to ours. Their access to resources, for example, land, is far greater than ours, thereby giving them a greater level of flexibility. In addition, it has been established that their unit cost of production is far lower than ours not only because of the scale on which they operate but also because their labour costs are much lower than our costs.

The competitiveness of the Banana Industry on the international market must be one of the main concerns underlying research and development in the Industry. The areas of farm productivity and profitability, and how these impact of the long term viability of the Industry are issues which we must continue to address.

Unfortunately, current levels of productivity in the Industry are cause for concern, particularly the aspect of labour productivity. A survey of wages and employment conducted by WINBAN in St Lucia in 1991, revealed that the vast majority of farmers were experiencing difficulty in getting farm labour, particularly on harvesting days, with the problem being more acute on medium and large size farms. In an industry which is highly labour intensive, the availability of labour is a critical factor in the further development of the Industry.

The data collected from this survey revealed that wages increased by between 30% - 40% in the last six years. This, no doubt, was a contributing factor to an increase in overall production costs of between 21% - 27% over the same period.

It is, therefore, vital that labour productivity be improved. This necessitates closer supervision of workers at the farm level as well as improvements in the scheduling of farm operations. WINBAN and other organizations involved in the Industry will have to focus their efforts in devising alternative production methods that are less labour intensive in order to reduce the dependence on manual labour. There is need also to focus, to a large degree, on the overall management of the farm in order to identify factors which inhibit efficiency.

It is generally accepted that average yields per acre, which in St Lucia's case are just about seven (7) tons, can be more than doubled in some cases. This view is supported by the fact that there are cases where some farms have produced in excess of 20 tons per acre. The case of St Lucia Model Farms is an example. In order to achieve this, we must direct our attention to the farmers and areas where the best conditions exist for such increases in productivity.

Conditions such as topography, quality of soil, access to water, among others, are factors which affect productivity. We must encourage farmers who possess the right conditions, to invest in these new technologies such as irrigation.

As indicated earlier, banana is generally speaking a labour intensive crop. However, there is some scope for mechanisation of certain activities on the farm. Such scope must be explored and farmers who possess the conditions for adopting such technologies, targeted.

In order to achieve these potential increases in productivity extension at the field level must be organized in such a way so as to be able to transfer these new technologies to the farmers. The emphasis of extension must be to improve the overall operational efficiency of production at the farm level, taking into consideration the conditions under which the farmer operates.

SUPPORTIVE POLICIES

It is realised that the full benefits of Agricultural Development cannot be realised unless Government support systems are created that provide the necessary incentives, economic opportunities and access to needed inputs to enable farmers to expand their output and raise their productivity.

In this connection, in Saint Lucia we are taking steps at strengthening extension systems and support structures to facilitate the modernization process. Also, incentives in the form of duty concessions have been and will continue to be granted to farmers and other persons investing in new technologies in agriculture.

CONCLUSION

This workshop provides an opportunity for creating linkages, sharing experiences and increasing cooperation among Banana Producing Countries, and institutions engaged in banana research in the region. As such, it is one step along the road of a United Caribbean response to the new international situation facing the Banana Industry. In this context, we will all survive or perish together. The importance of the exercise upon which you are about to embark cannot, therefore, be over stated.

IV. TECHNICAL PRESENTATIONS

BELIZE BANANA INDUSTRY

A Zabaneh

INTRODUCTION AND BACKGROUND

Mr Chairman, Fellow Delegates, Ladies, and Gentlemen. Let me first say how grateful we are to be present at this workshop today and for the opportunity to present to you, the status, achievements and constraints in the Banana Industry of Belize.

The Belizean Banana Industry is completely privatised. However, Government continues to assist the growers in a number of vital areas as follows:-

- 1. Lobbying with the Governments of Europe and the Caribbean region to ensure that the best possible conditions of trade are obtained.**
- 2. Extending bank guarantees on behalf of the Banana Growers Association.**
- 3. Granting development concessions up to the year 2000. This includes the waiving of taxes on all items imported for use in the industry, and the non imposition of income tax on farmers' earnings.**

STRUCTURE AND FUNCTIONS OF THE BANANA GROWERS ASSOCIATION

The Banana Growers Association (BGA) is made up of a Board of Directors who are elected by the members on an annual basis. It consists of seven members. The Chairman and Vice Chairman are also elected by the members. The B.G.A. has a membership of 24.

The functions of the B.G.A. are as follows:-

- 1. To negotiate prices with our marketing agents annually.**
- 2. Receive fruit from growers at the port and load vessels. Contracts are F.O.B.**
- 3. Conducts a mandatory spray programme for Black Sigatoka.**
- 4. Sources and makes available technical support whenever needed.**

MARKETING

All bananas produced in Belize are sold to Fyffes in the UK. It should be noted that they also provide us with some technical support.

PRESENT STATUS OF THE CULTIVATIONS

The industry has, at present, 5,200 acres planted. Four thousand acres are presently in production and are expected to yield 1.6 million boxes of 40 lb fruit this year.

The remaining 1,200 acres are being rehabilitated.

All packing stations are located within 30-35 miles of the port.

TECHNOLOGICAL STATUS

- Fifty percent of the established acreage is irrigated with an undertree system.
- Cableway systems are used to transport fruit from the fields to the packing houses.
- All bananas are packed in 28 lb and 40 lb boxes. Because of the length of the voyage (22-23 days) storage life and fruit quality are extended by packing fruit under vacuum.

RESEARCH AND DEVELOPMENT

The cost of production in Belize is very high. Research and Development in the following areas could help to reduce costs:-

1. Black Sigatoka forecasting and control.
2. Underpeel discoloration due to low winter temperatures.
3. Peel rot which is of major concern in the market places.

CONSTRAINTS

1. Roads to the port are not paved.
2. Increased acreages are needed (1,800 acres) to produce a production volume of 5 million boxes by 1995-96, so that our place in the export industry can be maintained.

THE JAMAICAN SITUATION

J A Dixon

BACKGROUND

The most recent register (November 1992) of export banana farmers in Jamaica show that about 4,430 hectares have been established 95% of which is currently in production. Approximately half of this acreage is on flat lands, the remainder is on gentle to steep slopes.

Three farms occupy 1,850 hectares, ten (10) farms total 450 hectares and range in size between forty (40) and a hundred (100) hectares. About 300 farmers with individual farms ranging between two (2) and thirty (30) hectares cultivate approximately 1450 hectares. A large number of farmers with holdings less than or equal to about two (2) hectares each, are involved in a loose "cooperative" market arrangement and export from about 450 hectares through the Growers Association; the production is on a private and individual basis.

PRODUCTION SYSTEM

The varieties now planted for export include Grande Naine, Williams, Robusta and Valery. Irrigated farms (ca 2000 ha.) plant Grande Naine and Williams mainly. Robusta and Valery are more tolerant of water stress and are, therefore, recommended for areas within the lower rainfall regime which also experience periods of drought.

The larger farms generally apply straight fertilizers (Nitrogen and Potash, Phosphate occasionally) on a six weekly cycle. Fertilization on non-irrigated farms is linked to rainfall events; blends of N:P:K: are used on these farms. The use of micro-nutrients is not now widespread, but is gaining popularity among the medium acreage farmers.

The level of Yellow Sigatoka management varies among farms. The larger farms have excellent control with about nine treatments per year. Medium sized farms also have good control but with an average of seventeen applications of fungicide annually. The smaller farms apply up to twenty-six (26) treatment cycles per year and attain control just at or below an acceptable level.

Processing of fruit for export is by either the traditional centralized wet pack method or the decentralized mini wet pack operation. There are some modifications to both these systems that seem to be adequate; they produce the desired results.

EXPORT PERFORMANCE

Our statistics show that 75,300 tonnes of fruit were exported from 3,700 hectares in 1991. The large farms averaged about 33 tonnes per hectare. Yields from the medium and smaller farms averaged 9 tonnes per hectare and ranged between 7 and 25 tonnes per hectare. The Banana Export Company estimates that exports for 1992 should be about 78,000 tonnes.

CONSTRAINTS TO PERFORMANCE

There are several factors limiting the performance of our export banana farmers. The listing of some important ones presented below, does not reflect an order of importance.

1. Water
2. Level of disease and pest control
3. Plant nutrition (fertilization - type, amount, timing and application method)
4. Rejection level on farm
5. Ratoon rate
6. Management of cultivation on slopes (soil erosion)
7. Postharvest management of fruit to preserve quality
8. Losses in the market

POSSIBLE IMPROVEMENTS

It is possible to improve our export performance per unit area of land cultivated. This may be done by any one, or a combination, of the following approaches:

- * straight transfer of existing (appropriate) technologies
- * modification, then transfer of existing technologies
- * on-farm research
 - new technologies
 - adaptations
 - problem solving

ADDRESSING THE CONSTRAINTS: THE JAMAICAN APPROACH

Framework

The Jamaican Banana Industry is composed of three individual companies with strong horizontal and vertical interactions. The Banana Board is a statutory organization with responsibility for crop insurance and research support. Banana Board also manages the Banana Breeding Programme for the Government of Jamaica. The Banana Export Company Limited (BECO), a non-profit organization, exports the cargo to the market place and sells fruit to

ripeners. The All Island Banana Growers Association (AIBGA) procures and retails input supplies and provides an extension service to growers.

Research and Extension are privately funded. The Export Company provides major support for these budgets and this represents indirect funding by farmers. There is also some direct support for specific research projects by individual farmers. Some financing has been received from local and international agencies for research and extension projects as well as for market studies. The Government makes some provision for maintenance of the germplasm collection.

The production is 'largely' privately owned. The Government has however, announced its intention to divest itself of interests in the production base.

The Jamaican Banana Industry maintains linkages with other local as well as international institutions in the fields of research, marketing and extension. These include the University of the West Indies, Scientific Research Council, Jamaica Bureau of Standards, Research and Development Unit of the Ministry of Agriculture, CARDI, WINBAN and respective Growers Associations of the Windward Islands, the Caribbean Banana Exporters Association, the Natural Resources Institute of The Overseas Development Agency (UK), ACORBAT, ASBANA and INIBAP. BECo maintains a presence in the market place through JAMCO, a Government Agency.

CURRENT AND PROJECTED PROGRAMME TO IMPROVE EXPORT PERFORMANCE

Eight items were listed as being among the most important constraints to improving productivity in the Jamaican banana production system. If the assumption is made that the commitment and the will exist to improve productivity, then inadequate water supply is the only difficulty limiting factor to resolve. Inadequate financial and human resources restrict the pace at which the other constraints can be minimized.

For the past 10 years, the research and extension support for production has been financed mainly by the farmers. It becomes very difficult to convince a traditional farming clientele to invest heavily in long-term research projects. In fact retroactive or immediate solution are demanded!!!

Involvement in the Agriculture sector does not provide the financial remuneration available in other enterprises. As a result, suitably qualified persons do not readily become involved in the sector. Further, pathways for upward movement are not well defined and this makes it unattractive as a chosen career.

THE PRESENT STATUS

Water

A few medium farms are now installing irrigation systems to supplement rainfall. For the majority of small farmers this option does not exist; a source of water for irrigation is not available.

Disease and Pest Management

The Research Department, reactivated in 1987 after a number of years closure, is presently engaged in a project aimed at improving the management of Yellow Sigatoka disease. We have had the benefit of WINBAN's experience in this. The project received funding from the Jamaica Agricultural Research Programme (JARP) for a one year period. It is now being financed by the core budget.

At present, there is no research on other diseases or on pests. Considering the likely adverse reaction of consumers to the use of chemicals on fruit for consumption, an integrated approach to the management of diseases and pests should be pursued. This is one area for immediate cooperation between members of the group of banana producers represented at this meeting.

Plant Nutrition

Interaction between

- * (peculiar) soils,
- * the ratoon nature of banana crop production,
- * the rate of decay of the vegetative plant parts in the fields,
- * the influence of rainfall, and,
- * the terrain cultivated

dictate that plant nutrition is one of the areas that must involve continuing, on-farm research. In fact, it is considered that in Jamaica, the local variations in soil type suggest multi-site trials for any one investigation.

The general fertilizer recommendations now offered to growers are based on local research results for Robusta, Valery and Lacatan. The fertilizing regime for commercial Grande Naine and Williams is based on practices developed elsewhere (non-adapted).

Plant nutrition research is expensive. At present, there is only one investigation on fertilizer usage in banana in Jamaica. The Research Department has outlined a number of sequential plant nutrition trials aimed at identifying the upper economic yield threshold on

Jamaican banana farms. It is considered that some aspects of the investigations are best executed by graduate students attached to a tertiary level institution. The project needs financing. Inter-institutional cooperation would produce more timely results and a more extensive data base.

Rejection level on farm

Improvements in the cultural practices and in the postharvest handling of fruit will contribute significantly to a reduction in the level of rejection. The factors influencing rejection have been quantified for some Jamaican banana farms.

Two areas have been identified for research, to provide immediate and practical solutions. A project proposal has been prepared and submitted to an international funding agency for support.

Ratoon rate

The pruning practices employed in Jamaica need to be examined to ascertain if the optimum ratooning rate is being achieved. Further, studies need to be done to understand the influence of plant population, plant nutrition and climatic parameters on the ratoon rate.

Management of cultivation on slopes

The establishment of banana cultivations on slopes is guided by experience of the individual farmer or, in rare cases, a trained soil management expert.

This is one area that needs urgent attention; placement of fertilizers is one aspect of the Research Department's proposed plant nutrition study. Mulching and the spatial array of plants are two other parameters whose influence on soil retention deserves immediate study.

Postharvest management of fruit to preserve quality

Some deterioration in the quality of fruit is to be expected after harvest. The extent of the deterioration is linked to the time interval between harvest and storage at approved temperatures. Attention must be paid to the logistics of each farmers' operation; inconvenient trucking arrangements have been identified as an important factor in Jamaica.

Selection and postharvest fungicide treatment of export fruit received total attention from the Research Department of Banana Board for several months between 1987 and 1988. The activities were interrupted by hurricane Gilbert in September 1988. The results of the investigations culminated in the "Mini Wet Pack" system of processing fruit for export. This technology is now very widely used on small, medium and large farms. One important feature of the practice is the low rejection rates when compared with some traditional wet packing

operations. "Mini Wet Pack" has proved to be an appropriate method for Jamaican banana farmers; the integrity of the system is not easily violated.

Losses in the Market

Seasonal variations are reported for the quality of the fruit in the export market place. Unacceptably high levels of scarring and prematurely ripened fruit are major causes for concern.

Unquestionable, the increase in the level of some defects manifested on discharge of the cargo are related to variations in the conditions of fruit growth and development. Some preharvest influences have been identified and quantified. Further studies are, however, needed to devise applications that will extend shelf life.

In the drive to maintain consistently high quality of export fruit, the Banana Export Company recently established a "Quality Improvement Programme". The strategy employed to date, involves:

- * examination of farmers' field to identify areas that need improvement;
- * monitoring the on-farm processing operations and where necessary, advising against the shipping of fruit of a certain quality;
- * reorganization of the harvesting and processing operations, on a farm by farm basis, where necessary;
- * weekly (district) seminars at which the requirements of the export market are discussed, new developments explained and practical demonstrations for the correct packing of cartons as well as the preparation of mixtures for leafspot management are done;
- * advising farmers of their individual contribution to the total amount of fruit dumped on discharge;
- * identification of critical areas for on-farm research.

To date, farmers' response to the programme has been quite positive.

Shipping trials involving "new" cartons are also being done. This is in keeping with advances in the overseas ripening trade. Fruit for export palletized - on farm - large and medium - at port - smaller growers.

Port facilities now being upgraded to include temperature controlled holding facilities.

The programme which has been assigned priority status for short term objectives, is being conducted with collaborative efforts from the Research Department of the Banana Board, AIBGA, RADA and Jamaica Banana producers Group - Small Farmer Project.

TO SUMMARIZE

A number of areas in which there is room for improvement in the productivity and quality in the Jamaican Banana Industry have been identified. This will influence increased return on investment to the farmer. In this regard, the actions to address some problems have been highlighted. Weak financial and personnel resources are the major constraints that limit the pace at which improvements could be realized.

CONCLUSION

I would like to thank IICA for the opportunity to share ideas with colleagues from other banana growing territories. I am quite confident that at the end of this workshop, we will be able to:

- * firstly, identify areas for stronger collaboration in research, marketing and extension;
- * secondly, define a practical operational framework for cooperation and,
- * thirdly, be motivated to convert plan into productive action in the shortest possible time.

NB: RADA - Rural Agricultural Research Development Agency - Extension arm of Ministry of Agriculture

TECHNOLOGICAL ADVANCEMENTS IN THE BANANA INDUSTRY OF SURINAME

K F Pinas

SUMMARY

In Suriname bananas are produced under unique but very difficult conditions, because of the very heavy alluvial clay soils, which is drained by a system of primary, secondary and tertiary drains (a so called polder system).

One of our recent major achievements was the mechanization of the re-passing the tertiary drains which not only boosted up the production per hectare but also reduced the demand for labour significantly.

In our continuous endeavour to reduce variability in both quantity and quality produced, Surland plans to install a so called undertree fertigation system starting in 1993. It must be stated that we in the banana business must strive for mechanizing our overall process as much as possible especially when the availability of labour for this heavy physical work decreases shortly over time.

The replacement of the old moving cable way system with the fixed cable way system (hanging tractor system) and the upgrading of the packing stations will ensure a more efficient internal transportation of the fruit out of the field.

Moving from a two port operation to a one port operation facilitated with modern equipment enabled Surland to move gradually away from the traditional inefficient production system compared to today's standards.

INTRODUCTION

The development of the banana industry in Suriname began during the latter part of the fifties. Two experimental projects on bananas proved to be successful (the Saramacca experiment and the Nickerie experiment). The government then decided to invest in the cultivation of this crop on a large scale. In 1960 two polders were constructed on the heavy alluvial clay soils, one in the Saramacca district (the Jarikaba operations) and one in the Nickerie district (the Nickerie operations).

Each operation is about 1000 hectares (ha) divided into smaller operational units of about 350 ha. In 1971 Surland Limited was established and it took responsibility over the banana operations. It is worth mentioning that all shares belong to the government of Suriname.

Suriname since then exports its fruit to the United Kingdom.

SYSTEM OF PRODUCTION

Suriname is the only banana producer in the region that grows its bananas on beds of 6 x 100 meters due to the necessity of having a polder system in place on our heavy clay soils. A single banana parcel is about 12 ha on average.

Rejuvenating the standing crop every 7 years is an essential practice because of declining yields due to an increasingly poorer root development as a consequence of a decline in both soil structure and drainage capacity and an increase in the nematode population over time.

Prior to replanting a field it is inundated for 6 months recovering soil structure and at the same time reducing the nematode population significantly (one - seventh of the total area is always inundated). After a field replacement decision is made, its seeds are first dug out to be used for replanting purposes. Before replanting, the seeds are brought to seed preparation stations where they undergo a warm water treatment for about ten minutes at 60 degrees celsius which have been proven to be sufficient to destroy many soil pathogens (mainly nematodes).

All other crop maintenance activities are similar to other operations in the region. For example: age grade control, tree bagging, guying, deflowering, etc.

PROCESSING OF THE FRUIT

Currently we are operating on a fourteen day harvest/shipping cycle. Each harvest takes about four days. The fruit is transported from the field to the packing stations by means of moving cableway which is powered by electrical energy. Each packing station covers an area varying from 150-350 ha. The average amount of 40-lbs boxes processed in any one packing station is 3000.

SHIPPING LOGISTIC

Palletised boxed bananas are transported from the banana operation to the wharf by means of ten ton trucks, covering an average distance of eighteen kilometers. These pallets are then loaded into the banana vessels. Due to the fact that Suriname has two banana operations located in different districts with a total distance of about 250 kilometers, a two port loading system is necessary. The harvest therefore takes place in a sequential manner. Suriname establishes approximately twenty four shipments per port, per year.

TECHNOLOGICAL IMPROVEMENTS

Identification of major bottlenecks within the total production process.

Drainage system

As already mentioned we grow our bananas on heavy alluvial clay soils in a tropical country characterized by extensive rainfall of about 2000 mm on average per year. A polder system is therefore required consisting of a fast network of primary, secondary and tertiary drains. The maintenance of the tertiary drain has been a long standing major bottleneck in the industry. The introduction of mini excavators has proven to be a major improvement in the maintenance of the tertiary drains within the standing crop. Each year about 1120 kilometer of tertiary drains must be repassed in the standing crop. In the past, repassing of the 1120 kilometer of tertiary drains had to be done manually using spades. The dimension of a tertiary drain is upper width 90 centimeters, lower width 30 centimeters, and depth 70 centimeters. One can easily imagine how tough it is for a human being to achieve these dimensions.

A simple mathematics tells us that with an average of 100 people we need 2240 days or 6 years to repass 1120 kilometer of tertiary drains. In 1991 we introduced the mini excavator on an experimental base to solve the drainage problems. Soon after the introduction it became clear to us that with some adjustment it will be successful. At the beginning of this year Surland Ltd bought 12 of these small excavators. Starting with one to two drains a day for each excavator it is now expanded to an average of 10 drains per day. This also will not complete the 1120 kilometer bi-yearly repassing requirement for tertiary drains. A total of 20 mini excavators are required taking 10% down-time into account.

One thing is sure and that is, that we made a giant step forward in solving our drainage problem.

Irrigation

Our heavy clay soils tend to crack during severe drought, damaging the root system. We plan to start experiments with the so-called undertree fertigation system beginning next year.

Seed Planting Process

We are now at the verge of introducing portable motorized augurs in order to move away from the need to use spades for digging the holes in which the seeds are to be planted. Again one can easily imagine how hard it is for a worker to manually do this job.

Fruit Transportation System

The replacement of the moving cableway system by the well known fixed cableway system (hanging tractor system) will be introduced next year in order to improve on both quantity and quality produced.

Improving Wharf Facilities

In conjunction with the One Port Operation scheme it is necessary to improve the overall wharf facilities such as experiments with cold storage facilities.

MARKETING

Suriland is not actively engaged at the actual marketing of its bananas. We sell our product on FOB-basis to Fyffes Group Ltd.

CONCLUSION

In conclusion we may simply state that in recognition of both current and international economic changes with the consequent changes in terms of trade, we in Suriname will always push ourselves to our mental and physical limits to secure a feasible market share in bananas for our relative little third world country.

THE STATUS OF BANANA RESEARCH AND DEVELOPMENT IN THE WINDWARD ISLANDS

E Reid

INTRODUCTION

The Banana Industry in the Windwards is characterised by the large numbers of small of small farmers; some 23,000+ in 1991, on farms ranging from less than 0.5 to over 100 acres. Sixty and forty six percent of these produced less than 10 and 5t/year respectively. However, over sixty percent of total production comes from farmers producing over 20t/year, that is, some twenty percent of producers (see figures 1 and 2).

Bananas are produced on an estimated 38,000 acres, 51% of which are on slopes greater than 20 degrees and approximately 49% are in areas receiving less than 100 inches of rainfall per annum; less than 1% of this acreage is under irrigation.

Associated with this terrain and wide variation in rainfall from costal to interior regions, is a variety of soil types. These include (a) soils of the medium and high rainfall interior, the clay fraction of which is dominated by kaolinite or allophane, (b) soils of the low rainfall zones and the clay fraction of which is dominated by allophane or montmorillonite, and (c) alluvial soils of variable clay mineralogy.

Fertility is good in the alluvial soils but poor in (a) and intermediate in (b). The banana soils of the Windwards are almost volcanic in origin, and are generally of low ph in the 3-5 range.

Banana production in the Windwards is constrained by a number of environmental factors including:-

- a) poor soils
- b) steep sloping land
- c) high winds
- d) drought
- e) inter plant competition
- f) flooding/waterlogging in the rainy season
- g) diseases such as leafspot and moko
- h) pests such as the banana borer and nematodes

Management practices to ameliorate the adverse effects of these factors, and their effects when uncontrolled, contribute to the high cost of producing bananas in the Windwards.

The FOB prices of Windwards' bananas in the UK is estimated to be twice that of "Dollar" fruit. The average production cost in 1991 was estimated at approximately 27 cents per pound, 58%, 29% and 13% of which were attributable to labour, inputs and transport, respectively. Some 41% of the labour were involved in harvesting operations.

The high labour component of production costs, when viewed against reported low labour productivity and availability must be considered a critical area requiring attention in the drive to improve farm productivity and modernize banana production systems. The following is one estimate of the gap between productivity in the Windwards and Central America.

	Windwards	Central America
Average production (t/ac)	6-8	26
Bunches produced/ac/year	630	1006
Bunches harvested/ac/year	440	907
Field losses (%)	30	10
Ratoon rate (bunches/year)	0.7	1.4

Source :- FHIA, Honduras.

It is would appear that the Windwards are at a tremendous disadvantage and must consider it critically important to work towards closing this wide gap.

ACTIVITIES

The Mission of WINBAN has been given as "securing remunerative prices to banana growers and ensuring the economic viability of the Banana Industry". In light of the present realities, the main role of the Research and Development Division must be to provide the technical input required to realise the above mission. The Division works towards this goal by conducting research and development activities, providing technical advice to the banana industry, monitoring of the quality of inputs, monitoring of banana production, fruit processing, handling and transportation system, monitoring the quality of fruit being produced and exported, and providing communications and technology transfer support to the BGAs extension and other field staff. These are all geared to improving the quality of fruit exported, improving the productivity and sustainability of banana farms, and lowering the cost of production.

The Research and Development Division has identified two programmes within which it undertakes projects aimed at addressing critical problems and issues facing the Windward Islands banana industry. These are:

- i) Fruit Quality (Improvement) Programme
- ii) Farm Productivity (Improvement) Programme

In addition, certain communications activities which do not fit within the above Programmes, but are nevertheless important to the operations of WINBAN, are undertaken by the Division.

Objectives of the Research and Development Programmes

Given the current and near term problems within the industry, the following broad objectives have been identified for the Research and Development Work Programme:

- i) increase marketable yields per hectare through improvements at all stages of production
- ii) enhance the competitiveness of the industry by evaluating alternative measures to reduce unit cost of production, improve the level of productivity and fruit quality
- iii) develop a strategy to more effectively manage the supply of high quality fruit to the market, consistent with demand pattern
- iv) explore and identify appropriate systems to effectively reduce the incidence of crop loss due to pests and diseases
- v) develop forecasting models to achieve greater optimisation of field operations, particularly in terms of yield and the level of pest and disease infestations.

FRUIT QUALITY PROGRAMME

This Programme addresses objectives (i), (iii), and (iv) and comprises projects which target the main defects affecting Windward Islands bananas. Activities within each project address factors giving rise to increased incidence of the defect, investigate measures to control these and develop relevant practices and or procedures. In addition, facilities for the processing, handling, storage and transporting of fruit are reviewed and or investigated in ensuring that the quality of the product is maintained from the field to the market. The delivery of recommended practices and procedures to farmers is accomplished through the implementation of technology transfer component of each project.

Projects

- (1.1) Crown Rot Control
- (1.2) Pest Control
- (1.3) Bunch Micro-environment
- (1.4) Leafspot Disease Control
- (1.5) Mechanical Injury (Reduction)
- (1.6) Quality Assurance

FARM PRODUCTIVITY PROGRAMME

The objectives of the Farm Productivity Programme are to increase marketable yield per acre, reduce unit cost of production, reduce field losses through snapping or toppling and identify improved cultivars for use under Windwards' conditions. In addition, procedures to forecast production, manage timing of crop and for effective management of farms are being investigated. These projects target objectives (i) - (v).

Projects

- (2.1) Plant Nutrition Improvement
- (2.2) Pest and Disease Control
- (2.3) Root/Soil Environment Improvement
- (2.4) Farm and Crop Management
- (2.5) Variety Testing

ACHIEVEMENTS

Since 1982, banana production has been increasing rapidly, (see figure 3) due partly to more attractive prices to the farmer and partly to the adoption of a radically new technology for post harvest processing of bananas; field packing. This technology, while putting greater responsibility on the farmer for the processing, packaging and transporting of his fruit, resulted in a dramatic reduction in losses, thus increasing farmer revenue substantially. This led to increasing acreage being planted to bananas, and increased use of production inputs per unit area, both contributing to the overall rapid rise in production.

The quality of Windward Islands' bananas, while not yet at the level targeted by the Industry, has improved substantially over the last ten years. The wide fluctuations in quality levels during the year have been significantly reduced, although there still remains a seasonal increase in crown rot and premature ripening. The adoption of improved technologies for bunch protection has also contributed to this improvement.

The Research and Development Division has developed basic Tek-Paks on all the pre and post harvest practices required to produce top quality fruit, efficiently. While it may be argued that these are not perfectly applicable in all the production zones in the Windwards, they are nevertheless good approximations which need the input of local personnel in the adaptation to individual circumstances. Farm productivity have been very good indeed, where these have been properly applied.

The significant improvement in leafspot control in the Windwards over the last decade is directly attributable to the adoption of better monitoring and control technologies. Cost, however, remains high and the current challenges is to maintain good control while reducing costs.

The Banana Industry has been able to contain Moko disease to Grenada and has actually succeeded in eradicating it from Carriacou. Present efforts are directed to excluding it from the three unaffected islands.

CONSTRAINTS

The adoption of recommended technologies has been constrained by a number of factors including:-

- a) availability of trained and experienced personnel in technology generation and transfer**
- b) availability of adequate financial resources to support technology generation and transfer**
- c) inadequacies in the technology transfer process**
- d) inadequate researcher-farmer linkage**
- e) a “traditional” approach to farming and reluctance to adopt new technologies**
- f) many farmers’ needs are met by relatively low levels of productivity**
- g) inadequate stimuli for the adoption of recommended practices (eg productivity or quality dependent prices, mandatory practices, significant penalty for poor performance etc)**
- h) difficult environment (wind, drought, topography)**

EXTERNAL LINKAGES

The Research and Development Division recognises that it is not sufficiently well equipped to meet the challenge to rapidly modernise banana production in the Windwards. It believes, however, that the critical area of focus must be the development of the “people” resources including farmers, workers, extension personnel, and managers. No radical change

is likely to be successfully achieved without this. Given the need for the Division to target development problems and issues, it seems appropriate that basic but necessary research in support of the Industry be conducted by external collaborating Institutions. Similarly, scope for cost efficiency in research/development activities through formal cooperation between Institutions should be pursued. The following are recommended.

a) Formal linkage with the University of the West Indies to:-

- i) conduct farm level socio-economic research in the industry**
- ii) conduct basic research in areas of interest, eg:-**

fruit physiology, alternative means of pest control, and improving the soil environment
- iii) develop labour saving devices**
- iv) provide training input at all levels**

b) Establishment of formal cooperation between research Institutes to:-

- collaborate on research of mutual interest**
- share knowledge on new technologies**
- share personnel and other resources**

THE BANANA INDUSTRY IN GRENADA

A Isaac

ABSTRACT

The system of mix-cropping of bananas with tree crops viz. cocoa and nutmegs in Grenada mitigates against sustainable high standards of banana production. This is compounded by special problems of an economic nature at the farm level. Technological enhancement in production is also constrained by the absence of sufficiently professional approach in our extension delivery system. Grenada's programme for upgrading the technical competence of producers involves first a focused strategy on pure-stand production of bananas using the project's approach and secondly intensive re-training of extension personnel.

BACKGROUND

A cultivation methodology appropriate to a system of continuous mix-cropping of bananas with perennial tree crops is yet to be developed for the Windward Islands. As we are aware, this model is practiced in an extreme form in Grenadian agriculture and to a much lesser degree in the other Windward Islands. Nevertheless it is carried out on a scale we believe that warrants more programmed attention than has hitherto been the case.

In the early 1980s WINBAN Research and Development did direct some of its attention to an investigation of intercropping bananas with annual crops viz. root crops and legumes. However this was limited to the plant crop phase and therefore of little relevance to the banana farmer who was engaged also in the joint cultivation of permanent crops on the same land, and where agronomic issues such as crop density and fertilizer regimes are of critical importance. Moreover not even during the early years in Grenada when banana affairs fell under the charge of the Ministry of Agriculture has attention been devoted to a systematic husbandry regime that took due account of the banana component in mixed cropped systems. Therefore for us in Grenada, the on-going application of evolving process and input technologies that are consistent with high production and optimum returns in the cultivation of bananas has always presented special problems.

Today in Grenada some 8000 acres are devoted to agriculture with of course cocoa and nutmegs constituting the dominant crops. Banana is estimated to occupy 1200 acres with all of its mixed crops to varying degree of intensity. The orientation of our farmers is one characterized by preoccupation with tree crop farming which is not only traditional, but which also reveals a great deal about the high premium placed on risks; for as we know a farmer's attitude to risk influences his adoption of technology decisions particularly when mix-cropping is seen as an effective adaptation to uncertainty in ameliorating its effects. However, it is important to point out that a significant number of our farmers have been earning sizable incomes from bananas and are therefore key agents in aiding the diffusion of the banana tech-pack's principles and practices to their other than less committed colleagues.

Having provided the foregoing background which is distinctly unique in the Grenada case, I now wish to turn to certain aspects of the industry which I think are indispensable to any meaningful elucidation of factors impinging on the technological improvement of our banana subsector. They can be grouped as economic factors, factors pertaining to extension and farm management.

ECONOMICS

A dynamic specification of the supply function for farmers in Grenada based on empirical data, suggest asymmetric pattern i.e. production of bananas when prices are falling appear to be more elastic than when prices are rising. This is not an all too unexpected phenomenon as it in many ways fits a typical small holder situation where he is inclined to severely "economize" or ration both labour and material inputs when prices fall below levels that he considers his threshold and conversely his tentative response to upward movements in prices increasing working capital only when prices markedly exceed perceived costs. I make this point in challenging the common misconception that mere knowledge of the technological aspects is a sufficient condition for improved efficiency and performance on the farmer's test.

In Grenada, the distribution of banana farmers on the basis of production shows that for over the past five years 20% of our growers generate approximately 60-65% of the island's output, revealing therefore a substantial majority of small producers who exercise considerable leverage in comparison to the poor adherence to extension advice. The situation is even more compounded by the absence of studies on cropping systems which specify comparative returns under varying levels of crop mix, risks input and cropping farm size, for in the case of the small holder with 3 acres or less land the highest profit mix may not necessarily be the least risk mix. The situation is therefore one that is not ideally conducive to the adoption and consistent use of sound husbandry practices. In summary therefore, the preponderance of small farmers engaged to a greater or lesser degree in very ad hoc approach to banana farming is a major inhibiting factor affecting our industry's efforts at modernizing the sub-sector.

EXTENSION AND FARM MANAGEMENT

I think we would all agree that success in commercial banana production does demand a level of sophistication in our farmers that hitherto could have been overlooked. One can only succeed as a banana farmer if one is receptive and attuned to the developments and continuously changing requirements of the industry. This is central for a viable and long term association with the crop. However it does not necessarily imply the whole scale blind adoption of all recommendations handed down, but involves instead the ability to identify and analyze production problems and to adapt research recommendation to the special circumstances of their farms. Unfortunately many of our growers do not exhibit these traits and as a consequence the task of extension workers engaged in banana activities is particularly difficult taking into account the exacting combination of material and other inputs required and the constant adaptation of production technology to the changing circumstances and pressures of the trade. The adoption

of this technology we are aware, is increasingly being influenced today by the level of organization of activities at the farming level. Producers who experience difficulty in planning and running their farms smoothly are usually severely restricted in enhancing productivity and profits.

Nevertheless the technological modernization of the industry is also most decidedly a function of the quality and effectiveness of the extension service available. In this regard the turbulent and often capricious nature of the banana environment present abnormal challenges to the field officer. The foregoing notwithstanding, it is amazing how much their role is taken for granted. Research is conducted and tech-packs are formulated, programmes are devised and targets are set, many times without economic screening, and handed down to field officers for transmission to farmers, and of course with them having to accept full blame for any shortfall in the rate of implementation by growers for good measure is often compounded by the rejoinder "time is not on our side". It is no surprise therefore that extension officers are exposed to considerable tensions and contradictions in the exercise of their duties. In fact I am convinced that the cursory adoption of recommended practices by farmers is in many ways a reflection of the under-preparedness of our field staff for the tasks. I have seen in Grenada where extension officers operating within the context of a very depressed agricultural sector of farmer disenchantment, resort to a kind of benign neglect of growers i.e. winning no converts but doing little harm.

In the Windward Islands a significant part of an extension officer's interaction with banana growers is consumed with regulatory tasks eg. inspection of fields for awarding premium, and serving suspension notices where the authority of the office and punitive structures are the tools of persuasion. It is my view that the competence of our field staff which is so crucial for ongoing improvement in farmers technical and managerial skills still needs to be addressed in a vigorous manner.

PLANNED INITIATIVES FOR THE TECHNICAL MODERNIZATION OF THE SUB-SECTOR

- 1. For the first time in Grenada the implementation of a banana expansion programme (500 acres) which is directed explicitly to pure-stand production. Conditions for grower participation will be carefully circumscribed to ensure the exclusion of other crops and the observance of a high standard of enterprise management from production to packaging.**
- 2. Intensive training of extension staff.**

CURRENT AND PROJECTED WORK PROGRAMME IN ST VINCENT AND THE GRENADINES

S Vanloo

In St Vincent and the Grenadines, approximately 65-75% of land available for agriculture are under banana production due to a weekly guaranteed price and market.

Where in the past, large estates dominated, very few now exist and a multiplicity of small holdings with varying management techniques predominate .

As a result, though Vincentian farmers are considered very innovative (black field boxes; 100% paco pack) due to the above mentioned areas, WINBAN recommended practices are not fully adopted hence the wide disparity between farmers. There is the lack of a Business Management approach to banana production.

It therefore means that programmes aimed at technological modernisation should be cost effective and adaptable to the requirements of the local banana farmers.

BANANA PRODUCTION

St Vincent's production had literally doubled since 1987 due, especially to increased acreages; there are now bananas planted in every niche on the islands, so St Vincent has really gone bananas.

Productivity is generally low, and the increase in production was at the expense of quality in order to obtain higher profit margin after poor utilization of expensive inputs.

Projected programme should take account of the specific local conditions the various holdings:-

- **Soils**
 - **Fertilizer and chemical usage to suit soil status/analysis (to offset nutrient imbalances)**

- **Bunch Care**
 - **Use of Blue Diothene (treated/untreated) based on historical trends of insect damage.**
 - **Propping (protection)**

- **Weed Control**
 - **Selective weed control programme (weeds and chemicals)**

- **Planting Material**
 - **Selected varieties to suit niches; improved varieties resistant to pests and diseases.**
- **Leafspot Control**
 - **Programmes based on area/district control rather than island control i.e. use of Piche Evapormeter rather than recommended duration of chemical control**
- **Cropping Patterns**
 - **Farmers in marginal areas concentrating on one crop yearly**
- **Irrigation**
 - **Wherever it is cost effective or simply adjusting planting time to suit plant requirements**
- **Production Estimates**
 - **A necessity; bunch tagging should be a pre-requisite of banana production.**
- **Record Keeping**
 - **A necessity; another pre-requisite and forms/format should be provided to farmers**
- **Summer Production**
 - **Increase summer production by manipulating population density/ratoon rate/pruning**
- **Bio-degradable Products**
 - **Should be sought and utilized**
- **Soil and Water Conservation**
 - **Another pre-requisite as most of our slopes are covered with pure stand bananas**
- **Formal Training/workshops for Farmers and their Workers**
 - **Should be for one week on all aspects of banana production, labour productivity, etc**

PROCESSING

Field packing was very successful as it adopted to our situation i.e. topography, less labour intensive, reduced operation time, less handling and very cost effective.

Many farmers in St Vincent do not have sheds in their field, so centralised packing was

never adopted; thus any new processing method which involved some form of centralised packing would face some resistance especially due to the additional cost.

The current technology is geared toward centralised packing and dipping for the dreaded Crown Rot Disease Control. However, this method is considered by many to be a primitive method of technology due to its labour intensive structure and the hazards involved in the use and disposal of the chemical mix.

Emphasis would have to be placed on education, external appearance and cartons of fruit. Farmers must realise that it is the "skin/peel" of the banana that counts and bananas are now processed by cartons, not clusters. To this end, education must be concentrated on:-

1. **Product Appearance:** Reduce defects to give a more lively and glossy fruit.
2. **Product Uniformity:** proper selection, packaging and carton weights.
3. **Product Quality:** fresher and better quality with proper handling.

At the Inland Buying Depots (IBD's) and the Kingstown Reception Depot, there should be no need for any deep selection; selection should be based on surface appearance and uniformity. Only fruits that go to the Quality Assessors should be unpacked and clinically inspected.

The price structure should be such that sub-standard fruit fetch below cost price and harsh disciplinary measures implemented.

Transportation and handling should maintain the quality of the fruit and the following could help achieve that objective.

- containerization of fruit at source/specific points/ IBD's
- palletization of fruit at source/specific points/IBDs
- Specialization of transport i.e. use of flat bed six-wheel vehicles with collapsible sides for the transportation of fruit

MARKETING

Marketing I would leave to our marketing agents as it would be somewhat difficult to become established overnight unless we are able to achieve high volumes of consistent good quality fruits.

There should be increased communication of the market situation to enable better responses to the market demands.

Ship conditions should be thoroughly inspected by authorised personnel to ensure that ship conditions does not have adverse effects on the fruits.

V. ANNEXES

ANNEX V.1

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¹Does not include special guests who attended only the Opening Ceremony

PROGRAMME

TIME FRAME	TARGETED ISSUE	INPUTS	EXPECTED OUTPUTS
Date: November 29 0700-2300	Registration	- Identification of Participants	<ul style="list-style-type: none"> • Accommodation of participants • Recorded list of participants
Date: November 30 0900-1000	Inauguration	<ul style="list-style-type: none"> - Protocol Session Remarks • Welcome Remarks: Cosmos Richardson, Permanent Secretary, Ministry of Agriculture Saint Lucia • Workshop Background: Antonio M Pinchinat Regional Specialist, Technology Generation and Transfer, Inter-American Institute for Cooperation on Agriculture (IICA) • Address: Cyril Matthew, Managing Director, WINBAN • Keynote Address: Hon Ira d' Auvergne, Minister for Agriculture 	<ul style="list-style-type: none"> • Officialisation of Workshop
1000-1030	Break	Refreshments (Courtesy IICA)	<ul style="list-style-type: none"> • Transition to Technical Sessions
1030-1230	Institutional Research/ Development (R/D) Status (Activities, Achievements Constraints, Cooperation Needs)	<ul style="list-style-type: none"> - Technical Presentations (by country) • Belize • Jamaica • Suriname 	<ul style="list-style-type: none"> • Defined technical basis for cooperation
1230-1400	Break	Lunch	

TIME FRAME	TARGETED ISSUE	INPUTS	EXPECTED OUTPUTS
<p>Date: November 30 1400-1800</p>	<p>Institutional R/D Status (Activities, Achievements Constraints, Cooperation Needs)</p>	<ul style="list-style-type: none"> - Technical Presentations (by country) • WINBAN R/D Centre • Windward Banana Growers Association (Dominica, Grenada, Saint Lucia and St Vincent and the Grenadines) - General Discussion - Synthesis of Regional Supply/Demand of Technology <p>Tropical Punch Party</p>	<ul style="list-style-type: none"> • Defined technical basis for cooperation • Defined consolidated technical basis for cooperation • Linkages facilitated
<p>Date: December 1 0830-1730</p>	<p>Interactions</p> <p>Banana R/D Case Study - Saint Lucia</p>	<ul style="list-style-type: none"> - Field visit • Selected Farmer Holdings • Model Development Projects • Lunch (Courtesy of WINBAN) • WINBAN facilities • Return to hotel - Buffet (Courtesy of Ministry of Agriculture) 	<ul style="list-style-type: none"> • Results, experience and knowledge exchanged • Linkages facilitated
<p>Date: December 2 0800-1100</p>	<p>Interactions</p> <p>Organisation of Horizontal Reciprocal Cooperation</p>	<ul style="list-style-type: none"> - Work Groups (3) • Technology Transfer • Technology Research/Development • Strategic Planning - Plenary Discussion <p>Lunch</p>	<ul style="list-style-type: none"> • Regional networking structured
<p>1100-1230</p>	<p>Break</p>	<ul style="list-style-type: none"> - Plenary Session 	<ul style="list-style-type: none"> • Prioritized areas for horizontal reciprocal cooperation • Institutional framework for cooperation
<p>1230-1400</p>	<p>Agenda for Cooperation</p> <ul style="list-style-type: none"> • Intra-regional • Extra-regional 		
<p>1400-1600</p>			

TIME FRAME	TARGETED ISSUE	INPUTS	EXPECTED OUTPUTS
<p>Date: December 2 1600-1700</p>	<ul style="list-style-type: none"> - Synthesis of Workshop results - Closing Remarks 	<p>Summary Report of Plenary Session</p> <ul style="list-style-type: none"> - MOA, Mrs Rufina Paul - WINBAN, Errol Reid - CARICOM Secretariat, John Browman <ul style="list-style-type: none"> • Dr Antonio M Pinchinat, Regional Specialist Technology, Generation and Transfer, IICA • Joseph Lawrence, Asst. Principal Secretary, Ministry of Agriculture, Saint Lucia • Vote of Thanks (a country representative) 	<ul style="list-style-type: none"> • Planning and technical basis for follow-up • Workshop conclusion and assessment
<p>Date: December 3 0600-</p>	<p>Departure of non-resident participants</p>	<p>Transport means (Courtesy of IICA)</p>	<p>Return trip facilitated</p>

