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AGRICULTURAL EXPORT SERVICES PROJECT
TECHNICAL AND INSTITUTIONAL ANALYSIS

PREPARED FOR:-

AGRICULTURE AND RURAL DEVELOPMENT OFFICE

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SUMMARY

Institutional Analysis

Many institutions (domestic and international) play important roles in Jamaican agriculture with some overlap and duplication of activities. Weaknesses in the Ministry of Agriculture - research, extension etc. - have caused the different Commodity Boards to undertake their own agricultural support activities.

The Commodity Boards (AIBGA, CIB, CIDCO), JAS, CARDI and Development Banks have the capability to manage specific project activities and the associated funds. New associations are proposed to support small bananas producers and for aquaculture. Assistance is recommended for the Co-operatives involved in cocoa and coffee production and export for their institutional strengthening, credit, extension etc.

Technical Analysis

Of the traditional agricultural crops, coffee, cocoa and bananas are seen to be areas of great growth potential. The Commodity Boards have established attainable production and export targets but they will need special assistance in removing constraints to meet quotas in preference markets and take advantage of premium markets. By 1992 banana export is projected to attain the UK quota of 150,000 tons per annum. Cocoa export in 1995 is expected to be 4,500 tons while coffee acreage in 1993/1994 is expected to be 10,000 acres in Blue Mountain coffee and 20,000 acres in non-Blue Mountain coffee.

Pimento needs greater market thrust. Assistance should be provided for this as well as drying pimento and the extraction of pimento leaf oil.

In the non-traditional export areas, yams are seen to provide the greatest opportunities for expansion and the widespread promotion of the mini-sett technology is proposed. Using this technique gross returns of \$143,640 per acre are attainable at current prices. This compares with gross returns of \$66,050 per acre using the traditional method.

Mangoes and other tropical fruits (papaya, sweet sop, sour sop, guava, passion fruit) are to be encouraged based on the strong demand for them in North America and Europe.

The need is seen for technical assistance for feasibility studies, technical and management problems during project implementation, strategic studies on potential crops, market studies and market intelligence. The development banks (JADF, NDF, TDB) are proposed for managing the funds for technical assistance. The fund should be biased towards assistance during implementation rather than for feasibility studies.

Need is recognised for assistance in establishing pesticide residue analysis facilities, in association with the Ministry of Industry and Commerce. A quarantine manual is urgently needed and local technical expertise is proposed to prepare such a manual. Additionally, technical assistance is proposed for solving certain post-harvest problems in export crops such as early ripening in papaya and bloom damage in anthurium.

RECOMMENDATIONS

1. Export Production Component

a. Bananas

- Assist small farmers in setting up association under A.I.B.G.A.
- Credit (in kind) for material input.
- Long-term technical assistance (local) for general banana technology including field packing technique.
- Refurbishing of packing plants.
- Transportation
- Channel funds through AIBGA.
- Establish banana nurseries in selected areas.

b. Coffee

- short term technical assistance (local) to strengthen cooperatives.
- Provide funds for credit (in kind).
- Make funds available through CIDCO.
- Training of producers.

c. Cocoa

- Long-term technical assistance (local).
- Credit (in kind) for material purchase.
- Transportation.
- Training of producers.
- Training of Co-op management.
- Make funds available through Cocoa Industry Board.

d. Pimento

- Short-term technical assistance (local) to study pimento market.
- Short-term technical assistance (foreign) for drying.
- Transportation to assist JAS in collecting pimento berries.
- Short-term technical assistance (local) in extracting pimento leaf oil.
- Extension service.

e. Yams

- Establish mini-sett nurseries.
- Provision of transportation.
- Long-term technical assistance (local) for nursery and extension.
- Work with financially troubled Christiana Potato Growers Association to produce yams along with potatoes. Here funds would be through JAS. Funds for other items above would be through CARDI.

e. Aquaculture

- Assist fish producers to form national association as well as Cooperatives.
- Association to keep register of producers and dealers.
- Short-term technical assistance (local) in establishing cold storage, processing technique, marketing.
- Training of producers.

f. Ornamental Horticulture

- Short-term technical assistance to solve specific problems that have industry wide implications.

g. Vegetables

- Long-term technical assistance (local and foreign) for market intelligence.

h. Tropical Fruits

- Short-term technical assistance for strategic market studies.

Post Harvest Export Services Component

1. - Assist Ministry of Industry and Commerce in establishing and operating pesticide residue laboratory.
 - Short-term technical assistance (foreign -U.S.A.)
 - Mobilization
2. Short-term technical assistance (foreign - Hawaii) to solve problems in Ornamental Horticulture eg. anthurium bloom damage.
3. Short-term technical assistance to work on problems in tropical fruits eg. early ripening in papaya (foreign - Hawaii)

Export Project Design and Management Service Component

- Emphasise technical assistance during project implementation over technical assistance for feasibility studies.

- Matching grant (50% investor; 50% project) for feasibility study.
- Matching grant (40% investor; 60% project) for technical assistance during implementation. Project may bear full cost if problem has industry wide implication or investor's portion could be treated as a loan.
- Technical assistance for strategic studies on potential crops.
- Technical assistance for Market Analysis.
- Technical assistance for market intelligence.
- Channel funds for technical assistance through Development Banks.

INTRODUCTION

This paper is one of three in the development of the Agricultural Export Services Project that seek to identify and remove constraints to increased production and export of agricultural crops. It addresses the three proposed components of the project, namely:-

1. Export Production Services Component - which promotes increased diversification, production and export.
2. Post-harvest Export Services Component - which addresses those off-farm services relevant to the proposed crops.
3. Export Project Design and Management Services Component - which concerns itself with the technologies for improved production.

In doing this, the paper examines the project components to determine their technical feasibility in relation to project objectives of increasing the production and export of traditional and non-traditional export crops.

Secondly, the institutional capabilities of the groups or organizations involved in production and export of traditional and non-traditional export crops are described and analysed.

INSTITUTIONAL ANALYSIS

Ministry of Agriculture

The agricultural sector in Jamaica encompasses the work of a number of agencies of differing status which devote all or part of their efforts to direct agricultural support.

The Ministry of Agriculture (MOA) in the 1980s has concentrated on small farmers through its extension, marketing and technical services and has planning, research, regulatory, land and water resource responsibility.

The major contributors to agricultural planning policy analysis are the Ministry of Development, Planning and Production, the Ministry of Agriculture and the Planning Institute of Jamaica.

The Ministry of Agriculture contributes to policy analysis primarily through an Economic Planning Division (EPD) and a Data Bank and Evaluation Division (DBED). The EDP has four intended emphases: micro planning (feasibility studies), macro planning (5 year plan), farm management and data analysis. The farm management analysis work concentrates on developing an understanding of the components of production costs, a key element in understanding constraints to agriculture. DBED is primarily responsible for crop forecasting and production statistics. The DBED is changing its data collection method to a stronger and, hopefully, more efficient - sampling system.

Marketing

Marketing of the traditional export crops is performed primarily through the commodity boards (Coffee Industry Board, Cocoa Industry Board, Citrus Growers Association, Banana Export Company, Jamaica Sugar Holdings) and, in the case of pimento, the export division of the Ministry of Agriculture.

The Jamaica Export Trading Company (JETCO) provides export marketing intelligence services, particularly for non-traditional commodities. Now there is also a large number of individuals exporting non-traditional crops.

The domestic marketing is dominated by higglers who buy at the farmgate, transport and distribute the products either directly to the consumers or through markets managed by local authorities. This tradition is well established and fairly immune to regulation or systemization.

The marketing and Credit Division of the Ministry of Agriculture oversees such activities as quality and standard inspection of Jamaican exports, pre-clearance inspection of products exported to the U.S. market, inspection of vegetable products imported into Jamaica.

The Division with the assistance of the USAID had established the Producer Marketing Organizations (PMOs). These were designed to assist the farmer in marketing (local and export) his crop working in a cooperative environment. The PMOs have not been successful and of the 12 started only four remain functional.

Research

There are many institutions, public and private, that carry out agricultural research. Many of these are under the auspices of the Ministry of Agriculture such as the various Commodity Boards. These boards tend to do research that relate specifically to the crop they are responsible for and mainly do the research to solve specific short-term problems related to the commodity.

Much of the research, especially in the Ministry, lacks continuity and mostly there is inadequate publication of the research findings. Often too, the research is so designed that the data cannot be properly analysed. This has been especially so since the 1970's.

The Ministry of Agriculture lacks the qualified staff and funds needed to carry out useful research. This can to a large extent be blamed for the low agricultural production experienced throughout the country since the technologies are not being updated.

In 1979 the IDB funded a US\$6.4 million "Programme for Reorganization of Agricultural Research Services". A key objective of this project was to redress the balance of research between export crops and domestic crops and small farmer agriculture. The physical facilities have been built up but fiscal constraints have prevented the full use of the research facilities.

The inability of the Ministry of Agriculture to satisfy the research needs of the various sectors provided a driving force

for these sectors to begin to strengthen their own research efforts. The result is a long list of institutions which do all or part of their own agricultural research. This list includes:

1. Ministry of Agriculture - Science, Technology and Research Department
2. Scientific Research Council (SRC)
3. University of the West Indies (UWI)
4. Caribbean Agricultural Research and Development Institute (CARDI)
5. Inter-American Institute of Agricultural Corporation (IICA)
6. Sugar Industry Research Institute (SIRI)
7. Banana Board
8. Cocoa Industry Board (CoIB)
9. Coconut Industry Board (CoIB)
10. Coffee Industry Development Company (CIDCO)
11. Citrus Growers Association (CGA)
12. Storage and Prevention of Infestation Division (MIT)
13. Soil Survey Laboratory (MOA)
14. Jamaica Agricultural Research Programme (JARP)

The MOA research budget for the 1987/88 financial year was \$8,606,000. This quantum of funds for agricultural research is not small for Jamaica's size. In fact, it is high by third world standards and approaches the situation of developed countries.

While the Ministry of Agriculture is the major institution providing agricultural research it suffers from various long term problems such as shortage of operating funds, vacancies

direction. The Ministry of Agriculture has its major research facilities at Kingston, Bodles, Grove Place and Montpelier.

Bodles operates on 1,269 acres of which 540 acres are devoted to livestock and 600 acres to field crops. The livestock work encompasses dairy and beef cattle breeding, nutrition, pasture research and small stock multiplication. The work on crops involves corn, sorghum, yams, cassava, sweet potatoes, red kidney beans, irish potato, pigeon peas, onions, cabbage and cantalope. It also includes plant pathology (entomology, nematology) and banana breeding.

Grove Place which has a mid-island location has a total of 1,600 acres. Improved pastures take up 694 acres. Beef cattle research is on 700 acres of hilly land. There are also 70 acres of pasture research mainly grass/legume mixtures.

The nucleus herds of Jamaica Red and Jamaica Black Cattle are maintained here. There is also some work on goats and sheep.

The Montpelier Research Station was established in 1980-81 in the west of the island. There are 900 acres that are used mainly for livestock research. The IDB provided a grant for staff housing, office block, milking parlour, roads and water. In addition to livestock research, there is research on legume forage and there is a cocoa observation plot for varieties of cocoa imported from Trinidad.

The Scientific Research Council which falls under the Ministry of Agriculture does research in tissue culture (funded by UNDP) in collaboration with UWI and IICA. Crops involved are irish potato, sweet potato, fern, orchid, yam and cassava.

It also researches bio-energy and has a bio-project funded by the Italian Government. Also being researched are legume inoculants, mushroom cultivation, pesticide research and monitoring, trace elements.

The Food Technology Institute is an arm of the SRC. It researches meat processing, food dehydration, and crystallization, low acid canned foods and mineral research using solar energy to produce salt.

The Soil laboratory of the MOA does research in areas such as soils, tissue, water and fertilizer analysis. The Laboratory is well equipped but grossly underutilized.

The storage and Infestation Division of the Ministry of Trade and Industry does research in accordance with storage problems.

At the UWI, the departments of Zoology, Chemistry and Botany carry out agricultural research. This research includes tissue culture, virus free planting material, nitrogen fixation in rice and legumes, efficiency of herbicides, nematode control, fungal control, control of fidler beetle of citrus, insecticides, control of coffee berry borer in conjunction with CARDI, pesticides levels in foods in collaboration with the SRC and the control of Diamond Back Moth in conjunction with the Jamaica Agricultural Development Foundation - JADF.

CARDI is a regional institution which collaborates with UWI, MOA, CIB, SIRI and IICA. It performs research throughout Jamaica on a variety of crops and in agricultural engineering.

ICCA has been doing research locally in support of technical and managerial aspects of Farm Systems.. It emphasises the

training of personnel and tests of methodologies.

The College of Agriculture is located on 600 acres of hilly land. It has another 100 acres of level clay soil. No research is currently being done but plans are being formulated to begin research soon.

Extension

The Production and Extension Division of the Ministry of Agriculture has prime responsibility for agricultural extension. The service is provided from the regional and parish offices. As is the case with research, the Commodity Boards are engaged in extension for their own farmers. Other institutions such as the JAS are also actively engaged in extension. The result, naturally, of this fragmentation is inefficiency. It is uncoordinated and disjointed. It has duplications and encourages waste.

The Structural Adjustment Programme beginning in 1981 saw to the reduction of Government expenditure to the public sector. This included the extension service to no small extent. The extension service in the MOA is now being done by fewer than 200 extension officers. Some 100 of these officers are assigned to the IFAD small farmer credit project. They assist in activities such as the preparation of farm budgets and in soil conservation programmes. The other extension officers are supposed to work with "satellite" farmers around the "mother" farms and "production centres".

In the redundancy programme, the more senior extension officers were kept on so that experience has not been severely

affected. One advantage of the reduced number in the service is that it is more manageable but the service is not being delivered to the farmers because of the many crippling problems that beset the service.

There are many weaknesses and needs in extension. Primarily is the need for an operative policy concerning extension programmes which defines objectives, identifies clientele and establishes coordination among institutions and with research and education programmes. Second is the need to develop effective work plans for extension offices located at the regional and parish levels and for individual officers. Third is to define and provide the level of auxiliary support needed to field a functional extension officer, including transportation and inputs. Fourth is to re-assess pre-service and in-service training options.

The new Government has stated its intention to form a new Statutory organization to implement its improved extension delivery service. This institution, to be called Rural Agricultural Development Agency (RADA), will have four regional offices and have effective linkages between research and the farmers. It is expected that this organization will require up to a year to come on stream.

Credit

Sources of Agricultural Credit in Jamaica are:-

1. The International Financial Institutions including:
 - a. World Bank
 - b. European Development Bank

- c. Inter-American Development Bank
 - d. U.S.A.I.D.
2. Domestic Private Financial Institutions
- a. Commercial Banks
These mostly make short-term loan to agriculture.
 - b. National Development Foundation (NDF)
This private sector institution lends to small business on short, medium and long term basis.
 - c. Trafalgar Development Bank (TDB)
This development bank which was established with USAID funds makes medium to long term loans to agriculture.
 - d. Jamaica Agricultural Development Foundation (JADF)
This is a Private Venture Capital Institution that makes medium to long term loans to and takes equity in agricultural ventures.
3. Domestic Public Sector Financial Institutions.
- a. Agricultural Credit Bank (ACB)
 - b. People's Cooperative Bank

Agricultural Credit Bank (ACB)/Agricultural Credit Board

The Agricultural Credit Bank is one of the successors to the Jamaica Development Bank and focuses on lending to agricultural and agribusiness projects through forty People's Cooperative Banks and the commercial banks. The ACB has a number of branch offices to facilitate borrowing.

The ACB was established in 1981 to rationalize and consolidate in a single institution the execution of all agricultural credit programmes which to them were financed by loans from international organizations. The ACB has an eleven member board of Directors appointed by the Government, two of which represent the Ministry of Agriculture and the Ministry of Finance.

The ACB grants loans to the PCB system so that they can in return, distribute them among the small farmers consistent with the plans and policies set up by the Small Farmers Development Programme. The procedure for this is that the PCB presents to the ACB a package of credit requests formulated by farmers. The ACB examines the requests and grants overall credit according to terms established for the different agricultural activities. The PCB, therefore, becomes the debtor, manages the resources and attends to repayments to the ACB.

The ACB gives technical and legal assistance to the PCB's including the management and solving of problems of portfolio arrears.

The Agriculture Credit Board

The Agricultural Credit Board acts as regulator and supervisor of the ACB and the PC Banks. It functions in a manner similar to the Inspector Department of the Bank of Jamaica.

The staff of the Agricultural Credit Board is under the Civil Service System. The Ministry of Agriculture provides certain payroll and Administrative Services to the Board for which the Board reimburses it.

Coffee Industry Board/Coffee Industry Development Company

The Coffee Industry Board (CIB) was formed in 1948 and is the agency responsible for the collection, pulping, grading, furnishing and export market of coffee. It has in its operation seven coffee pulperies. Its role extends to the regulation of coffee under the Coffee Industry Regulation Law.

The producers of coffee receive a Market-related price. Presently the price approximates 64 percent of the proceeds of coffee sales. The Ministry of Agriculture which is involved with the Board in setting the price paid to the farmers hopes soon to be able to return 75 percent of coffee sales proceeds to the farmers.

The export marketing of coffee has been deregulated. Not many producers have attempted to take advantage of this situation since certain restrictions exist, such as minimum volume. JABLUM which has its own pulperies exports coffee (beans and roasted coffee) independently of the Coffee Industry Board except for the regulatory aspects.

The Coffee Industry Board has established a subsidiary company, Coffee Industry Development Company (CIDCo). This company is financed by a cess on coffee processed along with returns from the CIDCo coffee farms. Some of the activities are funded from grants from donor agents.

The programmes of CIDCo include extension, crop protection, seedling production, administration of coffee development programmes and operation of coffee plantations. The company has an extension staff of 100. These agents also supervise a credit

programme for inputs, most of which are supplied by CIDCo.

The U.W.I and CARDI perform most of the coffee research on contract. CIDCo itself has a research staff of two who conduct field trials and short term research on varieties and fertilizers.

Unlike the Cocoa Industry Board and other EMO's the CIDCo has not been asked to divest its farms.

CIDCo is well organized and has been performing its role well. Before the hurricane of 1988 the industry was self-financing. The hurricane imposed a two year set back. Because of the fall off in production, funds are not available to maintain the technical staff. Some funds have been secured for certain programmes such as a US\$7.3 million from the Japanese traders. It is estimated that some J\$23 million are needed over two years. These funds are being actively sought.

A costing has been done for the individual Cooperatives. Of the 21 Co-ops only eight can pay for the services received. Four are hopeless. For the services, these Co-ops need grant funds for two to three years. The immediate needs of the cooperatives then are for:-

1. Extension Service
2. Crop Care
3. Assistance to Cooperatives.

The Coffee Industry Board makes grants to non-viable cooperatives while they make efforts to increase their production and income. The Board is not in the position now to provide much of this assistance. The problem is with the 16 non-Blue Mountain

Co-ops. This represents the Co-ops of the small farmers. It is estimated that a grant of \$5,000,000 over five years will bring back the Co-ops to viability.

Banana Export Company/Jamaica Banana Producers Association/
All Island Banana Growers Association

The Banana Export Company (BECo) was established in 1985 as a marketing company owned by producers of bananas. It replaced the Banana Company which was a general purpose organization serving the banana industry. BECo is solely an exporting company for bananas and is licensed as the sole exporter of bananas for 10 years. The Ministry of Agriculture, the All Island Banana Growers Association and independent growers are represented on the board.

BECo pays a market related growers' price to growers who deliver export quality fruits to the port of export. It is the responsibility of the growers themselves to pay for inputs.

Over the last few years banana production has concentrated on large holdings in areas zoned for the crop. There is now a strong drive to bring back the traditional small farmers into banana production. Additionally, new small farmers are being encouraged to produce the crop.

The Jamaica Banana Producers Association Ltd. is a private company. Its agricultural interest includes Aqualta Vale and St. Mary Banana Estates, Eastern Banana Estates and fish farming through Jamaica Producers Aqualapia. The company owns Sunburst which is the largest exporter of non-traditional crops to the United Kingdom. Another subsidiary, Jamaica Producers Marketing

exports non-traditional crops to the U.S.A.

The All Island Banana Growers Association (AIBGA) concentrates mainly on supplying inputs for banana production, including fertilizers and chemicals. It also operates six public boxing plants for its members on a cooperative basis.

The Banana Board is a technical organization and is involved in banana research.

Cocoa Industry Board

The Cocoa Industry Board (CIB) was established in 1957. Its specific mandate was to perform the market related activities for Cocoa farmers. With time the CIB took on certain non-marketing activities including cocoa farming, research, crop protection and extension. These non-marketing activities were in 1984 passed on to a newly formed subsidiary of CIB; the Cocoa Farmers Development Company.

The Cocoa Industry Board was also removed from Government budget. This had the effect of reducing the level of cocoa research. The CIB has been able to collaborate with certain other institutions such as the Coffee Industry Development Company, the Coconut Industry Board, the Research and Development Division of the Ministry of Agriculture, the University of the West Indies and Plant Quarantine to continue some research as well as demonstrations.

The export marketing of cocoa has been deregulated. The opportunity has not been exploited by any grower. This seems to be because cocoa production is a small farm affair. There are

some 24,000 suppliers with farm size averaging one acre. It is only the Cocoa Farms Development Company which has nine farms that can be classed as a commercial producer.

A market related producer pricing formula has been introduced by the Cocoa Industry Board. This has permitted the farmers to receive a higher percentage of the market price of cocoa beans. For the current crop, the supplier is paid \$75.56 per box which represents 22 lb. of dry beans.

The link between the Cocoa Industry Board and the growers is the Cocoa Cooperatives. There are sixteen such Cooperatives whose umbrella organization is the Cocoa Growers Federation. This is one of the farmer organizations under the Jamaica Agricultural Society (JAS).

Cocoa is purchased by the CIB from the group. Payments are made to the group which distributes it to the producers. So in its purchasing arrangement the CIB has no direct contact with the individual suppliers. This arrangements is said to work well.

Inland Fisheries Unit

The Inland Fisheries Unit at Twickenham Park, in Spanish Town, is the Government organization which provides support for inland fish farming in Jamaica.

It developed out of initiatives of the USAID which sponsored a Fisheries Development Project in 1978, to evaluate the economic potential of commercial fish culture in Jamaica and to increase Jamaica's institutional capacity to implement a fish production programme. The production and economic analysis of the project were very favourable and prompted a follow up project in 1979 to

stimulate the development of warm water fish culture in Jamaica's private sector.

The Inland Fisheries Unit is now staffed by seven technical officers. Two of these are graduates of the University of the West Indies. Five are graduates of the Jamaica School of Agriculture. It is determined that an additional four technical officers are needed to serve the industry and these four are to be recruited soon.

Activities of the Unit include:-

1. Adaptive research
2. Extension service
3. Provision of fingerlings, particularly carp (Grass and Silver).
4. Certification of live fish for export.

Jamaica Export Trading Company Limited

The Jamaica Export Trading Company Limited (JETCo) was established in 1977 and has as owners the Jamaica National Export Company (50 percent) and the Bank of Jamaica (50 percent).

JETCo provides the Jamaica Industrial and Agricultural producer with access to overseas markets. This it does through its subsidiaries; JETCo (UK) Ltd; and JETCo (USA) and agents in the Caribbean.

JETCo has been marketing mainly:-

- ground provision and fresh fruits
- spices
- horticultural products

- processed foods

It markets the pimento crop on behalf of the Government.

The functions of JETCo have not undergone changes since its inception. It has steadily been consolidating its position in the overseas market place.

JETCO assists the producers of agricultural produce by:-

1. Outright purchase of items for export.
2. It acts as export agent (without taking title to the goods). It provides the exporters with services such as documentation, assistance with pricing and providing expertise to ensure the completion of the transaction.
3. It makes local haulage and shipping arrangements.
4. It provides ancilliary services such as documentation and the establishment of and negotiation of payment instruments (letters of credit).
5. It provides marketing services to the Jamaica exporters covering creation of an overall marketing strategy, advice on the required specification of product to enter and become successful in overseas markets.

Pimento

Unlike Coffee and Cocoa, there is no Commodity Board for pimento. The Ministry of Agriculture is responsible for the export marketing services for this crop. It also sets the price to be paid to the growers. It is likely that the growers receive more for the crop than they would under a Commodity Board since

they do not have to pay for the bureaucracy but at the same time they lose out on the level of research and extension.

JETCo markets the pimento externally on behalf of the Government. The Jamaica Agricultural Society (JAS) is responsible to a large extent for the assembly of pimento berries for export.

Jamaica has been experiencing a reduction in status on the world pimento market in recent times. This is due to some extent to reduced production but also marketing effort might be a problem.

Another important product of the pimento plant is the pimento leaf oil. While Government markets the dry berries, private individuals extract and export pimento leaf oil.

There is a Pimento Growers Association under the umbrella of the JAS and housed at the Ministry of Agriculture. The Association operates a nursery and sees to other interest of the pimento producers.

Current efforts by the Ministry of Agriculture, the Pimento Growers Association and the JAS would seem to be adequate to restore the industry to pre-hurricane status.

The marketing of pimento seems to be the area of constraint in the industry. Jamaica once held 95 % of the world pimento market. During the 1930s it exported more than 5,000 metric tons. It now export only about half of this amount having lost market share to Mexico, Honduras and Guatemala.

This project could provide short term technical assistance (local) to study the market for pimento, for drying pimento berries and for extracting pimento leaf oil. Additionally, assistance should be provided for extension and transportation to

assist JAS in collecting pimento berries.

The Jamaica Agricultural Society

The Jamaica Agricultural Society (JAS) is the umbrella organization for a number of other agricultural organizations. It was originally the only agricultural organization in Jamaica and can be regarded as the original leader of agriculture in Jamaica. It promoted extension and commodity groups. The JAS is funded by the Ministry of Agriculture and now represents chiefly those producers who are not represented by other organizations.

The Agricultural Marketing Corporation

The Agricultural Marketing Corporation (AMC) was established in 1963 to provide certain services to farmers:-

1. To provide and maintain adequate marketing outlets for agricultural produce grown primarily for domestic consumption.
2. To buy and sell agricultural produce.
3. To provide for collection, transportation, storage, grading, packing and processing of agricultural produce.

There were eight branches with buying points. Additionally, there were 18 Green Groceries.

Purchases from the farmer were on the basis of:-

1. Minimum guaranteed price for the crop.
2. Monthly fixed prices.
3. Contract prices.

The operations of the AMC were not financially viable and were closed by the previous Government. The central facilities in Kingston are being used by various private concerns to export ethnic crops.

The present Government has voiced its intention to reopen the AMC. How it will function is not yet clear.

EXPORT PRODUCTION SERVICES COMPONENT

Banana

The Banana Industry has recovered from the September, 1988 hurricane. Much money has been put into the resuscitation programme including J\$25,000,000 from the ACB through the Bank of Nova Scotia, J\$10,000,000 from the Banana Industry Insurance Fund and J\$50,000,000 from private insurance. Donor agents such as the USAID have also injected funds into the resuscitation programme.

Funds for new plantings have not been sufficient to attain the 150,000 tons per annum. Additionally, the funds have been directed to only a few projects in the eastern growing areas.

The EEC - 1992 will pose a challenge to the Jamaican Banana Industry. It is necessary to lobby to maintain some level of preference but the industry must gear itself to compete in quality and quantity. This industry is accordingly worthy of special assistance.

Government intends to promote banana cultivation in the traditional areas. These are areas where small farmers contributed much to the high export levels of the past. This project should endeavour to assist production in other areas, in St. James and St. Elizabeth.

Funds should be channelled through the AIBGA and should be made available for:-

1. Establishment of banana nurseries in the selected areas.
2. Credit for purchasing material input.

3. Long term technical assistance (local) for general banana technology transfer including field pack technique.
4. Refurbishing of packing plants
5. Transportation
 - a. for technical personnel
 - b. for material to the Coops and banana to the wharf.

This assistance will cause the production of export bananas in areas where there is no production now.

6. Improving the Banana Port Facility at Port Antonio.

Yam

There is tremendous potential for the increased export of yam (especially yellow yam). Results from increased input are realized in the short run (within a year).

This project could assist by providing funds for:-

1. To establish three mini-set nurseries to serve
 - a. Hanover, St. James and St. Elizabeth;
 - b. Manchester and Trelawny; and
 - c. St. Ann and Clarendon.
2. 3 trucks and 3 pick-ups
3. One technical person. This arrangement could be made through a company so that after the initial stages where the person is used full-time, he could be called upon as needed.

It is proposed that this activity be done through CARDI in association with U.W.I. and IITA. These institutions have had many years experience with the mini-sett techniques and yams in general.

Cocoa

To encourage the production of cocoa, a model for mixed cropping with other tree crops is proposed. This will support cocoa ecology and has the potential to sustain itself.

Experience can be drawn from the systems that have developed locally where there are:-

- a. a large number of small farm producers (24,000-30,000).
- b. larger farms with (1) mix of cocoa and coconut mainly in St. Thomas and (2) other medium to large farms on which some cocoa is grown.
- c. the 9 farms owned by Cocoa Farms Development Company.

The farm systems approach is preferred too because of the low returns per acre from cocoa. Cocoa offers less favourable returns per acre per man day than coffee, yams, vegetables and citrus. As part of a mixed system it provides twice per year income and the market is sure.

Assistance to the Cocoa Industry should be by way of strengthening the organizational structure and capability of the Cooperatives to make them better able to assist their members in transportation, credit, supplies and information.

The Cocoa Industry Board should be made responsible for the administration of any such programme. Specific Co-ops would need

to be looked at in light of other projects being implemented by other donor agents. There is a cocoa project in the Rio Minho Water Shed and another in the Kingston Watershed Area.

Attention should be directed to other areas such as Hanover and St. James. Specific needs for such projects are:-

- a. One long-term technical assistant
- b. Credit for material purchase
- c. Transportation for bringing in material
- d. Training of producers
- e. Training of Co-op management to strengthen its managerial capability to serve its members in the production drive.

POST HARVEST EXPORT SERVICES COMPONENT

Activities under the Post-Harvest Export Services fall under the Division of Marketing and Credit in the Ministry of Agriculture. The service there is performed as two distinct activities namely:

- a. Pre-clearance
- b. Quarantine activities

Pre-clearance:- Produce, on entering any U.S. port if found with pests and diseases must be (1) destroyed (2) be treated or (3) be immediately re-exported. These are all very costly to the exporter. A pre-clearance programme allows these inconveniences to be avoided.

In Jamaica, pre-clearance activities have been in effect for five years. Produce for export to the United States receives pre-clearance at the exporters packaging house or at the two international airports in Kingston and Montego Bay. There are five officers and a consultant provided by the Animal and Plant Health Inspection Service of the United States Department of Agriculture. This staffing is considered to be adequate.

A centralized pre-clearance facility is now in operation at the Norman Manley International Airport. This facility was provided by the USAID and is being operated by private concern.

The facility has centralized refrigeration and a fumigation chamber. The fee structure is J\$25 per invoice. The concessionaire retains 95 percent of the fee. For fumigation there is an additional fee per box.

Quarantine Activities

This section sees to the control of the air and sea ports for the import and export of animal and plant material. It is its responsibility to see to the exclusion from Jamaica of new pests and diseases. They must also see to it that Jamaica's crop export is not jeopardized by allowing infested produce to be exported. The staff requirement here is 25 but this has not been filled.

Several activities in this component are in need of assistance.

1. Pesticide Residues

Pesticide residues have been detected in agricultural exports to the U.S. These have been in vegetables (calaloo and hot pepper) and resulted from:

- (a) the use of unapproved pesticides. Certain pesticides that are used only in a restricted way (eg. on cotton) in the United States are used on vegetables in Jamaica. This is partially due to the practice of pesticide relabeling by the chemical companies in Jamaica.
- (b) The use of the chemicals too close to harvest.
- (c) Too high dosages.

The Ministry of Industry and Commerce will be establishing a pesticide residue testing and monitoring programme. Currently, the U.W.I. does some pesticide analysis. This activity is best done in conjunction with the Ministry of Industry and Commerce, the Ministry

of Agriculture and the Ministry of Health. This project should strengthen the Ministry of Industry capability since it first has decided to set up the facility. Assistance should be in the form of equipment, mobilization and short term technical assistance (Foreign - U.S.A.).

2. Information

There is no quarantine manual. The manual is an extremely important tool and should be prepared with urgency. The need would be for technical assistance (local) for six months to one year, plus clerical support.

3. Post-harvest Handling and Care

(a) **Anthuriums** export from Jamaica remains lucrative. It has been observed though, that up to 50 percent of the blooms are damaged between harvesting and delivery to the consumer. The damage is mainly between cutting the bloom and packaging it.

Possibly, an improvement could be had from doing field packaging. An expert on harvesting techniques could prove most valuable here. Short term Technical Assistance (Hawaiian) is recommended.

(b) **Papaya** - Presently the system for shipping papaya is unsatisfactory. There is too much ripening. Short-term technical assistance is required to help

solve the problem. The assistance may best be obtained from Hawaii since it is the foremost in the papaya business

EXPORT PROJECT DESIGN AND MANAGEMENT SERVICES COMPONENT

This project component will provide assistance for the preparation of feasibility studies for export agricultural projects as well as technical and management assistance for implemented projects.

Several institutions have programmes to develop feasibility and pre-feasibility studies. With some financial institutions this is included as part of the loan package.

The Jamaica Pre-investment Programme (JPIP) of the Planning Institute of Jamaica (PIOJ) makes loans available at low interest rate (7.5 percent) for pre-feasibility studies.

Jampro has an agri-business unit that performs feasibility studies without charge for small and medium size agricultural projects.

The National Development Foundation (NDF) in addition to assisting without charge in project development, makes it compulsory for any one using its funds to attend its project management training sessions.

The Jamaica Agricultural Development Foundation will contribute 50 percent of the cost of the feasibility study. If the project is approved for funding, this 50 percent is added to the loan package. Should the project be declined, the 50 percent is written off as a grant. The facility is not advertised. Clients are told of it as is seen to be necessary.

The Agricultural Credit Bank and Trafalgar Development Bank also have project development capability. This holds true also

for most Commercial Banks. These have agricultural units that work on projects. In the case of TDB there is a fee associated with the assistance given.

The institutions monitor their agricultural loans to various degrees. It has been demonstrated that arrears on agricultural loans are less than half that on the overall portfolio (2.4-3.0 percent for agricultural loans versus 6.0-7.0 percent for all loans). This could be explained by the higher level of equity required for agricultural projects and that most of these agricultural projects were highly profitable export ones. The Peoples' Cooperative Banks which lend to small farmers have the highest level of arrears in agricultural lending.

The Jamaica Agricultural Development Foundation (JADF) has been able to pay consultants to give technical assistance to certain of its funded projects. This is not so for the other lending institutions. While funds and expertise are generally available for feasibility studies they are often not so available for assistance during implementation.

Often some problem surfaces during the course of project implementation; the solving or elimination of which could make the difference between success and failure of the project. These problems are not considered and allowed for in the feasibility studies. Of note too is the fact that often the feasibility report is considered only as the tool to access funding. The document is rarely used again once funds have been secured.

The need is seen then to be greater for technical and management assistance during implementation than for feasibility studies. While feasibility studies are not to be totally

neglected by the project only a small portion of funds needs to be set aside for them. The greater portion should be for assistance during implementation and operation.

The funds should be channeled through the development banks JADF, NDF and TDB. These institutions already do very close monitoring of their projects and have some experience in technical assistance in addition to the fact that USAID has been working with them.

For feasibility studies a matching grant of 50 percent of cost to undertake the study should be considered. For technical assistance during implementation and operation the investor should be asked to contribute 40 percent while the project would contribute 60 percent of the consultant's cost. Where the investor is seen to have problems paying the amount, it could be treated as a loan or the export service project could bear the total cost in special cases such as where the problem could be of national importance.

In addition to providing funds for feasibility studies and assistance during project implementation and operation it is proposed that certain other activities be addressed. Funds should be allowed for:-

1. strategic studies on potential crops. ^{Not part of the Proj.} As soon as there is information on the possibilities of producing a new export crop or expanding the production of an existing crop that could be of national importance, a study should be made. An example here is the new wave of interest being shown in the U.S. to crops such as sweet

sop, sour sop and breadfruit. The Ministry of Agriculture is not in a position to provide this service. The project then would be providing a very valuable service here.

2. The area of marketing is often the weakest in a feasibility study. This is so because there is usually the feeling (rightly so) that the market is large. It is nevertheless necessary to establish niches into which one markets and this requires much study and visiting of the market and market contacts in the overseas market.

3. Market Intelligence must be a constant service. This is grossly inadequate to the Jamaican exporter. This project could also fulfill a role here.

The Jamaica National Export Corporation (now part of Jampro) had as part of its responsibility the provision of information on the export market. This function is being continued by Jampro but there is the need for more effective dissemination of the information. Possibly newspaper items similar to the weekly press release of the Ministry of Agriculture on farm-gate price could be tried.

This type of information while useful is only a guide and real presence in the market place is needed because of how dynamic is the nature of the export market.

Praedial Larceny

The problem of praedial larceny has been animatedly discussed, deplored and debated for years. Praedial larceny, which essentially means crop and produce theft, has a unique status here. The term is seldom used elsewhere where laws and programmes treat the problem more generically under the broader category of "theft".

The effect and extent of praedial larceny in Jamaica is uncertain. A 1981 survey done by Peter Carson estimated losses at \$39 million annually. A 1986 Economic and Social Survey said the loss was but \$309,000. The President of the Jamaica Agricultural Society said, in a 1988 Senate Debate, that the cost to the sector is \$500 million, perhaps much higher.

This paper will not add another estimate to this array but notes that praedial larceny is routinely cited as a major and growing concern impacting on the potential and performance of the agricultural sector. Major commercial farm ventures routinely budget and plan for security measures and systems. Some commercial lending institutions reportedly used a percentage estimate for crop losses due to theft in assessing loan applications. Surely, the most vulnerable are the small and mid-size farmers who cannot afford to hire security and whose livelihood is based on fragile margins to begin with.

Praedial larceny patterns suggest not just small-scale, individualized theft, but increasingly organized, large-scale motorized operations.

The Government has attempted a number of solutions to the problems of praedial larceny. Following the 1981 Carson study, the Government undertook to set up an "Agriculture Wardens System". This scheme anticipated the selection, training and empowering of 400 agriculture wardens who would be assigned to areas throughout the country. In broad terms, appointments and administration were through the Police, salaries paid by the MOA and the programme monitoring exercised by a separate committee which had fairly broad representation from agricultural and security institutions and organizations.

The Agriculture Warden programme never fully materialized at the levels anticipated and was abandoned in 1986. The most frequent explanation offered for its failure were that it was inadequately supported materially (firearms, transportation, communications), that coordination and supervision by the Police was erratic, that attitude and motivation suffered due to poor working conditions and lenient sentencing practices in local jurisdictions.

Several good things did result from the effort, the most significant being that applicable legislation was reviewed and updated and is no longer a major barrier to prosecution. At the time of the Agriculture Warden System, local courts prosecutors and law enforcement officers were not up-to-date with these changes.

Praedial larceny has some unique characteristics. It hits some crops more than others, in certain fairly short time periods associated with harvest, in some locations more than others (usually close to major markets). Stolen product is sold at

certain times and to certain buyers. Vehicles are used, and, generally, the identity of major offenders is usually already known within the community. All of these factors suggest that selected targetting of efforts might be far more productive than the broad-scale, hard to organize approach now being pursued.

TECHNICAL ANALYSIS

Cocoa

Production

Jamaica now produces 2,500 tons of dried cocoa beans per year. Of this amount 2,000 tons are exported. Five hundred tons are used by two major local processors.

Pricing

At a price of 800 pounds sterling per ton, Jamaican Cocoa fetches 150 pounds sterling per ton above the London price. The Board maintains a policy of forward selling which enables it to obtain good prices for its cocoa beans.

Premium

Premium price is paid for Jamaican cocoa because of its fine quality. Only Trinidad and Tobago and Grenada enjoy this premium price with Jamaica.

Projection for Expansion

The market for fine quality cocoa is estimated to be 33,000 tons per year. The Cocoa Industry Board projects to increase its share of the market from 2,500 tons to 4,500 tons by 1995.

Market

The export market for Jamaica cocoa is:- The United Kingdom, Belgium, Japan, Germany, Holland and Canada.

Cocoa producers are small mixed crop farmers and not Cocoa farmers per se. They mostly have 10 to 30 trees per acre. These trees, typically, are not fertilized and the only care usually,

is once or twice per year weeding.

Cocoa tends to be planted in association with bananas. Not much land is made available each year to cocoa. The same lands are used from year to year depending on the emphasis.

Cocoa production in Jamaica lacks modern technology. This lack of technology is established both in husbandry practices and the use of improved varieties.

Table 1

Yearly Cocoa Production and Price Realized

Crop Year	Production (tons)	Price (\$,F.O.B.)/ton
1976/77	1,614	1,485
1977/78	1,300	4,607
1978/79	1,793	6,723
1979/80	1,369	6,635
1980/81	1,814	6,491
1981/82	1,426	4,423
1982/83	2,738	4,604
1983/84	2, 10	7,450
1984/85	2,604	11,977
1985/86	2,376	14,430

Source: Cocoa Industry Board

The above table shows the trend in production and price received for Jamaican Cocoa. The price per ton has increased dramatically over the years. This can be attributed to the premium price received and to devaluation.

It is suggested that the low level of production could be improved significantly by employing certain low input husbandry practices and higher yielding varieties in resuscitation.

Coffee

Jamaican coffee enjoys premium price on the world market because of its excellent flavour and aroma. The famous Blue Mountain Coffee fetches prices of four to five times the price of the nearest International Coffee Organization (ICO) indicator price and Lowland Coffee fetches between two and three times the indicator price.

Export of coffee from the 1988 crop amounted to US\$9,220,000. The industry is in a rapid development stage as demonstrated by the 40,000 boxes of Blue Mountain Coffee exported in 1982 and 200,000 boxes exported in 1988.

Since 1982, Blue Mountain Coffee acreage has increased from 2,300 to 7,000 acres. Additional acreage is planned so that by 1993/94 there should be 10,000 acres of Blue Mountain Coffee. At the same time, the Non-Blue Mountain Coffee is expected to increase to 20,000 acres.

Coffee is produced on the shale soil of the Blue Mountain Range. Elsewhere in St. Catherine, Clarendon, St. Elizabeth, and St. James, it is produced on more gentle slopes and yields more per acre. The cost of inputs and return per acre for Blue Mountain and Lowland Coffee are presented in Appendices 1 & 2. Blue Mountain Coffee Producers do not expect positive gross returns until year 4. In year five gross returns will be about \$6,000. Gross returns per acre will level off at about \$16,000 as of year seven. Lowland Coffee will attain and level off at \$6,000 per acre in year eight.

Constraints

1. Lack of credit on easy terms.
2. Crop care and Extension Services for lowland producers.

The above two constraints affect the small lowland producers more than the larger Blue Mountain producers.

The crop is highly profitable especially the Blue Mountain coffee. Lowland coffee producers (mostly small farmers) do not make a sufficiently high level of input and consequently fail to reap anything near the potential of the crop. It is estimated that resuscitation alone could triple the production of lowland coffee.

Yam

Yam is a relatively hardy crop which is not very exacting in its requirement for soil and climatic conditions. It produces best where annual rainfall is at least 40" and the mean day-time temperature below 86 degrees Fahrenheit. It prefers a deep, friable and well drained soil. These conditions are met in many areas in Jamaica with the hills of Manchester, Trelawny, Hanover, Clarendon, St. Ann, St. Elizabeth and St. James most suitable.

Yam was introduced into Jamaica in the Seventeenth Century from West Africa. The technology of production has not changed much even though there has been research on aspects of its production. Areas of research have been; size of planting material, staking, plant population, use of hill versus continuous mounds, disease and nematode control.

In 1985, the mini-sett technology was introduced into Jamaica from Nigeria. The principle here is to use a much smaller piece of planting material than in the traditional method. Mini-sett planting material averages 2 ounces while in the traditional method the planting material averages 28 ounces.

The result of using the mini-sett technology is the production of uniform medium sized non-proliferated yams. The improved uniformity in size and shape reduces harvest time and allows for easier transportation and packaging for export.

The mini-sett technology is being promoted by the Ministry of Agriculture and is being used by few producers.

Export of Yams

Jamaica exports yams (mainly yellow yams and negro yams) chiefly to the U.S.A., Canada and the U.K. There is considerable competition from Brazil, Colombia, Dominican Republic, Mexico and Puerto Rico for the supply of negro yam to the U.S.A., but Jamaica is the main supplier of yellow yam. The Round Leaf yellow yam is the preferred variety because of its longer shelf life.

The volume and value of Jamaica's export of yam has shown a constant increase since 1984 as seen below:

Volume and Value of Yam Export (1984-1988)

	1984	1985	1986	1987	1988
Volume ('000 kg)	5,891	8,157	8,564	9,118	8,567
Value (US\$)	3,823	4,481	5,946	7,463	7,947

Source: Statistical Institute of Jamaica

Constraints

A major constraint to the expansion of yam production is the availability of good quality planting material.

This constraint can be removed by encouraging the mini-sett techniques. This could be achieved by setting up mini-sett nurseries; one in each major yam growing area (Trelawny, Hanover, Manchester, Clarendon, St. Ann, St. Elizabeth and St. James).

It will be necessary to provide long term technical assistance to introduce and promote the nursery. This will be in association with funds to establish and operate the mini-sett nurseries. Funds should also be provided for loan for the purchase of production inputs (mini-sett planting material, fertilizer and chemical). The Cost of Production and Gross Returns for yams are presented in table 2 below. The production of yams is very profitable especially when mini-sett technology is used.

Table 2

Cost of Production and Returns (1 acre)
Comparison of Traditional and Mini-sett Methods

Items	Rate	Traditional	Mini-sett
<u>Labour</u>			
Land clearing	200/hr	200	200
Ploughing & harrowing	120/hr	480	480
Ridging	120/hr		240
Digging Hil's	\$1.00 ea.	1500	
Mini-sett cutting and planting for sprouting in nursery	15 md.		450
Watering in nursery	9 md.		270
Digging sprouted sets	6 md.		180
Spreading plastic mulch and planting	16 md.		480
Planting	10 md.	300	
Weeding	15 md., 3 md.	450	90
Fertilizer and manure application	3 md.	90	90
Erecting stakes	5 md.	150	
Training plants	4 md.	120	
Reaping and preparing for market	30 md.	900	900
Transport to farmgate	0.03 lb.	585	1 080
Sub-total		4,775	4,460
<u>Material</u>			
Planting material	\$4.5/lb	23,625	9,000
Sawdust, fungicide, insecticide			200
Fertilizer	6/cwt.	300	300
Manure	2,000/acre		400
Stakes	\$2.00 ea.	3,000	
Plastic mulch	4,000/acre		4,000
Sub-total		26,925	13,900
Total production cost		31,700	18,360
Revenue		87,750	160,000
Gross Returns		66,050	143,640

Assumptions

A. Mini-sett Method

1. 14,500 mini-setts of 2 ozs. each
2. 12,000 plants established
3. Average weight of tuber:- 3 lbs.

B. Traditional Method

1. 1,500 hills per acre
2. Two heads per hill each weighing 1 3/4 lbs.
3. Yield 19,500 lbs/acre
4. Stakes:- \$2.00 each.

General Assumptions

1. Price of yam - \$4.50/lb.
2. Planting material retained for planting next season in traditional method.
3. Labour - \$30.00 per man-day.

Banana

Banana was traditionally produced in most parishes by small farmers. Today, most of the banana produced is by three large high technology farms located in St. Thomas, St. Mary and Clarendon. The three companies are:

1. Eastern Banana Estate Ltd. with 2,085 acres and owned by GOJ (70 percent), JBPA (20 percent) and United Brand (10 percent).
2. St. Mary Banana Estate with 1,600 acres and owned by JBPA (50 percent), CDC (30 percent) and IFC (20 percent).
3. Victoria Banana Company with 900 acres and owned by GOJ.

Of the 34,231 tons of bananas exported in 1987, 80 percent was delivered by the high technology operations. The small traditional growers delivered 6,829 tons.

Export of Bananas from 1974 to 1987 is shown in table 3 overleaf.

Table 3

Banana Export (Tons) - 1974 - 1987

	Production	% Change
1974	72,488	-33.76
1975	71,333	- 1.59
1976	79,248	+ 9.99
1977	80,098	+ 1.06
1978	77,855	- 2.80
1979	68,834	-11.59
1980	33,107	-51.90
1981	18,774	-43.29
1982	21,878	+16.53
1983	23,456	+ 7.21
1984	11,058	-52.86
1985	12,742	+15.23
1986	20,713	+62.56
1987	34,231	+65.26

Source: Banana Export Company

During this period the highest production was in 1977 when 80,000 tons were exported. The low point was in 1984 when 11,000 tons were exported.

The 1988 production stood at 28,000 tons. This was projected to be 45,000 tons. Production was well on target until the hurricane. Production since April of this year has been averaging 1,800 tons per week. This is annualized to 90,000 tons for 1989; ahead of the 45,000 tons projected. The export projection for 1990, 1991 and 1992 are 80,000 tons, 120,000 and 150,000 tons respectively. The projected output is to be attained from 24,500 acres of banana cultivation.

Cost of production figures for banana production under small farm rain-fed conditions are presented in Appendix 3. Establishment cost is \$6,800, while maintenance cost is \$5,638 per acre. For high technology plantations, establishment cost is \$45,000 per acre while maintenance cost is \$10,000 per acre.

Export yield from small farms is 8 tons per acre. High technology farms produce 18 tons of export fruits per year.

Banana producers receive a market related growers' price. This in 1988 was up to \$1.30 per lb. delivered. Before 1985, the amount received by growers was \$0.40 per lb. delivered for export. Banana production is now very lucrative.

Constraints

1. Low level production.

This is being addressed by efforts to bring back the traditional small farmers.

In addition to assisting in attaining the 150,000 ton quota to the United Kingdom larger volumes would result in lower per unit shipping cost which would translate into higher price per pound paid to farmers.

Shipping cost is about US\$187 -- US\$200 per ton at 1,800 tons per week. At 150,000 tons per annum shipping cost would be reduced to US\$140 - US\$150 per ton.

2. State of Banana Port at Port Antonio.

Presently, banana is shipped out of Port Antonio and Kingston. Shipping from Kingston is expensive especially for those producers in St. Mary and Portland.

The Port Antonio port (Bound Brook) has been condemned as unsafe by the Port Authority.

A project has been conceived to develop the port. This requires J\$31,000,000 as a joint venture between the

Port Authority (51 percent) and BECO (49 percent). An EEC grant of J\$10,000,000 is almost sure. This leaves a shortfall of J\$21 million to be funded by Port Authority and BECO. The Banana Industry cannot now service this level of Expenditure. Other funding is therefore being sought.

Aquaculture

From a production of 50 tons of fish in 1978/79 during the initial trial period, the industry has grown to 3,000 tons in 1988. Growth of the sector is presented below for the period 1979 - 1988/89.

<u>Year</u>	<u>Marketable Production (lbs)</u>
1979/80	36,000
1980/81	72,000
1981/82	252,000
1982/83	320,000
1985/86	1,838,912
1986/87	3,172,349
1987/88	4,666,728
1988/89	5,984,215

Source: Inland Fisheries Unit.

The industry now has a direct employment of 726. It has a Gross Foreign Exchange saving of US\$4.65 million and has a Gross Foreign Exchange earning of US\$2.35 million.

The Inland Fisheries Unit estimates that from the trend in production, through additional promotion and extension service the production of fish will continue to grow. The projection for 1994/95 is as follows:

Pond acreage	3,500 acres
Production	25,000,000 lbs.
Direct employment	1,700
Foreign exchange savings	US\$19.37 million

Cost of Production

The major costs associated with the production of fish are:

Pond construction	\$10 - \$12,000/acre
Feed	4,000
Labour	1,200
Equipment	250 - 400
Fingerlings	3,500
Water	300

	20,400
	=====

Constraints

Although aquaculture has made dramatic strides, there are still certain constraints to increasing production and export marketing. These constraints include:-

1. Availability of fingerlings

In the early stages of aquaculture development, the Inland Fisheries Unit supplied fingerlings. As production of food fish by private farmers increased, Inland Fisheries could not provide sufficient volume of fingerlings; hence private producers were encouraged to have their own brooding operations. Specialized brood

farms also came into being and were well supported by the food fish producers.

The required sex ratio has not always been as required. With more specialized brood farms (hatcheries) and an increased number of farmers producing their own fingerlings the constraint of volume and quality in fingerlings is being removed.

Praedial Larceny

The stealing of agricultural produce at farm level has become a major problem. Aquaculture is experiencing this problem too and it has forced some fish farmers out of the business and discouraged others from entering.

Many suggestions have been given to combating praedial larceny but little effort has been put into dealing with the problem. The producers naturally feel helpless and neglected.

The producers themselves probably have the best weapons to protect themselves. One mean is to band themselves into a national organization having specific marketing places for fresh water fish and having a registry of producers and dealers.

Marketing

Most fresh water fish is marketed at the gate of the farmers training centre at Twickenham Park (Spanish Town). This situation developed out of the initial arrangement wherein the farmers were allowed to market their fish at the nearby Inland Fisheries Unit on Thursday mornings. The Inland Fisheries is no

more involved but the market has grown tremendously and is now a six-day-a-week affair. Several entrepreneurs have got into the distribution of fish but this distribution is far from being islandwide.

The export market remains largely untapped with only one major producer known to be taking advantage of it. This producer exports frozen fillet.

The export market requires consistency in supply. A cooperative would best address this situation. A large entrepreneur acting as purchaser - processor - exporter could also fulfill the role. It would be required that the producer grow his fish larger to the one fish per pound size instead of the two to three fish per pound size.

Water

Insufficient quantity of water is often a constraint in certain areas where there has been uncontrolled proliferation of fish ponds. Often, especially in the dry seasons there is competition for water for filling fish ponds and for irrigation. Improvements in water delivery by the National Irrigation Authority is helping the situation.

Regulating the Industry

There is no true regulatory or monitoring arm of the industry. A regulatory function would be to ensure that the farmer receives quality fingerlings (eg. the promised sex ratio and fingerlings with the necessary growth potential). The regulatory arm could also provide market intelligence.

The Inland Fisheries Unit could best serve this purpose. Short-term technical assistance (U.S) would be needed to set up a system and train local technical officers.

This project could also assist in the setting up of a cooperative of fish farmers. The need would be for training in cooperative, holding area (fresh water fish is now marketed live), cold storage, processing technique and marketing. A short term technical assistant (foreign) would be needed.

Ornamental Horticulture

Jamaica has now established itself as a serious producer of ornamental crops. It has exported various flowers and foliage to the U.S.A., Canada and Europe.

The country has met much competition from other producing countries such as Columbia which has various Government incentives for export such as subsidy on air freight.

The business of cut flowers has gone through phases with different flowers being popular at different times in various markets. The same holds true to a lesser extent for the foliages. It is often necessary for the producer to mix the crops to take advantage of the need for variety in the market places. This also allows him to shift the emphasis from one ornamental to another as the market dictates.

Some producers and exporters of ornamentals have formed associations which have made them more formidable in marketing. The industry nevertheless retains many individuals having their own export marketing arrangements.

Ornamental horticulture is capital and labour intensive. The requirements and trend favour larger investors. These investors have access to credit and production technology. They often need though, support services as would assist in disease and pest monitoring and control and packaging techniques.

The Agricultural Export Services Project could assist producers of ornamental crops by providing needed support service to the industry in general. One instance in which immediate assistance is needed is in solving the post harvest damage to Anthurium blooms. Short term Technical Assistance of as little as one week should lead to recommendations to solve the problem. An expert from Hawaii is recommended.

Pimento

The pimento industry was hard hit by the hurricane. As a result the Ministry of Agriculture has launched a \$4,600,000 Pimento Replanting Resuscitation Programme. The programme is intended to:-

1. Produce 160,000 pimento trees to replace 153,000 trees over five years.
2. To educate the farmers on cultural techniques for speedy recovery.
3. Restoration of foreign exchange earning to pre-hurricane level in the shortest possible time.

The estimated loss of earning as a result of the hurricane is put at US\$13,000,000 over the five years required for recovery. The volume and value of pimento exported between 1984 and 1988

are as follows:-

	1984	1985	1986	1987	1988
	-----	-----	-----	-----	-----
Volume (tons)	1,612	2,640	2,535	2,260	2,305
Value (J\$'000)	27,137	36,975	29,549	27,057	28,259

Vegetables

Recent trends have indicated a growing demand for vegetables in the U.S. and European markets. In the U.S., sale of vegetables grew 14.8 % between 1976 and 1980.

Crop	Optimum Import Time
-----	-----
Asparagus	January - February
Sweet Peppers	February - March
Cucumber	February
Beans	January - February
Broccoli	January - April

For most of these crops the volume imported has been increasing eg. imports of sweet peppers into the U.S. increased from 70,000 metric tons in 1983 to 99,00 metric tons in 1984; a 41 % increase in one year.

The trend in vegetable consumption is also strong in Europe. The U.K., France, West Germany, Holland, Belgium, Switzerland and Sweden have market niches for vegetable which are ready to be exploited. Crops to fill these markets are okra, sweet peppers, pumpkin and egg plant. The table 4 demonstrates the imports of vegetables into the European market.

See Table Overleaf

Table 4

Vegetable Imported into European Market (1982-1986)

Product	Unit	1982	1983	1984	1985	1986
Egg Plant	ton	40,044	41,293	45,606	47,889	47,315
(Incremental increase)			3%	10%	5%	-1%
Beans (green)	ton	76,329	73,801	77,347	90,812	102,895
(Incremental increase)			-3%	5%	17%	13%
Sweet Pepper	ton	225,571	238,235	262,965	312,239	302,986
(Incremental increase)			6%	10%	19%	-3%
Pumpkin	ton	1,224	1,829	N/A	N/A	N/A
(Incremental increase)			49%			

Jamaica has been producing and successfully exporting these vegetables over the years. Table 5 shows the volume and value exported by Jamaica (1984-1988).

See Table Overleaf

Table 5

Volume and Value of Vegetable Exported (1984-1988)

Crop	1984		1985		1986		1987		1988	
	Vol. (ton)	Val. (US\$ '000)								
Pumpkin	2,352	688	2,366	769	1,301	542	1,583	611	1,189	600
Sweet Pepper	483	249	862	892	2,939	1,085	1,219	653	1,144	801
Cucumber	307	230	2,785	1,059	4,477	879	3,046	640	457	1,241
Tomato	1,893	1,284	301	334	44	16	3	3	1	1
Okra	65	244	12	14	39	36	3	3	8	N/A
Others	682	577	1,075	1,244	2,494	1,117	698	857	840	639
Total	5,782	3,272	7,401	4,312	11,524	3,675	6,552	2,767	3,639	3,282

Production costs and gross returns for hot peppers, green peppers, calaloo are presented in tables 6, 7 and 8. Gross returns indicate that all these crops are profitable to produce.

See Tables Overleaf

Table 6
Hot Pepper

Item	Unit	# of Units	Rate/Unit	Total
<u>Labour</u>				
Land clearing	acre	1	200	200
Ploughing and harrowing	acre	1	300	300
Ridging	acre	1	125	125
Nursery Cost	md	10	30	300
Fertilizing	md	2	30	60
Transplanting	md	15	30	450
Reaping and grading	md	25	30	750
Transport to farmgate	lb.	6,000	0.03	180
Spraying	cycle	10	30	300
Sub-total				2,665
<u>Material</u>				
Insecticides	lb.	30	25	1050
Seeds	lb.	0.5	600	300
Fertilizer	cwt.	8	55	440
Sub-total				1,790
Total				4,455
Revenue				24,000
Gross Returns				19,545

Assumptions

- * Casual labour rate \$30/md
- * Marketable yield. 6,000 lb.
- * Price per lb. \$40.00

Table 7

Calaloo

Item	Unit	# of Units	Rate/Unit	Total
<u>Labour</u>				
Land clearing	tractor hr.	1	100	100
Ploughing and harrowing	tractor hr.	2	100	200
Ridging	tractor hr.	1	75	75
Applying herbicide	cycle	1	30	30
Nursery Charge	md	8	30	240
Transplanting	md	12	30	360
Fertilizer	md	4	30	120
Weeding	md	15	30	450
Applying pesticide	cycle	12	30	360
Reap, bundle & sprinkle	100 lb	100	5	500
Transport to farmgate	lb.	10,000	0.03	300
Sub-total				2,735
<u>Material</u>				
Pesticides	lb.	16	40	640
Seeds	lb.	0.25	160	40
Fertilizer S/A	cwt.	4	50	200
Fertilizer NKP	cwt.	2	55	110
Weedicide	pt.	2	30	60
Sub-total				1,050
Total				3,785
Revenue				7,500
Gross Returns				3,715

Assumptions

- * Casual labour rate \$30/md \$30/md
- * Marketable yield. 10 000 lb.
- * Price per lb. \$0.75
- * Number crops per year 3

Table 8
Green Pepper

Item	Unit	# of Units	Rate/Unit	Total
<u>Labour</u>				
Land clearing	acre	1	200	200
Ploughing and harrowing	acre	1	300	300
Ridging	acre	1	125	125
Nursing Cost	md	8	30	240
Fertilizing	md	3	30	90
Transplanting	md	10	30	300
Applying weedicide	application	1	30	30
Reaping and grading	md	30	30	900
Transport to farmgate	lb.	10,000	0.03	300
Spraying	application	8	30	240
Weeding	md.	15	30	450
Sub-total				3,175
<u>Material</u>				
Pesticides	lb.	24	35	840
Seeds	lb.	0.25	400	100
Fertilizer NPK	cwt.	6	55	330
Fertilizer S/A	cwt.	3	50	150
Weedicide	pt.	2	35	70
Sub-total				1,490

Assumptions

- * Casual labour rate \$30/md
- * Marketable yield. 10,000 lb.
- * Price per lb. \$5.00

Tropical -Fruits

Tropical fruits are becoming increasingly popular in North America and Europe. Those that are demanded and present opportunities for Jamaica include mango, papaya, passion fruit, guava, sweet sop and sour sop. Of these only mangoes and papaya have been grown on any significant scale in Jamaica although the agro-climatic conditions are excellent for them. Mangoes, guava, sweet sops and sour sops are seen growing wild islandwide.. These fruits are marketed as fresh fruits or processed into various forms.

Mango

Mango is a native of South Eastern Asia. It has been cultivated in India for some 4,000 years and was introduced into Jamaica in the 18th Century.

The crop may be produced under various ecological conditions. It prefers night-time temperatures of 50-60 degrees Fahrenheit and day-time temperatures of 70-85 degrees Fahrenheit.

Rainfall of 30" to 50" annually is satisfactory but there should be a distinct dry season of 3 to 4 months preceding and during flowering.

Good drainage is necessary but very sandy soils are undesirable. The soil pH should be on the acid side (5.5 to 6.5) and ample nutrient supply is necessary for good crop production.

Suitable locations for commercial mango production are: the plains of St. Catherine, Clarendon, St. Thomas and St. Elizabeth.

Market

Jamaican mangoes have been marketed in the U.S.A., Canada and Europe. The orchards are mostly new and large quantities have been exported only within the last two years.

The market for mangoes is large and growing but is quite competitive. Several of the competitors produce large volumes and sell at prices with which Jamaica cannot compete. The seasonality of mangoes though can be exploited so that Jamaican mangoes can reach the market when there is least competition.

Over 50 % of mangoes are marketed in June and July. Between September and March the supplies are minimal. Mangoes from Mexico (the main competitor) and Florida reach the market in April to August. Jamaica could manage its mango orchards so that a significant crop reaches the market from September to February.

Jamaica could also compete by producing more of the Keitt variety which is superior to the popular Hayden and Tommy Atkins varieties. The following shows the sources of U.S. mango imports.

Sources of U.S. Mango Imports

<u>Country</u>	<u>Percent</u>
Mexico	78.5
Haiti	18.9
Brazil	0.7
Puerto Rico	0.7
Dominican Republic	0.3
Belize	0.2
Venezuela	0.7

Source: Fresh Fruit and Vegetable Arrivals Totals for 22 Cities, Agricultural Marketing Service, U.S.D.A. - 1984.

Other important mango suppliers are India and Taiwan. Mango imports into the EEC (1981-1983) are as follows:-

Annual Imports of Mangoes into EEC (1981-1983)

Country	(US\$ '000)		
	1981	1982	1983
Belgium	308	369	304
France	2,711	2,939	4,094
Germany	529	520	1,111
Great Britain	2,888	3,758	4,310
Italy	109	103	—
Netherlands	1,192	1,470	1,592
Others	15	52	60
	<u>7,752</u> =====	<u>9,211</u> =====	<u>11,473</u> =====

Source: Etude de Marche des Fruits Tropicaux en Europe, Phase 1, SOFREDA

Constraints

1. Volume of production is insufficient to have effective penetration of the market. Production should increase significantly with progressive years. Much of the planting is young and will come into bearing gradually.
2. Ban on the use of Ethylene dibromide for spraying against fruit flies. Alternate methods have been proposed including:
 - a. hot water bath treatment; and
 - b. radiation treatment.

Table 9

Mango

Cost of Production per Acre

Labour	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8-12
Land Clearing	300/ac.	300	---	---	---	---	---	---	---
Land Preparation	---	200	---	---	---	---	---	1	---
Cutting pegs and lining	2 wd.	60	---	---	---	---	---	1	---
Digging holes	\$2 ea.	180	---	---	---	---	---	---	---
Planting	2 wd.	60	---	---	---	---	---	---	---
Weeding	5 wd.	150	150	150	150	150	150	150	150
Spraying	---	60	60	60	90	90	90	90	90
Fertilizing	---	30	30	30	45	45	45	60	60
Pruning	5 wd.	---	---	---	---	150	150	150	150
Harvesting	\$35/1,000	---	---	---	193	385	566	771	900
Grading and packaging	---	---	---	---	100	200	350	450	520
Sub-total	---	1,040	240	240	578	1,020	1,351	1,671	1,870
Material									
Plants	\$12.00	1,080	---	---	---	---	---	---	---
Fertilizer	\$55/cwt.	45	68	90	113	135	158	180	203
Insecticides and fungicides	---	---	250	250	400	400	800	800	800
Herbicides	---	---	---	---	---	250	250	250	250
Boxes	\$3 ea.	---	---	---	1,667	3,375	4,950	6,750	7,875
Sub-total	---	1,125	318	340	2,200	4,160	6,158	7,960	9,128
Total Cost of Production	---	2,165	558	580	2,778	5,180	7,509	9,631	10,998
Revenue	---	---	---	---	10,125	20,250	29,700	40,500	47,250
Gross Returns	---	(2,165)	(558)	(580)	7,347	15,070	22,191	30,849	36,252

Assumptions

1. Plant population - 90 plants per acre

2. Marketable yield/tree:-

- * year 4 - 75
- * year 5 - 150
- * year 6 - 220
- * year 7 - 300
- * year 8-12 - 350

3. Fruits are packed in boxes holding 12.

4. Fertilizer is applied at the rate of 1 lb. per plant in year one. This amount is increased by 1/2 lb. per tree to a maximum of 4 lbs. per tree/year.

Table 10

Solo Papaya

Production Cost and Return per acre (J\$)

Item	Rate	Year 1	Year 2	Year 3
<u>Labour</u>				
Land Clearing	\$200/acre	200		
Land Preparation	\$800/acre	300		
Lining and digging of holes		250		
Planting	4 md.	120		
Circle weeding x 4	\$0.3/plant	744	744	744
Spraying (pest)	17 app./yr.	300	300	300
Spraying (herbicide)	6 app./yr.	180	180	180
Fertilizing	3 md.	90	90	90
Irrigation	18 md.	540	540	540
Pruning	1 md.	30		
Harvesting	500 lb./md.	930	1,860	780
Supervision		500	500	500
Sub-total		4,184	4,214	3,134
<u>Materials</u>				
Plants	\$1.00/plant	620		
Fertilizer		1,500	3,000	3,000
Water		600	600	600
Sub-total		2,720	3,600	3,600
Total Cost of Production		6,904	7,814	6,734
Revenue		18,600	37,200	15,624
Gross Returns		20,586	29,386	8,890

Assumptions

1. Plant population - 620 plants/acre
2. Yield
 - Year 1 - 15,500 lbs/acre (25 lbs.per tree)
 - Year 2 - 31,000 lbs/acre (50 lbs.per tree)
 - Year 3 - 13,020 lbs/acre (30 lbs. per tree)

(By year 3, approximately 30 percent of the trees will have died).
3. Marketable yield - 80%
4. Price of papaya \$1.20/lb. (farmgate)
5. Chemicals - 4 lbs. of pesticides and herbicides per acre at 17 applications per year using a three week spraying cycle.
6. Fertilizer Application -
 - 1,000 lbs. triple superphosphate pre-planting application.
 - 14,250 lbs. (12-10-18) NPK
7. Weed Control - circle weeding by hand and herbicides.

GUAVA

The guava plant is hardy and grows under a variety of climatic conditions and soils that range from acid to alkaline. It is one of the few crops that will withstand lengthy periodic water-logging.

Guava is not now grown under organized orchard conditions in Jamaica. Harvesting is from scattered trees that grow wild. Suitable areas for commercial production of guavas are to be found in St. Catherine, St. Mary, St. Thomas, St. Ann, Portland, St. Elizabeth and St. James.

Guava is usually marketed in the processed form for which markets exist in U.S.A., Canada, Europe and Japan. The projected annual demand in these markets are:-

U.S.A.	-	15	million	lbs.
Canada	-	5	"	"
Europe	-	30	"	"
Japan	-	15	"	"

The value of United States imports in 1983 was US\$42,039,000 with Mexico accounting for US\$38,650,000.

Constraints

Constraints are mainly of a production nature. There is no tradition of cultivating the crop and sufficient amounts for processing are usually gathered from scattered trees.

The estimated costs of production and gross returns are presented (table 11).

See Table Overleaf

Table II

Guava

Production Cost and Returns per Acre

Items	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7-15
Planting Material	1,000	---	---	---	---	---	---
Fertilizer & Chemicals	1,200	1,200	1,300	1,400	1,450	1,450	1,450
Lining and Planting	400	---	---	---	---	---	---
Weed Control	300	100	100	100	100	100	100
Pest and Disease control	300	300	300	300	300	300	300
Pruning	60	---	---	120	---	---	120
Harvesting	---	---	480	960	1,440	1,920	2,400
Transportation	---	---	285	520	835	1,140	1,425
Supervision	450	300	480	600	750	750	750
Total	3,725	1,915	2,960	4,015	4,940	5,675	6,560
Revenue @ \$0.60/lb.	---	---	3,000	6,000	9,000	12,000	15,000
Gross Returns	(3,725)	(1,915)	40	1,985	5,060	6,325	8,440

Assumptions

1. Plant population - 193
2. Yield:
 - * Year 3 - 5,000 lbs. per acre
 - * Year 4 - 10,000 lbs. per acre
 - * Year 5 - 15,000 lbs. per acre
 - * Year 6 - 20,000 lbs. per acre
 - * Year 7 - 25,000 lbs. per acre
3. Seedlings are from selected commercial cultivars
This promotes early bearing.
4. Crop life - 15 years.
5. Price - \$0.60 per lb.
6. Labour cost - \$30 per day.

ORDER OF CROP FOR PRIORITY ATTENTION

The following criteria were considered in ranking the crops for priority attention under the proposed project:-

1. Gross returns per acre.
2. Level of foreign exchange earnings.
3. Employment potential.
4. Size of export market.
5. Surety of export market.
6. Investment cost.
7. Willingness of farmers to produce crop.
8. Tradition of producing crop.
9. Need for assistance.

The crops were ranked as follows:-

<u>Traditional</u>	<u>Non-traditional</u>
1. Bananas	1. Yams
2. Coffee	2. Mangoes
3. Cocoa	3. Papaya
4. Pimento	4. Vegetables
	5. Ornamental Horticulture
	6. Aquaculture
	7. Other tropical fruits

Bananas in the list of traditionals and yams in the list of non-traditionals should be given priority attention. The order of priority without grouping into traditional and non-traditional would be:

1. Bananas
2. Coffee
3. Yams
4. Cocoa
5. Pimento
6. Mangoes
7. Papaya
8. Vegetables
9. Ornamental Horticulture
10. Aquaculture
11. Other tropical fruits

APPENDIX 1

BLUE MOUNTAIN COPPER
COST OF PRODUCTION FOR ONE ACRE (J\$)

ITEMS	DATE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
I. ESTABLISHMENT COSTS											
I. Labour:											
Land clearing	\$300/acre	300									
Routing pegs	\$50/1000	45									
Transporting pegs	\$40/1000	36									
Lining land	\$25/MD	100									
Digging of holes	\$50/100	450									
Transport manure & fertilizer		125									
Interfield distribution of organic manure	\$25/100	225									
Fertilizer application & refilling holes	\$40/100	360									
Transport & interfield distribution of seedlings		495									
Preplanting weed control	5 MD	125									
Planting of seedlings	7 MD	175									
I. Materials:											
Seedlings	\$1.00 each	1,000									
Organic manure	\$250/ton	625									
Inorganic fertilizer for holes (6:18:27)	\$50/cwt	200									
Herbicides		399									
SUB-TOTAL		1,560									
II. OPERATING COSTS											
Labour:											
Transport manure & fertilizer		125	125	125	125	125	125	125	125	125	125
Fertilizing	12 MD	300	300	300	300	300	300	300	300	300	300
Spreading manure	3 MD		75	75	75	75	75	75	75	75	75
Weed control		440	440	440	440	440	440	440	440	440	440
Pest & disease control		360	360	360	360	360	360	360	360	360	360
Plant training & pruning		70	130	80	80	80	80	80	80	80	80
Harvesting	\$20/box			300	900	1,800	1,980	2,178	2,178	2,178	2,178
Stripping & handling				120	120	120	120	120	120	120	120
Material:											
N.P.K. fertilizer		378	601	819	819	819	819	819	819	819	819
Sulphate of ammonia		165	255	340	340	340	340	340	340	340	340
1 Knapsack (pump)		500									
Agricultural chemicals		792	1,011	1,036	1,036	1,036	1,036	1,036	1,036	1,036	1,036
SUB-TOTAL		3,130	3,297	3,995	4,595	5,495	5,675	5,873	5,873	5,873	5,873
OTHER CHARGES											
Contingency 10% (A+B)		779	330	400	460	550	568	587	587	587	587
Supervision		250	250	250	250	250	250	250	250	250	250
Land charges		250	250	250	250	250	250	250	250	250	250
SUB-TOTAL		1,279	830	900	960	1,050	1,068	1,087	1,087	1,087	1,087
TOTAL COST OF PRODUCTION		9,069	4,127	4,895	5,555	6,545	6,743	6,960	6,960	6,960	6,960
REVENUE				2,100	8,400	12,600	16,800	23,100	23,100	23,100	23,100
GROSS RETURNS		(9,069)	(4,127)	(2,795)	2,846	6,056	10,058	16,140	16,140	16,140	16,140

APPENDIX 1

Assumptions - Blue Mountain Coffee

1. 1,000 plants per acre.
2. Yield:
 - Year 3 - 10 boxes per acre
 - Year 4 - 40 boxes per acre
 - Year 5 - 60 boxes per acre
 - Year 6 - 80 boxes per acre
 - *
Year 7-12 - 110 boxes per acre
3. Rainfed conditions
4. Land charges - 5% of current land value
5. Price - \$210/box (1986/87 net price)
6. Cost per MD - \$25.00

APPENDIX 2

**LOWLAND COFFEE
COST OF PRODUCTION FOR ONE ACRE (J\$)**

ITEMS	RATE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
LABOUR COSTS											
Land clearing	\$150/acre	150									
Cutting pegs	\$30/100	270									
Lining land	3 MD	75									
Digging of holes	\$45/100	405									
Interfield distribution of organic manure (holes)	\$12/100	108									
Refilling holes	\$20/100	180									
Interfield distribution of seedlings	\$10/100	90									
Preplanting weed control		100									
Planting of seedlings	5 MD	125									
Fertilizer application		50	80	100	120	120	120	120	120	120	120
Post planting weed control		200	200	200	150	150	100	50	50	50	50
Pest & disease control		80	80	80	100	100	100	180	180	180	180
Plant training & pruning		80	80	80	120	120	120	120	120	120	120
Harvesting	\$10/box			150	200	800	1,200	1,400	1,600	1,600	1,600
Stripping				80	120	120	120	120	120	120	120
SUB-TOTAL		1,913	440	690	1,120	1,410	1,760	1,910	2,190	2,190	2,190
MATERIALS											
Organic manure	\$150/ton	675									
Inorganic fertilizer for holes (c.p. mixture)	\$73/cwt	292									
M.P.R. fertilizer		330	660	880	880	880	800	800	800	800	800
Sulphate of ammonia		240	360	480	480	480	480	480	480	480	480
1 Knapsack (pump)		500									
Pesticides & herbicides		509	509	509	350	350	350	350	350	350	350
Seedlings	\$90/100	900									
Transport seedlings to farm	\$20/100	200									
SUB-TOTAL		3,646	1,529	1,859	1,710	1,710	1,630	1,630	1,630	1,630	1,630
OTHER CHARGES											
Contingency 10% (A+B)		556	197	256	281	312	339	354	382	382	382
Supervision		250	250	250	250	250	250	250	250	250	250
Land charges		150	150	150	150	150	150	150	150	150	150
SUB-TOTAL		956	597	656	682	712	739	754	782	782	782
TOTAL COST OF PRODUCTION		6,515	2,566	3,215	3,512	3,832	4,129	4,294	4,602	4,602	4,692
REVENUE			1,400	3,500	5,600	7,700	8,400	9,800	10,500	10,500	10,500
GROSS RETURNS		(6,515)	(1,166)	285	2,088	3,868	4,271	5,506	5,898	5,898	5,898

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APPENDIX 2

Assumptions - Lowland Coffee

1. 900 plants per acre.
2. Yield:
 - Year 2 - 20 boxes per acre
 - Year 3 - 50 boxes per acre
 - Year 4 - 80 boxes per acre
 - Year 5 - 110 boxes per acre
 - Year 6 - 120 boxes per acre
 - Year 7 - 140 boxes per acre
 - Year 8-15 - 150 boxes per acre
3. Rainfed conditions
4. Land charges - 5% of current land value
5. Contingency - 15% of A + B
6. Price - \$80/box (1986/87 net price)

APENDIX 3

BANANA
ONE ACRE COSTINGS

ASSUMPTIONS

- (1) Land preparation done by hired tractor at commercial rates.
- (2) Suckers are purchased.
- (3) Fertilizer rates per annum for bring to bearing and production are as follows:

N₁ P K
242 94 657
(figures are lbs./acre.)

- (4) Costs are assumed to be constant.
- (5) Method of harvesting: Field Pack
- (6) Revenue calculated at \$1.10 per lb.
The average price received by growers in 1986 was 1.02/lb.
and in 1987, \$1.30/lb. Taking into account price and quality
fluctuation, a conservative estimate for 1988 is used.
- (7) Gross returns per acre

	YR 1	YR 2	YR 3	YR 4
Operating costs	6,800	5,638	5,638	5,638
Harvesting costs	0	7,456	7,456	7,456
Revenue	0	17,600	17,600	17,600
Gross returns per acre	(6,800)	4,506	4,506	4,506

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BRING TO BEARING COSTS PER ACRE

	AMOUNT	UNIT	RATE	TOTAL	
LAND PREPARATION:					
- Ploughing by hired tractor,	1.00	acre	500.00 /acre	500.00	
LABOUR					500

LINING, DIGGING HOLES, PLANTING, ETC.:					
- lining	800.00	holes	2.66 /100	21.28	
- Cui pegs	800.00	pegs	2.40 /100	19.20	
- Sucker purchase	800.00	suckers	1.00 each	800.00	
- Dig holes	800.00	holes	5.67 /100	45.36	
- Clean seed & inspect	800.00	seeds	4.53 /100	36.24	
- Head suckers	800.00	suckers	2.67 /100	21.36	
- Cover	800.00	suckers	2.40 /100	19.20	
- Supply (10%)				96.26	
					1,059
WEED CONTROL					
- Labour	6.00	acre	8.00 /acre	48.00	48
FERTILIZING					
- Labour	1.20	ton	48.00 /ton	57.60	58
NEMATODE CONTROL					
- Labour	2.00	acre	9.36 /acre	18.72	19
LEAF SPOT CONTROL					
- Aerial spraying (Calixin) (8 cycles)	8.00	acre	16.50 /acre	132.00	
- Aerial spraying (Benlate) (6 cycles)	6.00	acre	16.50 /acre	99.00	
					231
DRAINAGE					
- Dig secondary drains	60.00	sq ft chn	6.00 /sq ft chn	360.00	
- Clean secondary drains	10.00	chn	2.66 /chn	26.60	
					387
FRUIT PROTECTION					
- Labour (sleeving)	800.00	bunches	8.00 /100	64.00	
- Labour (propping)	800.00	bunches	0.08	64.00	
					128
PRUNING (5 cycles)					
	5.00	cycle	8.00 /acre	40.00	40
MISCELLANEOUS:					
- Cut down poor fruit	9.00	cycle	3.00 /acre	27.00	
- Windbreak				100	
- Weed by Hand	6.00	cycle	36.00 /acre	216.00	
- Soil and Foliar Analysis				100.00	
					443
SUB-TOTAL LABOUR & LAND PREPARATION COSTS					12,912

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APP. 3

BRING TO BEARING COSTS PER ACRE (CONTD.)

AMOUNT	UNIT	RATE	TOTAL	
1.13	gallon	120.00 /gal	135.00	
0.19	gallon	197.00 /gal	37.43	
			-----	172
0.40	ton	900.00 /ton	360.00	
0.80	ton	1100.00 /ton	880.00	
			-----	1,240
4.50	gallon	190.00 /gal	855.00	
			-----	855
2.00	litre	79.00 /litre	158.00	
12.00	gallon	9.60 /gal	115.20	
0.02	gallon	197.12 /gal	3.94	
1.50	lbs	65.00 /lb	97.50	
9.00	gallon	9.60 /gal	86.40	
0.02	gallon	197.12 /gal	2.98	
			-----	464
800.00	bunches	0.85 each	680.00	
39.00	cycle	2.35 /cycle	91.77	
39.00	cycle	3.72 /cycle	145.00	
800.00	bunches	0.30	240.00	
			-----	1,157
SUB-TOTAL MATERIAL COSTS				-----
				13,888
TOTAL BRING TO BEARING COSTS PER ACRE				-----
				16,800

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MAINTENANCE COSTS

	AMOUNT	UNIT	RATE	TOTAL	
LABOUR					
NEED CONTROL					
- Labour	8.00	acre	8.00 /acre	64.00	
				-----	64
FERTILIZING					
- Labour	0.80	ton	48.00 /ton	38.40	
				-----	38
NEMATODE CONTROL					
- Labour	2.00	acre	9.36 /acre	18.72	
				-----	19
LEAF SPOT CONTROL					
- Aerial spraying (Calixin) (11 cycles)	11.00	acre	16.50 /acre	181.50	
- Aerial spraying (Benlate) (10 cycles)	10.00	acre	16.50 /acre	165.00	
				-----	346.5
DRAINAGE					
- Dig secondary drains	60.00	sq ft chn	6.00 /sq ft ch	360.00	
- Clean secondary drains	10.00	chn	2.00 /chn	20.00	
				-----	380
FRUIT PROTECTION					
- Labour (Sleeving)	800.00	bunches	8.00 /100	640.00	
- Labour (Guying)	800.00	bunches	0.08	64.00	
				-----	704
PRUNING (6 cycles)					
	6.00	cycle	8.00 /acre	48.00	
				-----	48
MISCELLANEOUS:					
- Cut down poor fruit	12.00	cycle	3.00 /acre	36.00	
- Windbreak				100.00	
- Seed by Hand	3.00	cycle	36.00 /acre	108.00	
- Soil and Foliar Analysis				100.00	
				-----	344
SUB-TOTAL LABOUR					81,944

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MAINTENANCE COSTS (CONTD.)

MATERIAL	AMOUNT	UNIT	RATE	TOTAL
WEED CONTROL:				
- Gramoxone	1.50	gallon	120.00 /gal	180.00
- Citowett	0.25	gallon	197.00 /gal	49.25

				229
FERTILIZING:				
- N-P-K (15-5-35)	0.80	ton	1100.00 /ton	880.00

				880
NEMATODE CONTROL:				
- Vydate (3 cycles)	4.50	gallon	190.00 /gal	855.00
- Gun rental	3.00	acre	2.00 /acre	6.00

				861
LEAF SPOT CONTROL (mist blower):				
- Calixin (11 cycles)	2.80	litre	79.00 /litre	221.20
- Spray oil (11 cycles)	16.50	gallon	9.60 /gal	158.40
- Triton (11 cycles)	0.03	gallon	197.12 /gal	5.91
- Benlate (10 cycles)	2.50	lbs	65.00 /lb	162.50
- Spray oil (10 cycles)	15.00	gallon	9.60 /gal	144.00
- Triton (10 cycles)	0.03	gallon	197.12 /gal	4.97

				697
FRUIT PROTECTION:				
- Sleeving	800.00	bunches	0.85 each	680.00
- Deflowering	52.00	cycle	2.35 /cycle	122.36
- Leaf sanitation & sucker training	52.00	cycle	3.72 /cycle	193.34
- Guying twine	800.00	bunches	0.04	31.20

				1,027

				13,694

				95,638

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HARVESTING COSTS PER TON

PRODUCTION				
	AMOUNT	UNIT	RATE	TOTAL
HARVESTING:				
- Cutter/separator	75.00	stems	0.40 /stem	30
- selector	75.00	stems	0.40 /stem	30
- Carrier	75.00	stems	0.40 /stem	30
- Carrier	75.00	stems	0.40 /stem	30

				120
PACKING:				
- Packer	82.00	boxes	0.40 /box	33
- Make boxes	82.00	boxes	0.10 /box	8

				41
PACKING MATERIAL:				
- Boxes	82.00	boxes	6.18 each	507
- Transport to Packing Station	82.00	boxes	0.03 /box	2
- Polypack	82.00	boxes	0.43 /box	35

				544
TRANSPORT TO WHARF:				
- Truckage	82.00	boxes	1.00 /box	82

				82
OTHER MATERIALS:				
- Javes	82.00	boxes	0.02 /box	2
- Ink	82.00	boxes	0.01 /box	1
- Banana ties	82.00	boxes	0.02 /box	1
- Crown	82.00	boxes	0.91 /box	75

				78
INSURANCE:				
- \$66.10/ton	1.00	ton	66.10 /ton	66

				66

			TOTAL	932

*1 tonne = 2204 lbs
 82 boxes = 1 lb net = approx 1 ton

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