A Diagnostic Prescriptive Assessment of the Production and Marketing System for Mangoes in the Eastern Caribbean

by

Alan Hrapsky
with
Michael Weber and Harold Riley

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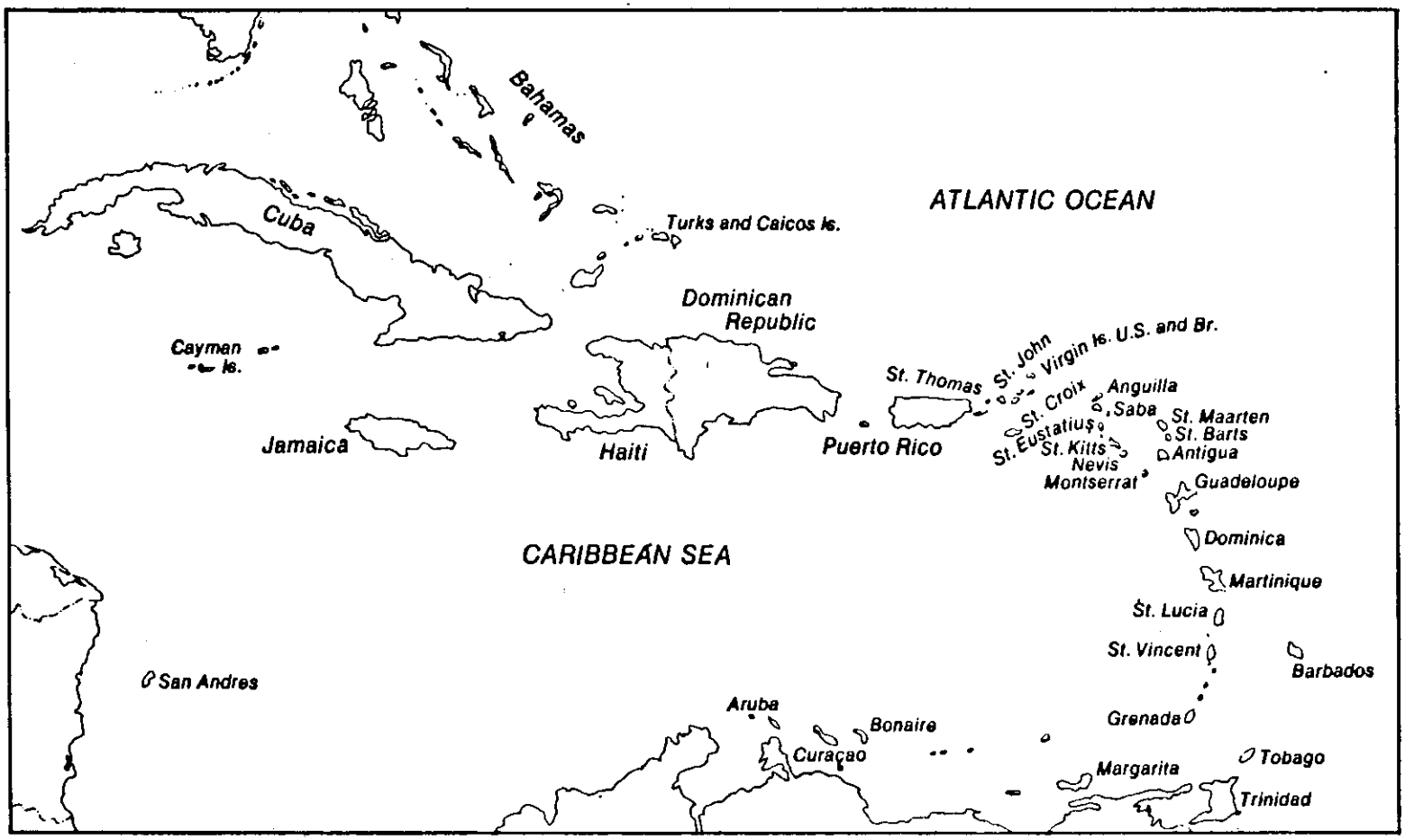
Figure 1. Map of the Caribbean Islands.



SOURCE: Porter, Darwin. Frommer's Dollarwise Guide to the Caribbean (including Bermuda and the Bahamas). Frommer/Pasmantier Publishers. 1984-85.

CHAPTER I

INTRODUCTION

Problem Statement

Increases in regional food imports, diminishing extra-regional market demand for traditional export commodities (for example, bananas and sugar), and declining foreign exchange earnings have eroded the economic position of Eastern Caribbean countries. In response to expanding trade deficits regional island governments are seeking ways to diversify and increase the efficiency of the existing agricultural base, and to improve the regional and extra-regional marketing systems for agricultural commodities.

A large proportion of Eastern Caribbean food imports comprise cereal grains and livestock products, most of which cannot be produced regionally at costs competitive within the world market.[1] However, a significant volume of fruit and vegetable imports, a growing proportion of which are shipped from extra-regional sources, could potentially be replaced by locally and regionally produced commodities. Also, several non-traditional fresh fruit and vegetable exports have potential for expanded sales in regional and extra-regional markets. But many constraints impede development of an efficient production and marketing system for fresh fruits and vegetables in the Eastern Caribbean Region. Geographical dispersion of production, relatively small production units, limited markets within individual countries, inconsistent volume and quality of products marketed, lack of suitable and timely transportation, and the absence of appropriate market information are key constraints to expanded production and trade.

In order to alleviate existing constraints, USAID has recognized the need to incorporate a strategy of market-guided agricultural research, extension, and production promotion activities into its regional agricultural project portfolio, and to improve coordination among project activities. USAID's regional projects include the Caribbean Agricultural Trading Company (CATCO), the Caribbean Agricultural Extension Project (CAEP), and the Caribbean Agricultural Research and Development Institute (CARDI). USAID bilateral projects relevant to this study are the St. Lucia Agriculture Structural Adjustment Project and the St. Vincent Agricultural Development Project.

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[1] USAID Regional Development Office In The Caribbean. "Caribbean Agricultural Trading Company Project Paper." 1982. p. 5.

The over-arching objective of this research was to provide USAID with a diagnostic-prescriptive assessment of the mango commodity system that would be useful in the design and management of USAID's project portfolio. A secondary objective was to demonstrate how a market-guided food systems approach could be applied to a particular commodity, thus facilitating coordination of vertical stages in the agricultural production and marketing system. The food systems approach begins with identification of consumer requirements in terms of product specifications and volume flows, examines the production changes necessary to achieve these requirements, then systematically diagnoses constraints at each stage in the production/marketing chain, and prescribes realistic actions for their removal.

Rationale for Studying Mango

Focusing on a single commodity made possible close examination of various physical functions performed, specific points of exchange along the marketing chain, organizational structures of export firms, and inter-relationships and behavior of participants in the system. Also, because most fresh fruits and vegetables flow through the same channels in moving from producers to consumers in the Eastern Caribbean, many bottlenecks identified for mango are common to other commodities.

Mango was selected for detailed study for four main reasons:

1. markets currently exist both regionally and extra-regionally;
2. mango production and export levels are relatively high in St. Lucia, St. Vincent, and Dominica;
3. planned increases in production in St. Lucia and Dominica have begun to come on-stream and will continue to grow significantly throughout the 1980s;
4. the Caribbean Agricultural Trading Company began importing mangoes into Barbados in 1984 and plans to penetrate the Trinidad market in 1985.

Objectives

The specific objectives which directed research on the mango commodity sub-sector were to:

1. provide an overview of the production and marketing system for mangoes in the Eastern Caribbean;
2. analyze the nature of demand for mangoes in Barbados and Trinidad and extra-regional markets (western Europe and North America) by identifying desired quality characteristics and volume flow requirements;
3. examine supply potential in the Windward Islands of St. Lucia, St. Vincent, and Dominica taking into consideration current volumes of exportable products, planned and potential increases in production, and existing cultural practices;

4. conduct in-depth case studies of regional exporters detailing performance of physical functions such as collection, sorting, packing, and shipping, and examine export firm behavior vis-a-vis other actors in the system;

5. collect and analyze cost and volume information from firms shipping to regional and extra-regional markets;

6. diagnose constraints in the marketing chain which restrict delivery of the desired product in the appropriate volumes;

7. recommend investments in infrastructure, training, and research to alleviate the identified constraints.

Research Procedure

The food systems approach adopted for this study is flexible in that it offers a wide range of information gathering and analytical techniques, both quantitative and qualitative. Data collection methods used in this investigation included formal surveys of supermarkets in Barbados and Trinidad. Non-random purposive samples designed to include a majority of the larger volume supermarkets merchandising mangoes in both islands were drawn. The survey instruments were designed to elicit quantitative information regarding prices and volumes of product flows, and qualitative information concerning types of suppliers, supply patterns, handling and merchandising practices, product quality, and supermarket purchasing preferences. Greater detail on methodology employed in this study is provided in Chapters III and IV and Appendix 2.

To gain an understanding of how Eastern Caribbean fresh produce export firms behave, in-depth case studies of selected firms were also conducted in St. Lucia, St. Vincent, and Dominica, the major agricultural producing countries in the region. Quantitative information regarding volumes and costs of assembling and shipping mangoes was gathered from regional export firms and then analyzed. In addition, field research involved following and observing traders as they supervised, or in some instances, actually performed the physical functions of collecting, sorting, packing, transporting, and shipping mangoes. One case study involved the researcher in the collection and assembly of mangoes in the supply country. These mango shipments were then followed to the airport, to the wholesaler in the regional market country, and finally into the supermarket. Other case studies drew on observations made on farms, in packhouses, at wholesale warehouses, and at the wharf. Five models of regional fresh produce traders were developed from the results of the case studies which facilitated comparison of their organizational structures and operational characteristics.

Secondary sources and interviews with knowledgeable individuals such as exporters,

importers, government officials, and technical specialists were used to characterize the markets for mangoes in western Europe and North America.

Organization of the Report

Chapter II provides an overview of the production and marketing system for mangoes in the Eastern Caribbean. Planned increases in mango production are discussed in Chapter III which mainly focuses on the British Development Division (BDD) supported tree crop diversification projects in St. Lucia and Dominica. Chapter IV assesses the market for mangoes in Barbados and Trinidad, mainly presenting results of descriptive supermarket surveys conducted in both countries. For illustrative purposes, marketing margins for CATCO's 1984 mango shipments to Barbados are also offered. Chapter V characterizes the western European and North American markets for mangoes and analyzes exports of two public sector institutions that consign mangoes to Geest Industries Ltd. Finally, Chapter VI offers conclusions and recommendations that follow from the study.

CHAPTER II

OVERVIEW OF THE PRODUCTION AND MARKETING SYSTEM FOR MANGOES IN THE EASTERN CARIBBEAN

The Structure of Production

Introduction

The general structure of agricultural production in the Eastern Caribbean region is characterized by small units of production, unequal land distribution, geographic dispersion of the island states, high input costs, lack of specialization at the farm level, and high natural risks. Banana is the major commercial crop and leading export in the Windward Islands of St. Lucia, St. Vincent, and Dominica. Major characteristics of the agricultural production system for fresh fruits and vegetables are summarized below.

1. In St. Lucia 82 percent of all agricultural holdings are less than five acres yet together account for only 14 percent of the total land in farms. In contrast, less than one percent of all farms are over 500 acres but make up about 37 percent of total agricultural acreage. Similarly in St. Vincent, 88 percent of all farms are less than five acres but constitute only 24 percent of total farm acreage. Less than one percent of all holdings in St. Vincent account for about 40 percent of total farmland. In Dominica, 69 percent of all farms are less than five acres but make up 13 percent of the farmland. Fewer than one percent of all agricultural holdings account for approximately 31 percent of the acreage in farms.[2]

2. Except for Antigua, the agricultural sector in the lesser developed countries (LDC's) of the Eastern Caribbean employs over 20 percent of the labor force. LDC's in the Region include: Antigua, St. Kitts/Nevis, Monserrat, Dominica, St. Lucia, St. Vincent and the Grenadines, and Grenada.[3]

3. Input costs for fertilizer, pesticides, and fungicides are high, largely due to the small quantities demanded by any particular country and high transportation and distribution costs.

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[2] Baucom, W., Fiester, D., Zuvekas, C. Agricultural Development in the Eastern Caribbean: A Survey. USAID. 1977.

[3] USAID Regional Development Office In The Caribbean. "CARDI Farming Systems Research and Development Paper." 1983, p. 4.

4. Farm labor is reported to be expensive because of negative attitudes toward agricultural work and the attraction of higher urban wages which restrict supply.[4]

5. Producers face significant natural risks such as pests, disease, and hurricane damage in growing fruits and vegetables.

6. Bananas dominate export crop production of fresh fruits and vegetables in the region and enjoy a protected market in the U.K. Bananas accounted for about 97 percent of all foreign exchange earnings derived from the export of fresh fruit and vegetables in St. Lucia in 1983; about 88 percent in Dominica; and approximately 50 percent in St. Vincent.[5]

7. No reliable production data is available in the region. Also, it should be noted that external trade statistics collected by regional island governments appear to underestimate the volume and value of trade, but are nonetheless, the best available indicators of market activity.

The Structure of Mango Production

In the colonial era mango and other commercially unimportant crops were planted in backyards and on inferior lands as the most arable land on plains and subdued slopes was reserved for plantation crops produced for export.[6] For the most part, this situation holds today with mango planted on marginal banana land (where it is often better suited than other crops and provides greater returns), in backyards, and as windbreaks. No large commercial mango production exists in St. Lucia, St. Vincent, or Dominica, the major mango producing countries of the Eastern Caribbean.

Average plantings range from one-half to ten acres and mangoes are commonly intercropped with annual crops and other tree crops. Intercropping with short-term crops is necessary to generate income during the seven to ten years required for mango to reach full production. Of the West Indian mango cultivars most suitable for export, St. Lucia mainly produces the Graham and Julie; St. Vincent, the Imperial, Julie and Ceylon; and Dominica, the Julie.

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[4] Baucom, et al.

[5] These figures are taken from external trade statistics published by the Governments of St. Lucia, Dominica, and St. Vincent for 1983.

[6] Tai, E. A. "Fruit Tree Crop Production in the Caribbean." In Proceedings of the Caribbean Workshop on Traditional and Potential Fruit Tree Crop Development. (eds.) Bazan, R., McLaren, L., Pinchinat, A. M., Tai, E. Inter-American Institute for Cooperation on Agriculture and Ministry of Agriculture, Tourism, Forestry, and Cooperatives, Grenada. November 9-14, 1980, p. 55.

"Cultivar" is a contraction of the phrase "cultivated variety" and is distinguished throughout this report from "seedling" mango varieties. Mango cultivars are reproduced vegetatively (asexually) by grafting a stem piece or bud of the desired cultivar (for example, Julie, Imperial, or Graham) onto any seedling or a branch of a preferred variety (for example, Mango Longue). Seedling mango refers to any tree reproduced sexually or asexually from seed.

The West Indian common mango is one type of seedling mango that exhibits polyembryonic characteristics. That is, the seed contains several embryos which are identical genetically with the seed parent, but only one of which results from the fertilization of the ovary with pollen. Although the West Indian common mango can be true to type, there is potential for the sexual embryo to be selected by mistake; hence the quality of the resulting seedling may be inferior to that of the parent.

Other seedling mangoes grown in the Caribbean may be monoembryonic or polyembryonic. Monoembryonic seedling mangoes will exhibit a great deal of variation in quality and other commercial characteristics from generation to generation.

The mango season throughout the Eastern Caribbean Region generally extends from May to September, although limited production occurs before and after. This production season is relatively long compared to many other mango producing countries such as India, Israel, and Egypt. The primary causes of this extended season are regional environmental conditions (that is, lack of extreme cold or dry seasons) and the multiple bloom characteristics of West Indian varieties. Multiple blooming refers to the phenomenon in which branches on trees have the potential to flower at different times during the season.

Characteristic growth of the mango differs from that of other fruit trees in that production takes place in periodic vegetative flushes from the terminal buds and buds in the axils of leaves on younger branches. The number of vegetative flushes during a season, the time of their initiation, their duration, and their subsequent flowering in the following year vary according to the following factors: climate, cultural practices, crop load, nutritional status, age, and variety.

In sum, the growth characteristics of mango in the Eastern Caribbean result in a production cycle of peaks and troughs which alternate within the year and from year to

year. Historical export trade statistics for individual islands generally reflect this pattern.[7]

Production Trends

Hurricanes David in 1979 and Allen in 1980 wrought considerable damage on mango trees in the region and total exports from the three island group declined by as much as 17 to 40 percent from 1979-1981. Since 1981 exports have steadily increased at an annual rate of about 22 percent, and statistics available for 1984 indicate that exports from St. Lucia, St. Vincent, and Dominica have surpassed pre-hurricane peaks at nearly 800 tons.[8]

Mango production in the region will increase significantly in the 1980s as trees planted under the British Development Division (BDD) supported tree crop diversification projects in Dominica and St. Lucia approach full production. Plantings to date total approximately 510 acres with another 150 acres scheduled for planting in St. Lucia. The projects are designed to benefit the small holder stipulating that acreage planted must be in pure stands of between one-half and five acres. Total on-coming production in St. Lucia and Dominica is projected at about 300 tons in 1986, almost 900 in 1988, and 1700 in 1990.[9] However, assuming that these projections are accurate and that about 60 percent of total production will be of suitable quality for export to extra-regional markets, only about 200 tons will be available for export in 1986, 600 in 1988, and 1100 in 1990. The St. Vincent tree crop project which involves topworking existing trees should also increase regional production, but projections of future production were not available. About 160 acres are scheduled for planting under the St. Lucia Model Farms Project in the next four years and planting outside of the projects may also contribute to increased regional production.

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[7] The description in this section is mainly drawn from: Popenoe,Wilson. Manual of Tropical and Sub-Tropical Fruits (Excluding the Banana, Coconut, Pineapple,Citrus Fruits, Olive and Fig). Macmillan. New York. 1920. pps. 79-145; and Chaudhri, Saeed A. "Mangifera India--Mango." In The Propagation of Tropical Fruit Trees. (eds.) Gardner, R. J., Chaudhri, S. A., and the Staff of the Commonwealth Bureau of Horticulture and Plantation Crops. FAO-UN:Commonwealth Agriculture Bureau. Farnham Royal, 1976.

[8] External Trade Statistics collected from the Governments of St. Lucia, St. Vincent, and Dominica.

[9] These figures are taken from the following sources: St. Lucia Ministry of Agriculture. Orchard Crop Diversification Project: Phase II (Revised). February, 1983. Appendix V; Dominica Ministry of Agriculture. Report and Results of the Tree Crop Diversification Project Summary. 1983, p. 5.

Mango Production Profitability

Rigorous farm level yield and cost of production data for mango are not available in the Eastern Caribbean making financial and economic analysis difficult. However, data from The St. Lucia Orchard Crop Diversification Project does lend itself to analysis (see Chapter III for more in-depth treatment and limitations of the analysis).

Analysis of the St. Lucia project farm budget results in financial and economic internal rates of return greater than 50 percent. Even taking into consideration the fact that no land cost is included in the budget, these high rates of return suggest that mango production is a potentially profitable enterprise.

The Structure of the Marketing System

Regional Market Size

Markets in the Eastern Caribbean are diminutive in comparison to other Caribbean and world markets. As described in Table 1, The Republic of Trinidad and Tobago offers the largest potential market in the region with a population of 1,152,000 and per capital GNP of $3,390 U.S. But after Trinidad, individual market size of other islands decreases significantly. Barbados and The French West Indies (Martinique and Guadaloupe) provide the only other markets of notable size.

These micro markets limit the potential for expanding domestic consumption of regionally produced mangoes, particularly in St. Lucia, St. Vincent, and Dominica where mangoes are abundantly grown and exported. Demand in the tourist sector is also limited, mainly because the mango production season coincides with the slack tourist season from May to September.

Export Trade and Trends

Excluding bananas, mangoes are among the top two fresh produce exports in St. Lucia where over 300 metric tons were exported to regional and extra-regional markets in 1983 and 1984. Appendix I provides regional trade statistics for fresh produce. Mangoes are less important to St. Vincent, positioned about sixth among non-banana fresh produce exports, albeit over 300 tons were exported in 1983 and about 400 tons in 1984. Dominica exports substantially less than St. Lucia or St. Vincent and its exports outside the region are small. Ranked about eighth on its list of major fresh produce exports, Dominica shipped 77 tons of mangoes to all markets in 1983 (mainly to the French West Indies, Antigua, and the U.S. Virgin Islands) and over 86 tons in 1984.

Table 1

Market Size of Independent States and Territories In The Eastern Caribbean[a]

Country or Territory	Area (Sq/mi)	Population	Population Growth Rate (%)	Per Capita GNP (1979/in US Dollars)
Trinidad & Tobago	1,719	1,152,000	1.5	3,390
Martinique	425	326,000	1.5	4,680
Guadaloupe & St. Martin	687	344,000	1.6	3,260
Barbados	166	253,000	1.0	2,400
Antigua	171	74,000	1.4	1,070
St. Lucia	238	122,000	1.5	780
Grenada	133	108,000	.4	630
St. Vincent	150	106,000	2.9	490
Dominica	290	79,000	1.7	410

SOURCE: Lowenthal, Abraham F. "The Caribbean." In The Wilson Quarterly. Spring, 1982.

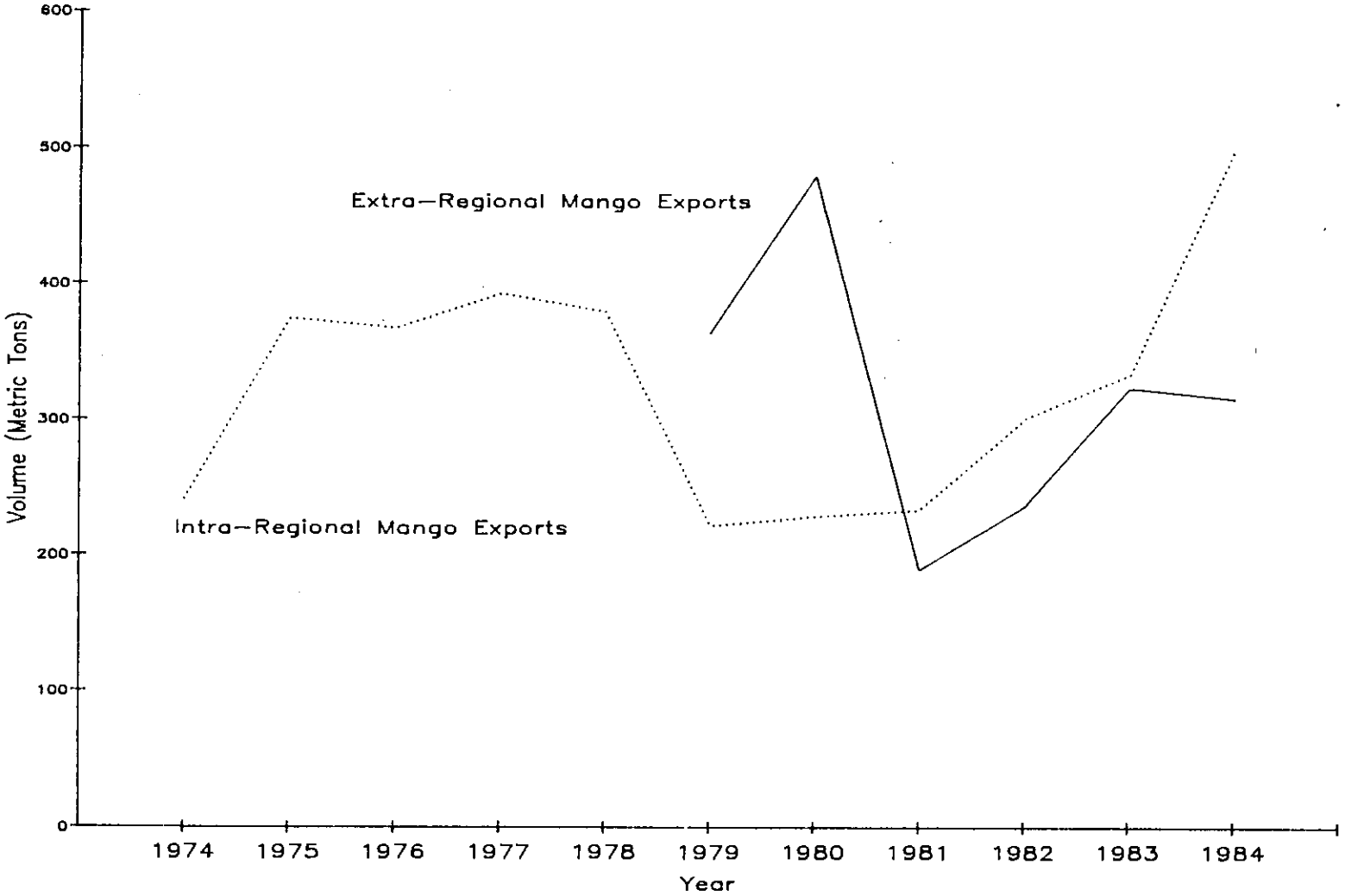
[a] Smaller territories such as St. Kitts/Nevis, Monserrat, Anguilla, etc. were not included in the table.

Mango exports from the three island group are divided between regional and extra-regional markets. Major regional markets for mangoes and fresh produce in general are Trinidad, Barbados, and the French West Indies. Trinidad imported over 280 tons of mangoes in 1984 of which St. Vincent accounted for about 90 percent. Barbados imported over 220 tons in 1984 which were almost evenly shared by St. Vincent and St. Lucia. However, St. Lucian mango imports into Barbados were banned in late July 1984 due to discovery of the mango seed weevil (Sternochetus mangiferae). Historically, Dominica's largest regional markets have been the French West Indies and Antigua, where it exported about 29 and 20 tons respectively in 1984. However, 28 tons were also shipped to Trinidad in 1984.

Overall, regional mango exports have remained relatively stable during the last ten years except when natural disasters have disrupted production. However, individual island exports are more erratic from year to year due in part to the characteristics of mango production. The emergent pattern is therefore one where declines in exports by one country are often partially offset by increased shipments by another.

Extra-regional exports from the three island group of St. Vincent, St. Lucia, and Dominica are largely sent to the U.K. because Geest Industries Ltd. provides the only

Figure 2. Intra and Extra-Regional Mango Exports: St. Lucia; St. Vincent; Dominica (in Metric Tons)



SOURCE: External trade statistics of St. Lucia, Dominica, and St. Vincent

weekly refrigerated sea freight service out of the region. One private sector firm in St. Vincent does ship by air to Toronto, but this involves trans-shipment to Barbados as St. Vincent does not have an international airport (see sub-section on shipping for more detailed discussion). The three island group exported about 184 tons of mangoes on the Geest ships to the U.K. in 1982, 373 tons in 1983, and 272 in 1984 (see Appendix 1 Table 30). Mango exports air freighted from St. Vincent to Canada totalled 43 tons in 1984. The volume of mangoes air freighted from St. Lucia to the U.K. is not known.

Channels of Distribution for Mangoes in Barbados and Trinidad

Supermarkets and domestic hucksters (small vendors) are the major market channels for distribution of mangoes in Barbados and Trinidad. Hucksters sell small quantities of mangoes from stalls in public markets and along city streets. Owners of backyard trees and farmers who provide relatives and friends with surplus fruit are another significant, yet non-market, channel of distribution for mangoes.

Results of a previous survey reported in Table 2 indicate that supermarkets and small shops are overall, the major source of Barbadian household purchases of fresh fruits and vegetables (45 percent), and that hucksters are second in importance (25 percent).[10] However, estimates of mango volumes moving through the supermarket sector collected during the present study and analysis of import statistics suggest that the domestic huckster market share for mangoes may be closer to 40 percent.

No formal surveys describing relative volumes of fresh produce moving through various market channels in Trinidad are available. However, this survey of the mango commodity subsector offers information concerning the flow of imported mangoes into Trinidad.

Among the more formal market sectors in Barbados (hotel, restaurant, supermarket, and institutions), the supermarket sector is estimated to be the largest buyer of mangoes. The data in Table 3 show that supermarkets purchase about 92 percent of all mangoes flowing through the formal sectors. Hotels account for less than five percent of mangoes sold, institutions purchase about three percent, and restaurants about one percent.

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[10] SYSTEMS Group of Companies. A Survey of the Hotel, Restaurant, Supermarket, and Institutional Markets for Fresh Produce in Barbados. Conducted for the Inter-American Institute for Cooperation on Agriculture. September 1981.

Table 2

Major Sources of Fresh Produce Purchases by Barbadian Household Consumers

Major Sources of Fresh Produce Purchases by Household Consumers	Proportion of Total Sample (Percentage)
Supermarket/shop	45
Hucksters	25
Own Garden/farm	15
Friends/relatives	10
Other	5
Total	100

SOURCE: SYSTEMS. Omnibus Survey of 1,000 Consumers. March 1981. Question Series on Fresh Produce Purchasing Behavior.

Table 3

Estimated Percentage of Formal Markets for Fruits by Sector: Barbados
(Volumes in Metric Tons)

Sector	All Fruits		Mangoes	
	Percentage	Volume	Percentage	Volume
Supermarkets	55	2041	92	207
Hotels	20	740	5	11
Institutions	15	493	2	6
Restaurants	10	398	1	1
Totals	100	3672	100	225

SOURCE: SYSTEMS Group of Companies. A Survey of the Hotel, Restaurant, Supermarket, and Institutional Markets for Fresh Produce in Barbados. September 1981. Conducted for the Inter-American Institute for Cooperation on Agriculture.

Mango imports into Trinidad are predominately supplied by traffickers (small-scale entrepreneurs) from St. Vincent. But due largely to poor shipping conditions and delays encountered along the marketing chain traffickers are unable, for the most part, to

distribute their mangoes and other fresh produce directly to supermarkets.[11] Instead they are forced to sell at the Central Market in Port of Spain which serves as both wholesale and retail markets and provides a convenient outlet. A few traffickers do distribute mangoes directly to the largest supermarket chain group in Trinidad (17 stores) which buys a majority of its fresh produce through a central purchasing warehouse. Independent supermarkets and members of smaller supermarket chain groups rely on wholesale markets (there are three including the Central Market) and direct deliveries made by gardeners and farmers for their mango supplies.

Channels of Distribution in the U.K. and Western Europe

The major channels for distribution of fresh fruits and vegetables in the U.K. are supermarket chain groups, independent stores, street markets, hotels, and restaurants. Demand in the U. K.'s relatively large population of South Asian and West Indian immigrants fostered development of a specialized trade for tropical fresh produce which largely evolved outside of the traditional marketing system. Historically, several large and numerous small-scale traders directly imported and supplied this market with mangoes, bypassing U.K. wholesale markets such as Covent Gardens.[12] With a broader-based and increasing demand for exotic fresh produce in the U.K., traditional import wholesalers have begun to incorporate mangoes into their product lines. Increasing volumes of mangoes are also being distributed through the marketing systems of other western European countries where supermarkets account for a large proportion of sales (see Chapter V, Table 18 for western European imports of mangoes).

Fresh Produce Export Trading Firms in the Eastern Caribbean

Mango exports to regional markets are mainly handled by a large number of small-scale entrepreneurs from the Windward Islands known as "traffickers," "hucksters," or "speculators" who accounted for roughly 80-85 percent of all exports to Barbados and Trinidad in 1984. Traffickers operating from St. Lucia, St. Vincent, and Dominica are thought to number between 300-400 in each country. The balance of mangoes exported to Barbados and Trinidad were largely shipped by three regional trading companies which implemented systematic market development and export strategies within the last two years.

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[11] Maxey, Mike. Unpublished St Vincent Trip Report, USAID/Regional Development Office in the Caribbean. November 17-19, 1984.

[12] Stother, Jacqueline. "The Market for Fresh Mangoes in Selected Western European Countries." Tropical Products Institute. London. April 1971. p. 15.

Most public sector institutions and private sector businesses exporting mangoes and other fresh fruits and vegetables from St. Lucia, St. Vincent, and Dominica to extra-regional markets ship to the U.K. Reasons for shipping to the U.K. include the following: Geest provides a regular weekly shipping schedule and sufficient cargo capacity for non-banana exports; the U.K. market can absorb larger volumes than regional markets; supply relationships with buyers or agents are relatively stable; and prices have been traditionally higher than in the region.

Private sector firms exporting to the U.K. and Canada mainly sell to buyers who supply immigrant populations, and it is common for the owner/operator of an export firm to have a family member act as the importer and wholesaler in the market country. Other private sector firms develop their own import contacts. Private export firms and traffickers are similar in that most supplement their incomes derived from exports of fresh produce by importing miscellaneous consumer goods to sell in the home market. This income becomes particularly important after production of seasonal commodities ends.

Public sector firms tend to operate their export businesses by selling on consignment with Geest which largely distributes to supermarket chain groups in the U.K. It should be mentioned that the governments of St. Lucia, St. Vincent, and Dominica are currently re-evaluating the role that government plays in trade and that prior mandates empowering national marketing boards to import and export commodities are being seriously questioned. These governments are seeking alternatives for improving and expanding regional and extra-regional trade.

Profiles of Export Trading Firms

During this study it was possible to identify 15 firms including public sector institutions and private sector businesses that currently export significant quantities of mangoes, in addition to other fresh produce, from St. Lucia, St. Vincent, and Dominica. Appendix 2 provides the methodology used to study exporters and a list of the firms identified. Four firms were selected from this universe of exporters for more in-depth study in order to gain a better understanding of their organizational structures, operational and behavorial characteristics, and to document relative volumes of product flows.

Four basic models of Eastern Caribbean trading firms were then developed from the results of the case studies. In addition, a model of the regional trafficker's system

for exporting fresh produce was developed from secondary sources of information and field observations.[13]

Figure 3 provides an overview of the five models illustrating relationships between various stages and actors in the system such as producers, first handlers, shippers, wholesalers, etc. Major and minor communication flows and their directionality are also highlighted. Major communication flows are defined as regular weekly telephonic, telegraphic, or interpersonal communication between actors regarding required volume flows, product specifications such as varieties, price information, feedback on quality of products shipped, and operational concerns. Minor flows mainly involve communication about operational matters such as shipping schedules and documentation.

Firm A: A Private Sector, First Handler/Exporter

This firm acts as a first handler in St. Lucia collecting, sorting, and packaging mangoes and other fresh produce for sales to one import wholesaler in the U.K. and one in Barbados. Close weekly communication with the U.K. buyer provides feedback regarding quality, market conditions in the U.K., and required volumes. Acting as both first handler and exporter in the supply country allows Firm A to: communicate directly with growers about harvest and handling practices and quality requirements; closely monitor the crop situation; compete aggressively for the best quality supply sources; and generally oversee the quality of produce being packaged.

Firm A has developed a network of mango growers over the past eight years capable of supplying an estimated 20 tons per week in the peak production season (May through July).

The owner/manager of Firm A indicated that many of his producer/suppliers prefer to shake their mango trees to harvest fruit rather than to hand-pick or use a harvesting pole. Firm A's employees must then spend additional time sorting fruit harvested in this manner. The manager of Firm A estimated that rejection of mangoes harvested in this fashion reaches as high as 50 percent in some cases. It should be mentioned, however,

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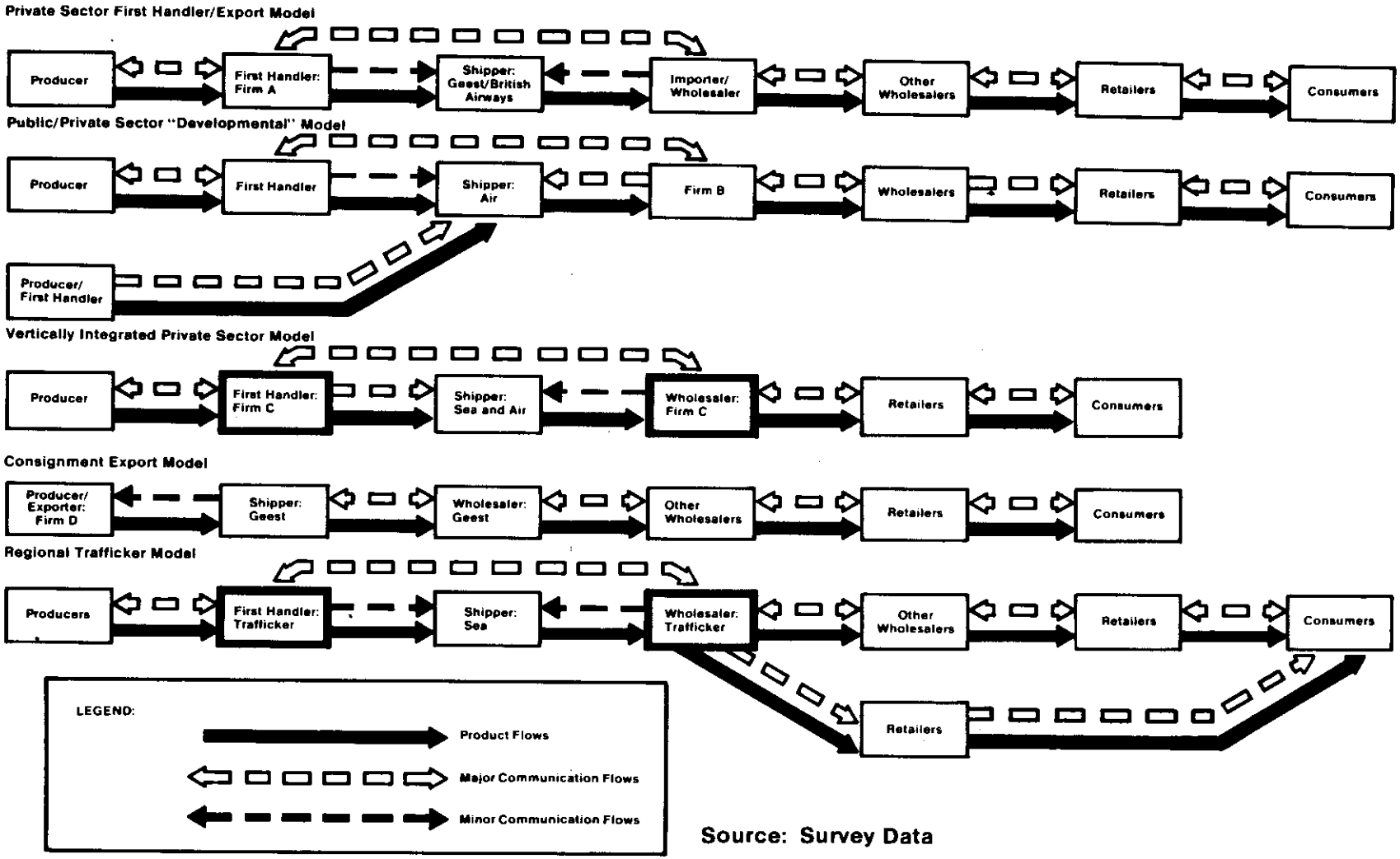
[13] Several studies of regional traffickers have been conducted in the Eastern Caribbean. Regarding marketing activities, the best available source which was used in the present study is: Systems Group of Companies. A Survey of Small Scale Agricultural Marketing Enterprises in the Eastern Caribbean. Volumes I and II. Conducted for the Food and Agriculture Organization of the United Nations, 1981.

Figure 3
Models of Eastern Caribbean Fresh Produce Export Firms



Source: Survey Data

that farmers supplying Firm A who depend more heavily on mangoes for income do not shake their trees and generally take greater care in harvesting and handling their fruit. During the peak production period Firm A selects farmers capable of bringing forth the desired quantities and quality.

Firm A employs 10 to 60 workers to sort, wash, and package mangoes. When necessary, the firm reduces labor costs by varying the number of employees according to export volume requirements and crop production cycle. The firm also finds it necessary to import sundry non-agricultural goods to generate income after the mango and breadfruit seasons end.

Firm A's owner/manager, and three additional traders who also export mangoes from St. Lucia said that it is critical for them to closely control the quality of produce being selected and packaged, and that they would not entrust this function to a third party. That is, if a central packing facility were available where different traders could have their commodities sorted, washed, and packaged for a standard fee, they would not pay for the service.

Firm A follows supply trends in the U.K. market, shipping on British Airways to ensure quality and achieve maximum prices when mangoes are scarce, and by sea on Geest when supplies are abundant and timeliness of delivery is not pressing. The firm's buyer in the U.K. pays a C.I.F. price of £ 3.50/carton (each carton weighs 5-6 kg.) for shipments sent by sea and an F.O.B. price of £2.50 carton for mangoes shipped by air. Firm A reported that it sold 78,550 cartons of Julie mangoes in 1984 (about 350 tons) to its U.K. buyer who mainly supplies the ethnic community. This volume exceeds the total volume of mangoes shipped on Geest by all Eastern Caribbean exporters in 1984, and if correct, would establish Firm A as the largest exporter of mangoes in the region. It was not possible to corroborate this volume as British Airways does not keep commodity-specific records for fresh produce cargo shipped.

Firm B: A Public/Private Sector "Developmental" Trading Company

The Caribbean Agricultural Trading Company (CATCO) was established with funding from international and regional development agencies, and to a lesser extent, the private sector. The project purpose was to create a commercial trading company capable of removing key marketing constraints in the Eastern Caribbean, promoting and developing new marketable products produced by farmers in the LDCs of the region, and

sustaining financially viable operations.[14] CATCO's purported role is to act as a channel captain by identifying commodities that have regional and/or extra-regional markets and then take the necessary operational steps to achieve continuity of supply from suppliers in regional producing countries.

Unlike all other firms that trade mangoes in the Eastern Caribbean, CATCO does not operate from a single supply country nor does it act as a first handler of fresh produce. Instead, CATCO relies on a network of agents in various regional islands to bring forth a high quality product in the appropriate volume, or in some cases, it buys from established traders. Since CATCO is more distant from producers it does not enjoy the advantages that other firms exporting from supply countries have. The firm therefore intends to make available technical assistance in the form of training and physical inputs to its agent-suppliers and major producers in order to achieve continuity of supply. Like Firm A in the first profile, CATCO sells mangoes and other fresh produce to independent wholesalers, who in turn, distribute to retailers.

CATCO imported about five total tons of mangoes into Barbados in 1984 (a mix of Julies, Imperials, and Grahams) which fell significantly short of the firm's projected trading target. Specific problems which CATCO encountered in attempting to achieve its 1984 target volume include the following:

1. difficulty in arranging timely air charter transport from the Windward Islands and securing sufficient cargo space;

2. variable fruit quality partly due to lower quality supply, inadequate selection, and delays in transportation;

3. a Barbados government ban on mango imports from St. Lucia in July because of discovery of the mango seed weevil.

Marketing margin analysis for CATCO's 1984 mango shipments is presented in Chapter IV.

Firm C: A Vertically Integrated Private Sector Firm

Firm C is one of three vertically integrated fresh produce export firms identified in the Eastern Caribbean during this study. In addition to exporting an array of fresh fruits and vegetables, Firm C imports and distributes cosmetics, foodstuffs, and other consumer goods. The firm combines first handler and export activities in St. Vincent

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[14] USAID/Regional Development Office in The Caribbean. "Caribbean Agricultural Trading Company Project Paper." 1982. p. 15.

with wholesale operations in Barbados and Canada. Firm C indicates that integration of these operations allows the firm to more effectively control product quality at each stage in the system, aggressively market its commodities, and achieve higher prices. Frequent communication between the wholesale operation in the market country and the office in St. Vincent plays a key coordinative role in maximizing export opportunities according to Firm C.

The firm maintains a close relationship with farmers and undertakes extension activities using both media and interpersonal channels to create flows of information in the system. Firm C employees encourage growers to improve their cultural, harvesting, and handling practices in the field and at the packhouse. The firm has also produced television programs intended to achieve the same effect. However, problems with quality persist.

During periods of high production Firm C uses a system of strategically located collection depots which facilitates expedient movement of produce from the field to the packhouse. The location of these depots are announced on the radio at mid-week. To further ensure product quality Firm C purchases extra space in the cargo hold of inter-island schooners when shipping to Barbados. This standard operating procedure increases ventilation and reduces damage incurred from over-packing cartons aboard the vessel. The firm stated that losses seldom reach five percent. Standardized carton weights of 40 lbs. are also maintained to reduce accounting time in the market country.

Firm C buys and exports the grafted Julie and Imperial cultivars and a lesser amount of Ceylon. Some common varieties which are made into chutneys and pickles by ethnic consumers are also exported to extra-regional markets. Firm C exported 34 tons of mangoes to Barbados and 43 tons to Canada in 1984.

Firm C received an average price of $2.09 EC/kg. from Barbados retailers in 1984. The average price received from Canadian retailers was about $4.26 EC/kg.

Firm D: A Public Sector Estate/Consignment Exporter

Firm D is a public sector estate which owns about 500 Graham mango trees in St. Lucia, each capable of producing roughly 200 mangoes suitable for export to the U.K. The firm exports exclusively on consignment to the U.K. through Geest Industries Ltd.'s shipping and marketing services. Geest charges a ten percent commission on gross sales and also levies charges for handling, shipping, and distribution.

Since Firm D grows it own mango crop it has three major advantages over firms that must collect fruit from a large number of farmers: it is in a better position to carry out proper cultural practices such as pruning, spraying to prevent disease (mainly anthracnose), fertilizing, and general grounds maintenance; it may dictate which harvest method to employ and when mangoes should be picked; less time may be involved in moving mangoes from the field to the packhouse. However, due to financial constraints, Firm D does not consistently spray to control anthracnose or fertilize. Unlike the other three firms described, Firm D does not enjoy close communication with its distributor, Geest Industries (depicted in Figure 3). In fact, Geest does not send an account of sales detailing prices fetched until 4-8 weeks after mangoes are loaded aboard the Geest ship in St. Lucia. Firm D dramatically improved the quality of mangoes it shipped in 1984 over previous years and realized significantly higher per carton prices. Better prices are mainly attributable to improved fruit selection. Firm D shipped 3,746 cartons of Graham mangoes on consignment with Geest to the U.K. in 1984, or about 21 tons.

Regional Traffickers

Regional traffickers are individuals who export fresh fruits and vegetables, among other commodities, from the Windward Islands to regional market countries. Traffickers, who are predominately female, frequently export mangoes, especially from St. Lucia, St. Vincent, and Dominica. The trafficker's export system parallels that of Firm C, the vertically integrated model, particularly in the sense that traffickers: act as first handlers of produce; tend to maintain a close relationship with farmers (however, some do buy from hucksters in the supply country, or grow their own crops); usually wholesale their own products in the market country (although some do send commodities to family members or agents); and frequently follow their produce throughout the marketing system.[15]

The trafficker's system of marketing mangoes and other fresh produce differs from Firm C's system in several respects. Generally, traffickers: buy small quantities for export; have no formal grading or quality standards; package produce in a mix of bags, boxes, crates, etc.; do not own vehicles for transporting commodities; have few, if any,

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[15] Systems Group of Companies. A Survey of Small Scale Agricultural Marketing Enterprises in the Eastern Caribbean.

permanent, paid employees; operate from a small capital base; and suffer product losses ranging from 25-75 percent.

Traffickers are responsible for a majority of mango exports shipped to regional markets. Therefore regional trade statistics presented in Appendix I provide an approximation of the collective export volumes they have shipped to various regional countries and territories.

A Comparison of Physical Functions Across Firm Type: Harvesting and Assembly

Except for two large estates that produce mangoes and export on consignment with Geest, other firms must buy mangoes from a large number of producers and therefore face several common problems. Communicating the product requirements of extra-regional markets to farmers and convincing them of the benefit of following recommended cultural, harvesting, and handling practices are key stumbling blocks to improving fruit quality. Exporters of fresh produce in the Eastern Caribbean Region have indicated that many farmers do not properly care for their mango trees. Spraying to prevent disease (mainly anthracnose, the major disease of mango), pruning, fertilizing, and general maintenance of surrounding grounds are not broadly practiced. While there is potential for increasing production of high quality West Indian mangoes by establishing appropriate horticultural practices, the question of whether the added costs of inputs necessary to achieve this are economically justifiable needs to be addressed.

Four methods of harvesting are followed in the region: hand-picking; use of long poles with nets and sharp cutting blades attached; shaking trees; and using sticks to knock mangoes free from branches. The last two methods have two unprofitable effects: they reduce the number of exportable fruit through mechanical damage and may deprive farmers of extra income; they increase labor costs allocated by the firm to sorting out damaged and immature mangoes. Hand-picking mangoes from the lower reaches of the tree and then using the harvesting pole to pick the remainder of the crop are recommended. Convincing farmers to harvest at the appropriate time of day, pick only mature mangoes of good size, and to use sturdy containers for moving fruit from the field to the packhouse has also proven difficult for exporters.

Assembly functions performed by two Eastern Caribbean firms which export mangoes to extra-regional markets are depicted in the photographs which follow on pages 25 and 26. Firms exporting to extra-regional markets generally collect mangoes, sort, and package them in a similar fashion. The common procedure for firms is to:

1. use radio spots to announce when they're buying mangoes and the location;

2. make purchases at a central packhouse, albeit a number of private sector firms also have designated collection points;

3. clean mangoes at the packhouse with water often mixed with benylate, a fungicide used to prevent the spread of anthracnose caused by infected fruit;

4. sort and package at the floor level;

5. pack mangoes in uniform ventilated cartons, most of which have individual cells;

6. reject fruit that are too small, immature, damaged, or over-ripe (no formal grading is practiced);

7. assess fruit maturity through visual inspection, random sampling of mangoes for correct flesh color and texture, and immersion in water whereby fruit that float are deemed immature and those that sink, mature.

Shipping

Shipping conditions in the region are generally inadequate for transporting highly perishable commodities. Presently, regional mango exports are shipped on small inter-island schooners that lack refrigeration and sufficient ventilation. Furthermore, wharf areas in the Windward Islands are disorganized and sheltered space is not available for traffickers to package and store their produce. Also, delays due to crowded ports and cumbersome clearance procedures in destination countries substantially reduce the shelf life of perishables.

Firm B's experience with regional air charter companies in 1984 supports the contention of other exporters that air freight service is unreliable. Shipping by air is also nearly three times the cost of sea freight.

Mangoes exported to the U.K. market are mainly sent on the Geest banana ships in refrigerated lockers or reefer containers at 7-10°C (45-50°F). These cool storage facilities are fitted with high-powered fans designed to remove gas generated by fruits and vegetables during the voyage to the U.K. (mainly ethylene gas which can accelerate ripening, but also to remove hot moisture-laden air and carbon dioxide).

The cool chain which begins on board the Geest vessels is interrupted when the ships call in other Windward Island ports to on-load additional cargo. During these stops the lockers are opened to accommodate other fresh produce exports destined for the U.K. and the locker temperature may rise. The voyage to the U.K. requires 10-14 days depending upon the point of embarkation in the West Indies. In addition, delays may occur in clearing customs and in off-loading procedures in the U.K. at Barry, further increasing transit time for perishables. Exporters not selling on consignment terms to Geest who send to their own buyers have reported that delays can be significant and reduce product shelf life.

The alternative to shipping on Geest is air freight. St. Lucia is the only Windward Island with an international airport but even so, capacity is limited to 15 tons per weekly flight on British Airways and freight is costly at $1.56 EC/kg. for a minimum 453 kgs. shipment. Three major fresh produce exporters in St. Lucia currently divide this capacity amongst themselves. One firm in St. Vincent trans-ships mangoes and other commodities to Barbados and then onward ships to Canada.

Market Information

Market information also plays a key coordinative role in the agricultural system guiding planning and production and providing feedback on the performance of exports in the marketplace. However, relevant market information is currently lacking for mango and other fresh produce in the Eastern Caribbean.

Weekly market information for selected fresh fruits and vegetables is collected and published by marketing intelligence units in Barbados, Dominica, and St. Vincent albeit these services are in their infancy. Currently, only the Dominica Market News publishes price information on different mango varieties. Although the Barbados Agricultural Statistical Information Service (BASIS) publishes price information on mango, it does not discriminate between varieties, but instead lumps various cultivars and seedling mangoes into an average wholesale supermarket price. The Marketing Intelligence Unit in St. Vincent does not collect information on mango. With the exception of the Dominica Market News, information regarding regional trends and volumes in the market countries and supply islands useful to both short-term and longer-term decision-making is also not provided.

Types of information facilitating short and long term decision-making of firms shipping to extra-regional markets is unavailable as well. The most conspicuously absent short run information is continuous feedback on the quality of mangoes exported and prices received. Although Geest sends accounts of sale to its consignment exporters which detail prices received for each shipment, the accounts arrive too late to be useful to exporters who may need to adjust handling and/or assembly practices from shipment to shipment.

Information most useful to longer run decision-making needs of export firms includes product specifications in target markets and financial and economic analysis of the profitability of producing and exporting the identified mango cultivars. Additionally, information regarding competition from other world producers and innovations in packaging, shipping, handling, etc. can facilitate long run decision-making processes of export firms.

Plate 1. Inter-island schooner (right) waiting to on-load regional traffickers' fresh produce in St. Lucia.

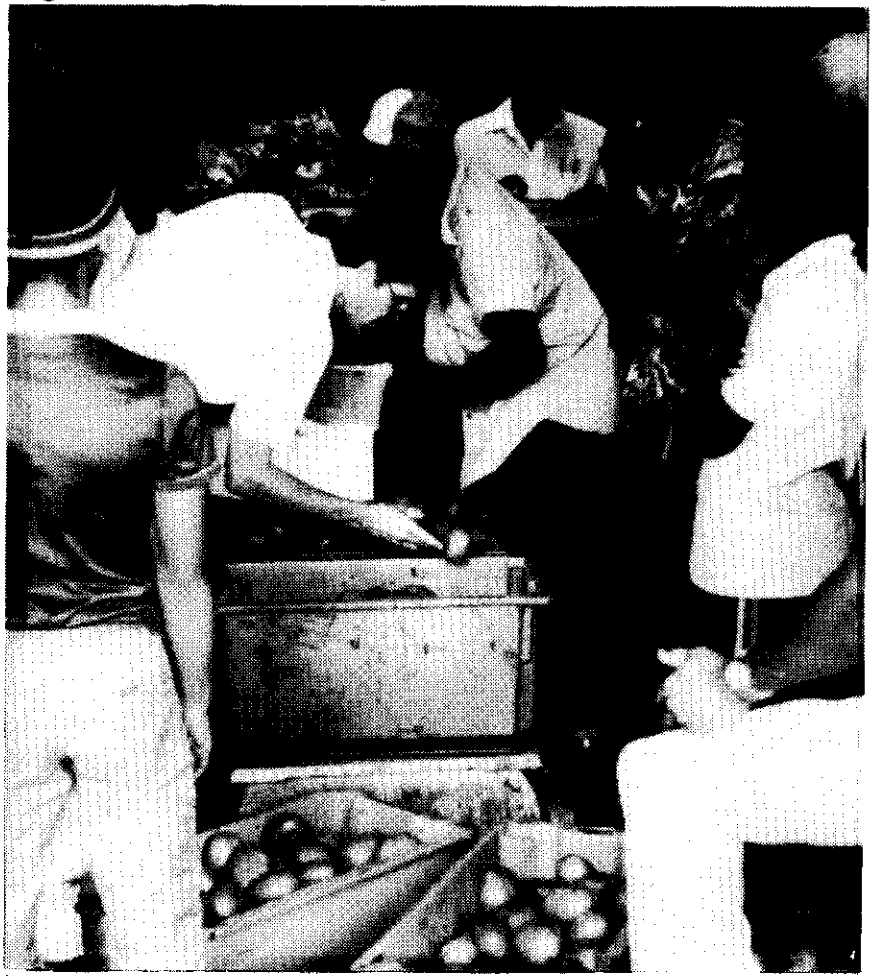

Plate 2. Purchasing supervisor inspects mangoes for proper size, maturity, and quality at public sector marketing corporation.

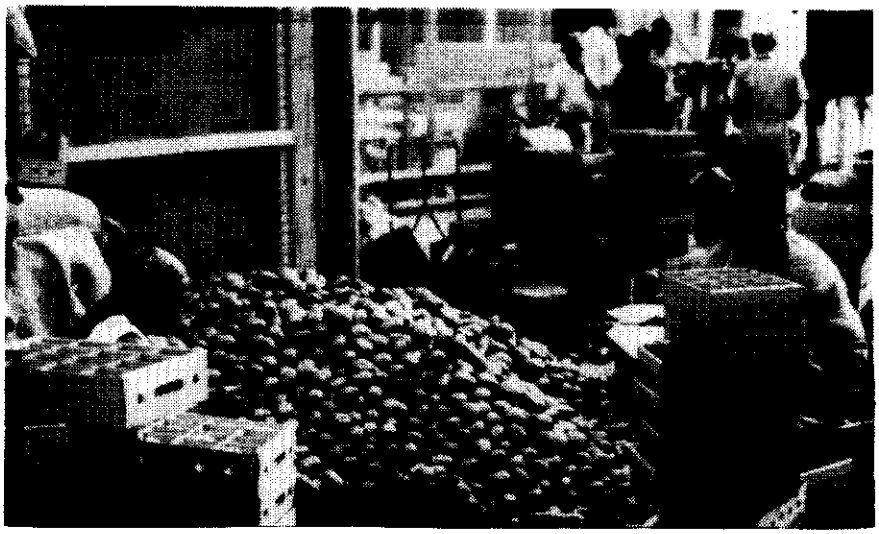

Plate 3. Cleaning, sorting, and packing of mangoes at marketing corporation.

Plate 4. Sorting and packing of mangoes at a private sector firm for air-shipment to North America.

Plate 5. Imperial mangoes packaged for consignment sales in the U.K.

CHAPTER III

PLANNED INCREASES IN MANGO PRODUCTION IN THE EASTERN CARIBBEAN

Introduction

Low mango supply volumes relative to market size is considered one of the major constraints for Eastern Caribbean exporters in penetrating the U.K. market---especially the supermarket sector. However, the supply constraint should relax in the late 1980's when plantings of about 510 acres of mango trees established by the BDD supported tree crop diversification projects in St. Lucia and Dominica approach full production. This chapter describes these two projects which involve the largest plantings of mango acreage in the region. Additionally, the St. Vincent Tree Crop Diversification Project, the Roseau Model Farms plan to plant about 160 acres of mango in St. Lucia, and fruit crop development projects in Barbados are discussed.

The Tree Crop Diversification Projects in the Windward Islands

Tree crop development efforts began in the Windward Islands after Hurricane David in 1979 as a joint undertaking between the BDD and respective national ministries of agriculture in the region. The principal objective of the projects is to diversify cropping patterns on marginal banana lands: that is, on steep hillsides, poorly drained soils, in areas distant from banana boxing plants, and in regions of low rainfall.[16] Mango is a key component of the projects along with orange, grapefruit, lime, and avocado.

Each project is primarily designed to benefit the small farmer, requiring that participants plant between one-half and five total acres of the chosen tree crop(s) in pure stands.[17] As a result, the existing pattern of fragmented production has been perpetuated in St. Lucia and Dominica. In the initial years intercropping is encouraged to provide the farmer with income until the trees reach the bearing stage. Commonly, the new tree crops are interplanted with existing banana trees which are then thinned out

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[16] Jackson, D. L., Proctor, F. J., Winter. Report on the Tree Crop Diversification Project in Dominica. Part I. Tropical Products Institute. February 21-March 12, 1982.

[17] Jackson, D. L. "British Development Division in the Caribbean." In Proceedings of the Caribbean Workshop on Traditional and Potential Fruit Tree Crop Development. (eds.) Bazan, R., McLaren, L, Pinchinat, A.M., Tai, E. Inter-American Institute for Cooperation on Agriculture and Ministry of Agriculture, Tourism, Forestry and Cooperatives, Grenada. November 9-14, 1980. p. 138.

as the orchard crop develops. Qualifying farmers are provided with planting material and labor assistance for field preparation. In addition, capital inputs and labor assistance for maintaining the crop are supplied by the project until the fifth year when trees begin to generate income.

According to the data noted in Chapter II, total expected mango production for trees already planted in St. Lucia and Dominica is projected at about 300 tons in 1986, almost 900 in 1988, and 1700 in 1990 (see Figure 4).[18] Roughly 60 percent of this on-coming production should be suitable for extra-regional export. The BDD sponsored tree crop project in St. Vincent is limited to topworking seedling or less preferred cultivars by grafting Imperial, Julie, and Graham buds or stem pieces onto their branches. The project target is 10,000 trees, of which about 5,000 have been grafted to date.

Notwithstanding the fact that the Florida cultivars have greater demand in extra-regional markets and ship better, the West Indian Julie and Graham cultivars were selected for increased planting. These cultivars were chosen mainly because they are familiar to regional farmers, are known to thrive in the Windward Islands, and markets exist for them in the U.K., particularly among the ethnic population.

The next two sections provide details on the tree crop diversification projects in Dominica and St. Lucia. However, before proceeding it should be emphasized that no rigorous farm level yield or cost of production data are available for mango in the Eastern Caribbean. Consequently, information presented in this chapter was extracted from secondary sources which appear to be based on interviews with producers and historical production data available from other producing countries.

The Dominica Tree Crop Diversification Project

The Dominica Tree Crop Diversification Project (TCDP) established about 310 acres of mangoes which ranks third in total number of acres planted by the project behind orange (642 acres) and grapefruit (416). The TCDP also planted 21 acres of avocado.

About 75 percent of all acreage planted in mango falls within the Northwest and Northeast agricultural districts. The map of Dominica shown in Figure 5 illustrates the major agricultural districts and denotes the number of trees planted in each. Mango plantings were established in four phases: 67 acres in 1979; 62 acres in 1980; 75

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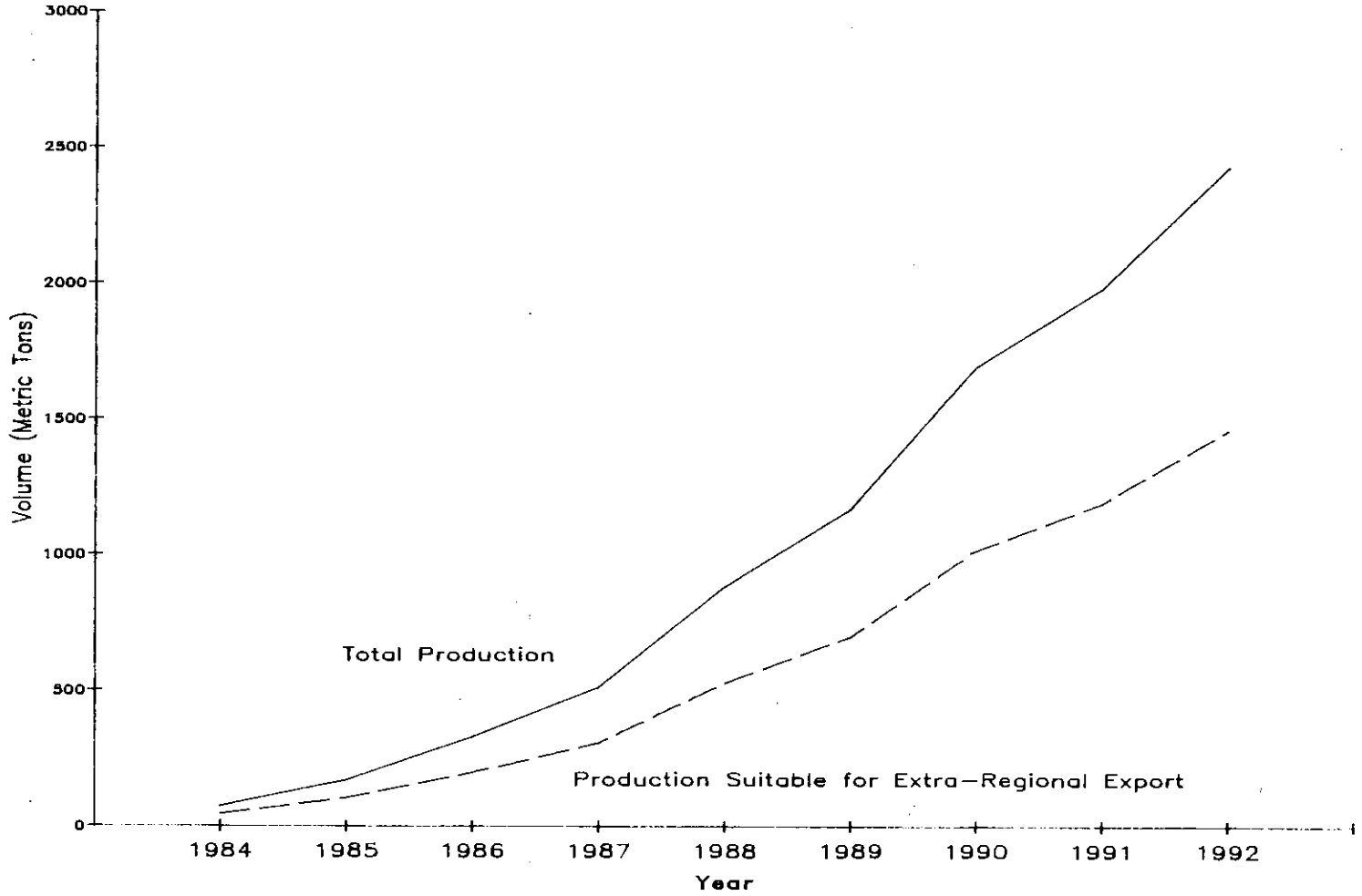
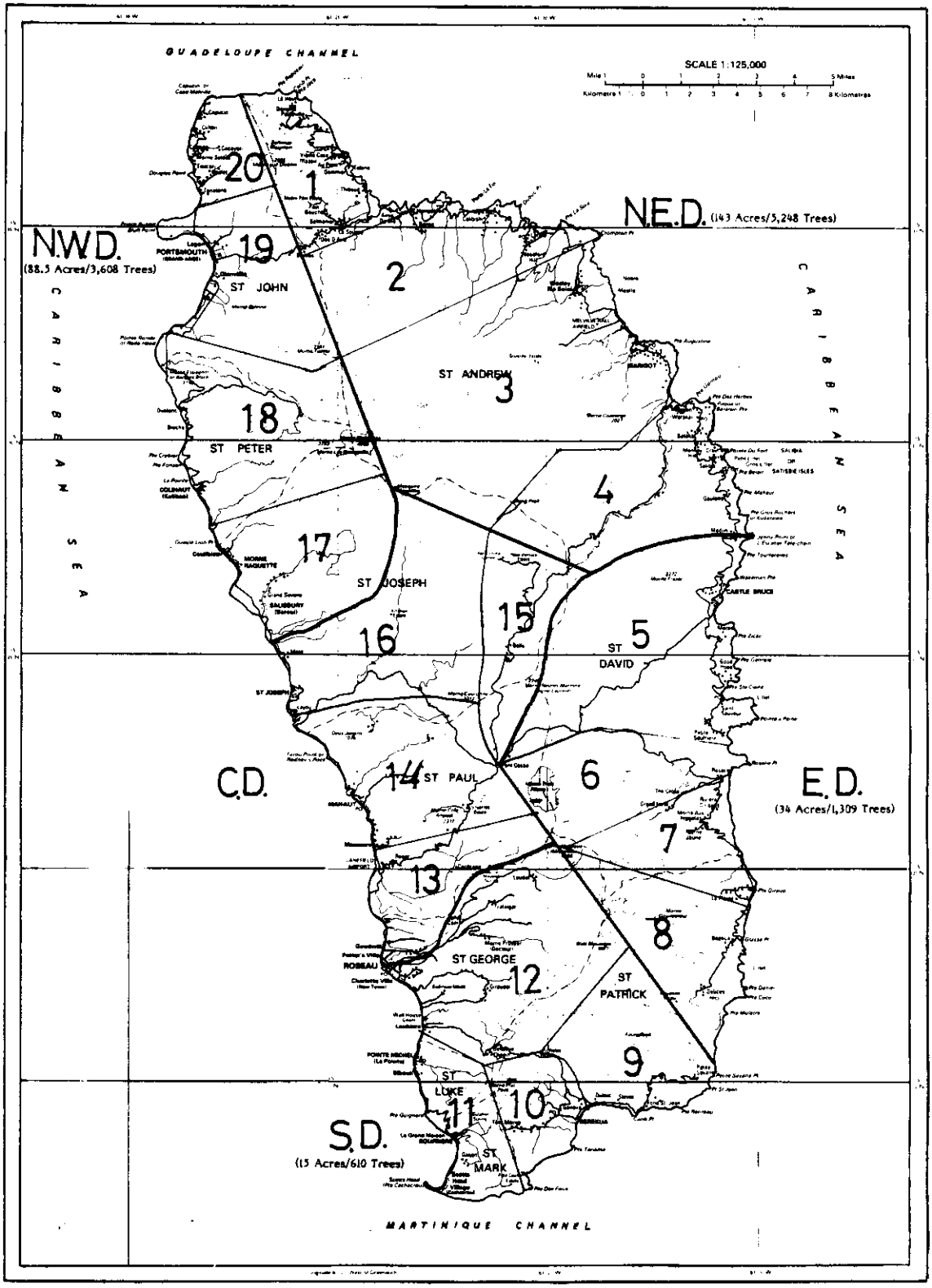
[18] These projections are taken from the following sources: St. Lucia Ministry of Agriculture. Orchard Crop Diversification Project: Phase II (Revised). February, 1983, Appendix V; Dominica Ministry of Agriculture. Report and Results of the Tree Crop Diversification Project Survey. 1983. p. 5.

Figure 4. Projected Mango Production for the St. Lucia and Dominica Tree Crop Diversification Projects (In Metric Tons)



SOURCE: St. Lucia and Dominica Ministries of Agriculture.

Figure 5. Location of Dominica TCDP Mango Plantings



SOURCE: Dominica Government, 1982.

acres in 1981; and 103 in 1982.[19] About 85 percent of these plantings consist of the Julie cultivar with a mix of the Florida cultivars (Kent, Tommy Atkins, Zill) and the West Indian Graham making up the remainder. Undocumented reports indicate that the Florida cultivars have not performed well in Dominica.

Projected production figures for the period 1984-1992 are available from a 1983 survey conducted by the Dominica Ministry of Agriculture designed to update information on the condition and quantity of the four crops planted by the TCDP.[20] These projections are based on the actual number of trees enumerated in the survey and the yield estimates were adjusted to reflect the condition of the orchards surveyed; that is, orchards were rated according to phase of planting and bearing characteristics of the trees. However, two caveats should be entered here. First, the estimates are not based on rigorous farm level yield data but on assumptions made by the survey analysts. Also, the method of rating orchards according to bearing characteristics involves an arbitrary judgment and assumes that the trees will continue to produce in a linear pattern. Second, although the projections are derived from the actual number of trees present at the time of the survey, they do not account for trees that have been planted to replace those lost to animals, pests, disease, etc. which will begin bearing in about four years. Nor do they account for production of orchards missed by the survey, unregistered orchards, and yield increasing improvements that farmers could potentially make. Nonetheless, the projections are the best available measure of future production. These projections appear in Table 4 and yield assumptions per tree for each year of production follow in Table 5.

Assuming that the forecasts are reasonably accurate and that about 60 percent of production will be of suitable quality for shipment to extra-regional markets, exportable volumes of mangoes should reach 171 tons in 1986, 421 tons in 1988, and 753 tons in 1990. Considering that Dominica exported only about 86 tons to both regional and extra-regional markets in 1984, TCDP production will represent a dramatic increase in the volume of mangoes available for export in the late 1980's.

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[19] Dominica Ministry of Agriculture. Report and Results of the Tree Crop Diversification Project Survey. 1983, p. 5.

[20] Ibid.

Table 4

Projected Mango Production for the Dominica TCDP
(In Metric Tons)

Year	Total Production	Year	Total Production
1984	65	1989	989
1985	153	1990	1,255
1986	285	1991	1,462
1987	456	1992	1,614
1988	703		

SOURCE: Tree Crop Diversification Project, Dominica Ministry of Agriculture. Report and Results of the Tree Crop Diversification Project Survey. 1983.

Table 5

TCDP Projection Yield Assumptions
(Kilograms Per Tree)

Year	Yield	Year	Yield
1	1.7	5	51.0
2	6.8	6	68.0
3	17.0	7	102.0
4	34.0	8[a]	136.0

SOURCE: Tree Crop Diversification Project, Dominica Ministry of Agriculture. Report and Results of the Tree Crop Diversification Project Survey. 1983.

[a] Yield assumptions for subsequent years were not available.

Anthracnose (Colletotrichum gloesoporioides penz.) the major disease of mango, was not identified as a critical problem among project trees during the Dominica TCDP survey. However, Dominica's wet climate is conducive to the spread of anthracnose and undocumented reports seem to indicate that the incidence of anthracnose in mango exports from Dominica to the U.K. is high relative to shipments sent from other Windward Islands. Although the most effective form of control for the disease is pre-harvest spraying, Dominica's rugged terrain, large number of small dispersed farms, and its wet climate which is favorable to the growth of anthracnose but not to the

application of fungicides, pose considerable constraints to establishing a control program.[21]

The St. Lucia Orchard Crop Diversification Project

The St. Lucia Orchard Crop Diversification Project (OCDP) established 100 acres of Graham mango in Phase I (mainly planted in 1981) and has nearly completed 150 acres under Phase II. A mix of 150 acres of Julie and Graham mangoes are scheduled for planting in Phase III but this is still in the planning stage. As in Dominica, plantings in St. Lucia are largely concentrated in the coastal areas as mango thrives best at lower altitudes. A majority of the acreage established to date is concentrated in the Northern and Central Regions of the island.

Actual project plantings of mango did not begin in St. Lucia until 1981, two years after the Dominica project, therefore only about 16 tons are expected in 1985. According to project forecasts presented in Table 6, new production will not reach significant levels until 1990 (441 tons).

Table 6

Mango Production Forecasts for the St. Lucia OCDP
(In Metric Tons)

Year	Total Production	Year	Total Production
1985	16	1989	180
1986	44	1990	441
1987	56	1991	523
1988	180	1992	818

SOURCE: St. Lucia Ministry of Agriculture. Orchard Crop Diversification Project, Phase II (Revised). February, 1983.

Table 7 gives cost of production and revenue information on a per acre basis for the St. Lucia OCDP. All costs that would be incurred by the farmer without the BDD project subsidy are included in the table for illustrative purposes. In other words,

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[21] Plumbley, Richard. "Mango Anthracnose." Sa Se Agwikolte. Quarterly Publication of the Division of Agriculture, Dominica. Vol. 3. September 1984. p. 9.

financial assistance for land preparation in year one ($80.00 EC, or a 30 percent subsidy) and subsidies covering all herbicide, pesticide, and fertilizer inputs for years one through five are contained in Table 7.

The financial and economic analysis performed with the available St. Lucia OCDP project data was limited by several factors, therefore it is necessary to enter the following caveats and assumptions before presenting the results.

1. Data concerning what the economic situation for participating farmers in the production areas would be without the OCDP are not available. That is, the analysis does not account for returns that factors of production would receive had they not been employed in the project.

2. In particular, the cost of land is not included in the farm budget given in Table 7, therefore the opportunity cost of land, or the benefit deriving from alternative uses that farmers must forego to participate in the project, is not considered in the analysis.

3. The project's original life was increased from 10 to 15 years in order to extend the stream of costs and income and more accurately reflect the long term characteristics of mango tree crop production. However, as yield data were not available for years 11 through 15, the assumption was made that costs and revenues for year 10 (full production) would extend through years 11-15.

4. The maximum yield assumption made by the OCDP (200 fruit/tree or about 4.4 metric tons/acre) represents the volume of superior quality fruit that can be sold for export to extra-regional markets. Consequently, additional production which could potentially be sold in local or regional markets is unaccounted for. Also, losses due to theft or spoilage are implied in the yield assumption.

5. Although financial and economic analysis normally do not account for inflation, the fact that fertilizer, herbicide, and pesticide costs are set in the world market and are sensitive to fluctuations in the cost of energy associated with their production and distribution should be underscored. Also, the production costs in Table 7 assume that the farmer will continue to apply chemical inputs after the project subsidy ends after year five. However, this investigation of the mango commodity system in the Eastern Caribbean found that producers do not frequently use chemical inputs.

Table 7, which is based on one acre of 48 mango trees, reflects the long-term investment indicative of tree crops where the cost of labor for land preparation is relatively high ($240 EC) but where the required amount of chemical inputs remains fairly stable over the productive lives of the trees. According to Table 7, the grower begins to realize income from his mango crop in year five ($93 EC) which then increases substantially in years seven ($1,101 EC), nine ($2,277 EC) and ten ($3027).

Table 7

Costs and Revenue for the St. Lucia Orchard Crop Diversification Project
(Based on One Acre and Calculated in EC Dollars)

	Years									
	1	2	3	4	5	6	7	8	9	10-15
COSTS (EC$/acre)										
Land preparation	240									
Herbicide and pesticide	60	80	100	129	129	129	129	129	129	219
Fertilizer	14	28	71	94	114	114	114	114	114	114
Harvesting and transport	0	0	0	0	48	48	192	192	360	480
Total costs	314	108	171	223	291	291	435	435	603	813
GROSS REVENUE										
Fruits per tree	0	0	5	5	20	20	80	80	150	200
Fruits per acre	0	0	240	240	960	960	3840	3840	7200	9600
Price (EC$/fruit)	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40
Gross revenue (EC$)	0	0	96	96	384	384	1536	1536	2880	3840
NET REVENUE (EC$/acre)	-314	-108	-75	-127	93	93	1101	1101	2277	3027
Economic Internal rate of return is 51%										

SOURCE: St. Lucia Ministry of Agriculture. Orchard Crop Diversification Project Phase II (Revised). February 1983.

a Based on $5.00 per hole.
b Herbicide $34.50 per acre. Pesticide $40.00 per acre. Labor: 3 man days=$54.00.
c 4 lbs/tree at 48 trees per acre at $1.10/kg. + labor $18.00.
d Based on $.05/fruit.
e Based on St. Lucia Marketing Board price of $.40 per fruit.
f It is assumed that the small harvest in years three and four will be consumed on the farm; however, this production is valued at the market price of $.40 EC/fruit and included as gross revenue.
g One acre = 48 trees spaced 30' by 30'.

Results of the sensitivity analysis conducted for the St. Lucia OCDP are presented in Table 8. It should be noted that the financial internal rate of return (IRR) [22] includes the BDD project subsidies and that the economic IRR excludes them. That is, the economic IRR accounts for all costs that the farmer would incur without subsidization.

Table 8

Internal Rates of Return for the St. Lucia OCDP

Assumptions	Financial IRR %	Economic IRR %
Original Assumptions	85	51
Yield		
25% lower	80	43
25% higher	92	58
Price		
$.12 EC/fruit	30	9
$.20 EC/fruit	56	29
$.25 EC/fruit	65	36
$.30 EC/fruit	69	42
Project Life		
10 years	82	54

SOURCE: Original data taken from The Orchard Crop Diversification Project Phase II (Revised project paper).

Under the original project assumptions given in Table 7, the financial IRR is 85 percent and the economic IRR 51 percent. Despite the limitations of this analysis which were outlined previously, these results suggest that mango production potentially is a profitable enterprise.

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[22] The IRR is the discount rate that just makes the net present worth of the incremental cash flow equal zero. Stated differently, it is the maximum interest that a project can pay the resources employed if it is to recover its operating costs and investment and just break even. (Gittinger, J. Price. Economic Analysis of Agricultural Projects. EDI Series in Economic Development, IBRD. 2nd Edition, 1982).

Varying the original yield assumptions in Table 7 by 25 percent in either direction does not significantly affect the apparent profitability of the OCDP. For example, reducing yields by 25 percent results in a financial IRR of 80 percent and an economic IRR of 43 percent. Conversely, increasing yields by 25 percent raises the financial IRR to 92 percent and the economic rate to 58 percent.

The market price assumption of $.40 EC/fruit for the Graham mango (which represents a majority of the OCDP acreage planted) is realistic in respect to prices paid by exporters in St. Lucia. However, if that price were to decrease significantly due to over-supply or a decline in demand, the attractiveness of investment in mango production would diminish. These two contingencies should not be overlooked, especially given that the OCDP will significantly increase production of Graham mangoes, a cultivar not as popular as the Julie mango in the U.K. market.

In light of the data limitations of this analysis, it is difficult to assess the price at which the IRR would become unacceptable. However, from the available data it would appear that a price below $.20 EC/fruit would raise serious questions about the profitability of producing mangoes. At $.20 EC/fruit the financial IRR is 56 percent and the economic IRR 29 percent.

The Roseau Model Farms Project in St. Lucia

The Roseau Model Farms Project in St. Lucia includes plans to plant about 160 acres of Graham mango in four phases over the next four or five years. If plantings proceed according to schedule, the mango trees will reach full bearing in the 1990's. The project is a joint public/private sector venture between the Government of St. Lucia, Geest Industries Ltd., the Commonwealth Development Corporation, and the European Development Fund (EDF). Unlike the BDD supported tree crop projects, the 1600 total acres being developed in the Model Farms scheme are located in one area where new farms are being established on reclaimed swampland and sold to small producers. Once the farmers take legal title, their progress in maintaining recommended cultural practices is then monitored by project management.

The Model Farms plan involves development of five-acre banana farms on the 1,000 acres situated in the valley. Another 400 acres on the surrounding hillside area are being parcelled into ten-acre farms, most of which will include a five-acre plot on the adjoining flat land. Project guidelines require these farmers to plant four acres of mango and one-half acre of lime on the hillside, and about five acres of bananas on the flat land. The farmer may choose which crop to plant on the remaining one-half acre.

Fruit Crop Development Efforts in Barbados

Projects designed to increase fruit production in Barbados are currently underway although they are small relative to the tree crop diversification projects in The Windward Islands. The Barbados development projects are primarily intended to satisfy domestic demand and reduce mango imports, which were over 220 tons in 1984.

The Fruit Crop Development Project represents a joint effort between the Barbados Ministry of Agriculture and the Inter-American Institute for Cooperation on Agriculture (IICA). About 40,000 seeds have been collected at Haggatts Agricultural Research Station for grafting. The goal is to graft at least 6,000-8,000 seedlings in the first year for distribution to the general public. Project sponsored plots are targeted at five acres each or more, and the selected cultivars are the West Indian Julie, and the Florida Keitt and Palmer (both late bearing cultivars). The seedings under production are also intended to satisfy demand generated by the Back River Valley Project. That project is funded by the European Development Fund and expects to establish 30 acres of mango. Finally, the Ministry of Agriculture's project plan, the National Fruit Orchard Project, awaits approval of the EDF. If approved, that project will plant about 50 acres of mango in four phases.

Attempts to estimate the effect that the Barbados projects are likely to have on domestic production are complicated by several factors. For example, project outputs will be influenced by the success rate for grafting seedlings, public demand for seedlings, the number of seedlings that are actually planted and survive, natural risks, producers' adherence to appropriate cultural practices, etc. However, conservatively assuming that only 3,000 seedlings or about 60 acres (50 trees per acre) are planted and that each acre yields 5.5 metric tons when fully mature, production would reach 330 tons annually.[23] This volume would significantly exceed the 220 tons of mangoes imported in 1984.

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[23] The yield assumption made in the Dominica TCDP for the Julie mango was about 6.5 metric tons per acre and some of the Florida cultivars produce between 5-7 tons per acre.

CHAPTER IV

REGIONAL MARKETS FOR MANGOES: BARBADOS AND TRINIDAD

Introduction

Chapter III described the BDD supported Tree Crop Diversification Projects in the Windward Islands which should substantially increase the volume of mangoes available for consumption and export by the late 1980's. In Chapter II it was also shown that domestic markets in the Windward Islands of St. Lucia, St. Vincent, and Dominica are small and have virtually no potential for market growth. And although it is expected that a majority of this additional production will be exported to the U.K. and perhaps other selected western European markets, a significant volume will also have to be shipped to regional markets, of which Barbados and Trinidad are the largest. This chapter primarily describes the merchandising system for mangoes in the Barbados and Trinidad supermarket sectors drawing on survey research conducted in both countries. Additionally, 1984 mango prices collected from public retail markets in Barbados are examined and marketing margins for regional shipments of mangoes from the Windward Islands to Barbados, based on the experience of CATCO in 1984, are analyzed.

Characteristics of the Demand for Mangoes in the Barbados Supermarket Sector

As noted in Chapter II, the supermarket sector handles 55 percent of the volume of fresh fruits and vegetables moving through the formal hotel, restaurant,institutional, and supermarket sectors in Barbados.[24] The Barbados survey discussed in this section involved interviews with 20 fresh produce managers of major supermarkets, or about 80-90 percent of all major supermarkets on the island. A major supermarket was defined as a self-service retail store employing ten or more individuals and predominantly merchandising food items mainly sold in pre-packaged form.

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[24] SYSTEMS Group of Company. A Survey of the Hotel, Restaurant, Supermarket and Institutional Markets for Fresh Produce in Barbados. Conducted for the Inter-American Institute for Cooperation on Agriculture. September 1981.

Before presenting the findings of the supermarket survey, it is expedient to introduce consumption estimates for mango and other fresh fruits available from earlier studies. Table 9 provides two different sets of per capita fruit consumption estimates: one based on a marketing survey of Barbadian consumers; the other derived from production estimates and trade statistics. The market estimate shows per capita consumption of mangoes at 1.4 kgs. which ranks last among orange, grapefruit, banana, apple, and lime. The production-based estimate also places per capita consumption of mangoes (2.2 kgs.) below that of orange and grapefruit although somewhat higher than the market-based estimate.

Table 9

Estimates of Per Capita Consumption of Selected Fruits in Barbados (In Kgs.)

Fruit	Market-based Estimates[a]	Production-based Estimates[b]
Orange	4.4	5.2
Grapefruit	2.4	3.8
Banana	2.9	-
Apple	2.4	-
Lime	1.5	2.2
Mango	1.4	2.2

SOURCES:

[a]Systems. Omnibus Survey of 1,000 Consumers. Question Series on Fresh Produce Purchasing Behavior, March 1981.

[b]Stevenson and Kellogg. The Horticultural Subsectors in Antigua, Barbados, Belize, and Dominica. Caribbean Community Secretariat Report, Volume II of IV. January 1980.

In considering the relative accuracy of the two per capita consumption figures, the fact that the market estimates are based on information collected directly from consumers should be underscored. On the other hand, the production-based estimates rely on an estimate of domestic production for each commodity, perhaps better described as "guestimates."[25] The production-based estimates were calculated by the formula:

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[25] Stevenson and Kellog. The Horticultural Subsectors in Antigua, Barbados, Belize, and Dominica. Caribbean Community Secretariat Report. Volume II of IV. January 1980.

$C = P^n + T^n - L$

where: C = consumption

P^n = net domestic production

T^n = net trade

L = losses along the marketing chain

Stated differently, accurate production information for fresh fruits and vegetables in Barbados is difficult to obtain, particularly for mango which is a dispersed, backyard enterprise. This methodological constraint coupled with the difficulties of measuring losses of fresh produce along the marketing chain and the imprecision of regional trade statistics make the production-based estimates highly suspect.

Consumer Trends

Consumer demand for fresh fruits and vegetables in the Barbados supermarket sector has risen appreciably in the past five years according to fresh produce managers (18 managers or 90 percent). Of those reporting increased sales, all mentioned a more highly educated and health conscious public as the underlying cause. On average, managers said sales have increased by about 50 percent.

Consequently, this upward trend in demand has increased the economic importance of fresh produce. Twenty-five percent of the sample explicitly stated that since most supermarkets merchandise similar lines of pre-packaged items it is necessary to improve the selection, quality, and presentation of fresh fruits and vegetables in order to expand sales.

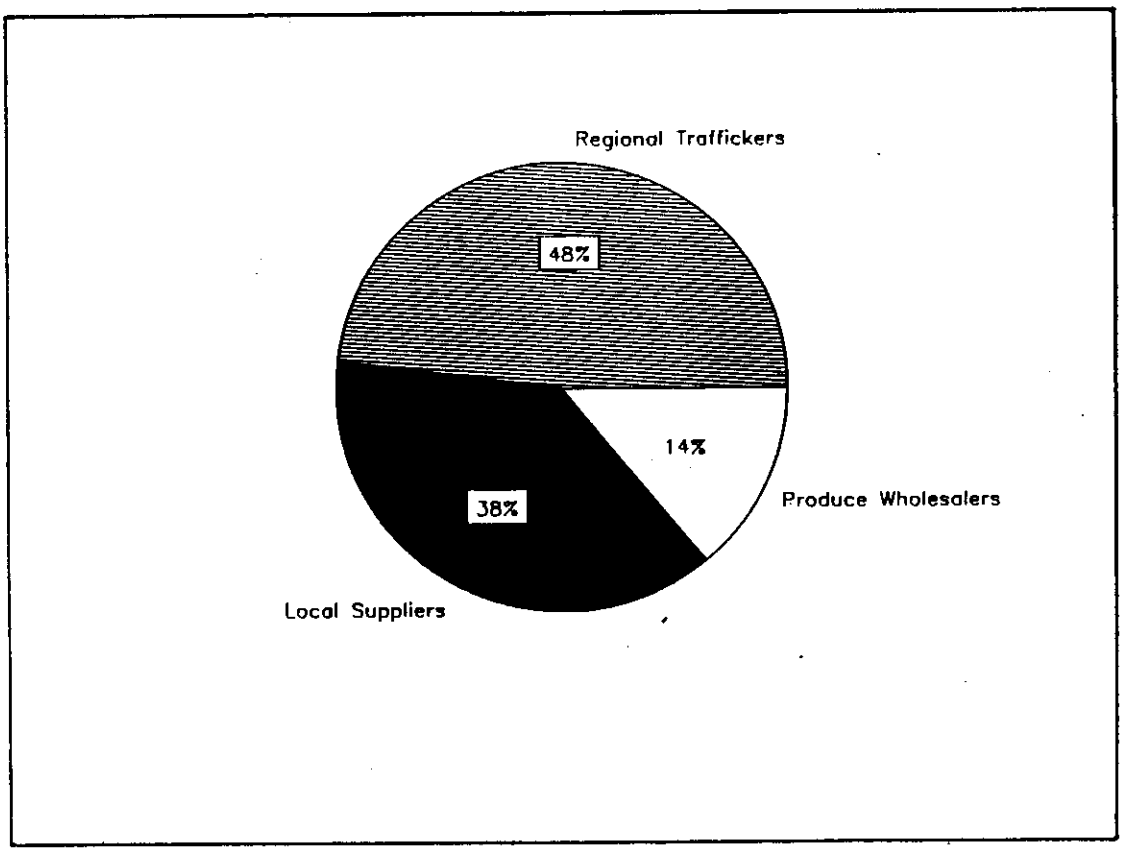
Types of Suppliers and Market Share

All supermarkets surveyed buy mangoes from three major types of suppliers: "regional traffickers" from the Windward Islands; "local suppliers"; and "produce wholesalers." Regional traffickers and their system of export for fresh produce were described in Chapter II. Local suppliers comprise individuals in Barbados such as gardeners, farmers, or patrons of supermarkets who either own mango trees or collect fruit from others for distribution to supermarkets in small quantities. Most managers emphasized that in the spirit of good customer relations, they felt obliged to buy mangoes from their regular shoppers. Several managers also said that they like to "help everyone out" by spreading purchases among several suppliers. "Produce wholesalers" are defined as firms or companies which attempt to provide a more consistent service

involving standard packaging of produce, a higher quality product, and larger volume flows. In short, produce wholesalers are more systematic and engage in longer range operational planning. They also operate from a higher capital base.

Survey results shown in Figure 6 indicate that regional traffickers supply 48 percent of the total volume of mangoes purchased by supermarkets, local suppliers provide 38 percent, and produce wholesalers 14 percent. Only three supermarkets indicated that they buy significant volumes from produce wholesalers (50, 50, and 90 percent of their total mango purchases). While the exact number of suppliers operating in Barbados is not known, the best estimate based on survey interviews places the number of produce wholesalers distributing mangoes to supermarkets at three and the number of regional traffickers between eight and twelve. Local suppliers are too numerous to estimate.

Figure 6. Proportion of Mangoes Sold to Barbados Supermarkets by Different Types of Suppliers.



SOURCE: Survey data.

In light of observations made in supermarkets during the survey, a question should be raised as to whether local suppliers actually account for 38 percent of supermarket mango purchases. Specifically, since relatively small proportions of seedling mangoes were observed in the supermarkets sampled and as a majority of the volume which local suppliers sell comprise seedling mangoes, it is possible that produce managers over-estimated the relative proportion of mangoes they buy from local suppliers.

The distribution system for fresh produce in Barbados is further characterized by a relatively large number of suppliers. Survey results contained in Table 10 indicate that about 58 percent (10 stores) of the responding supermarkets buy fresh fruits and vegetables from 5 to 40 different suppliers each week. On average, supermarkets buy their full line of fruits and vegetables from approximately 29 sellers weekly. The survey also found (Table 11) that 40 percent of the sample purchases mangoes from 1 to 5 suppliers, 33 percent from 5 to 10 suppliers, and 27 percent from 10 to 15 different sellers each week. Supermarkets buy from an average of 6 suppliers weekly.

Table 10

Number of Suppliers Distributing Fresh Produce to Barbados Supermarkets Weekly

No. of Suppliers	No. of Supermarkets	Percentage of Sample
5 - 20	5	29
20 - 40	5	29
40 - 60	2	12
60 - 80	1	6
80 - 100	2	12
100 - 200	2	12
Average No. of Suppliers = 29	N=17	100

SOURCE: Survey data.

Table 11

Number of Suppliers Distributing Mangoes to Barbados Supermarkets Weekly

No. of Suppliers	No. of Supermarkets	Percentage of Sample
1 - 5	7	40
5 - 10	5	33
10 - 15	4	27
15 - 20	0	0
Average No. of Suppliers = 6	N = 16	100

SOURCE: Survey data.

Produce managers interviewed also indicated which varieties they buy from the three types of suppliers. Traffickers, for example, were described mainly as distributors of Julie and Imperial mangoes (mainly from St. Vincent and St. Lucia), and to a lesser extent, the seedling mango called Mango Longue. Local suppliers largely provide supermarkets with seedling mangoes grown in Barbados but also supply locally produced Julies. For the most part, produce wholesalers sell cultivars imported from the Windward Islands.

Continuity of Supply

Produce managers indicated that continuity of supply in respect to stable prices, appropriate quantities, and high quality is critical to effective planning of weekly purchases and sales of mangoes, yet gave little evidence that such continuity currently exists. For example, although seven managers (47 percent) rated regional traffickers as "most consistent," all attributed the consistency of traffickers to weekly arrivals of inter-island schooners which transport their produce, and not necessarily to price, quality, or volumes. Similarly, four produce managers rated local suppliers as "most consistent," explaining that locally grown supplies and hence proximity to the market allows them to deliver a fresher, higher quality product than distributors who ship from the Windward Islands. However, local suppliers' ability to provide the desired varieties, quantities, and prices were not included in these managers' appraisals of consistency.

Most importantly, five managers rated produce wholesalers as "most consistent" vis-a-vis price, quantity, and quality. All five mentioned that the produce wholesaler's

system for distributing mangoes is better organized, more efficient, and therefore much less subject to uncertainties which traffickers and local suppliers face.

In sum, it appears from the sample of supermarkets that only produce wholesalers are able to consistently supply mangoes to supermarkets with respect to the prices, quantities, and quality desired. However, given the relatively limited presence of produce wholesalers in the supermarket sector who sell mangoes, it is perhaps too early to draw sound conclusions about continuity of supply.

Purchasing Arrangements

Due to the uncertainties of supply and the inherent risks involved, few if any produce managers make purchasing arrangements in advance regarding price, quantity, and quality. Furthermore, since managers do not perceive distributors of mangoes as capable of consistently supplying the desired product, they resort to purchasing by inspection rather than description.

Approximately 60 percent of the sample (12 managers) said they strike no agreement in advance whatsoever, and usually operate on a "first supplier through the door" basis. Five produce buyers stated that suppliers contact them about two days in advance to assess quantities demanded. Only three buyers place orders one week in advance. It should be pointed out that orders placed in advance are subject to the supply situation in St. Vincent or St. Lucia and potential losses that may be incurred in shipping and handling. Although no managers make iron-clad agreements on price in advance, several mentioned that they usually have a mutual understanding of approximate prices with sellers.

Product Quality

Produce managers were asked to rate the general quality of mangoes they buy on a scale of four which included very good, good, poor, and very poor. A photograph of several high quality mangoes was first presented to managers as an example of "very good" quality in order to provide a reference point for scaling. "Very good" was defined as fruit: harvested at the proper stage of maturity, or "full"; free of disease and bruises; firm; and turning color. The majority of managers rated the quality they buy as "good", which is reflected in Table 12 below.

Table 12

Quality of Mangoes Purchased By Barbados Supermarkets

Scale	Cultivars		Seedling Mangoes	
	No. Of Managers	Percent Of Sample	No. Of Managers	Percent Of Sample
1. Very Good	2	11	2	11
2. Good	17	89	15	78
3. Poor	0	0	2	11
4. Very Poor	0	0	0	0
Total	19	100	19	100

SOURCE: Survey Data.

However, results obtained from the rating scale used in this survey should not be considered conclusive. An inherent risk involved in using the terms "very poor" and "poor" in the scaling technique is the possibility that they may evoke negative images to the manager and influence his/her choice. Specifically, it may cause the manager to overestimate quality by selecting the first positive choice, "good," when the quality of mangoes typically bought could have been "poor." In fact, during the survey several managers hedged on "poor" before finally deciding on "good," stating that they should give suppliers the "benefit of the doubt" in respect to the quality of mangoes they sell. Another shortcoming of the rating scale lies in its general nature. That is, it fails to account for variations in quality encountered by produce managers from week to week.

Looking more specifically at quality, less than 50 percent of the managers interviewed reported problems with bruises and disease, over-ripeness, or immaturely harvested mangoes. The explanation offered by the managers who experience few problems with quality is that they only buy high quality mangoes and therefore reject inferior lots at the door. The proportion of mangoes rejected at the supermarket is not known. Once supermarkets have purchased mangoes, losses due to disease, over-ripeness, poor handling, etc. appears to be rather modest. Ten managers estimated losses at less than 5% and seven said they suffer 5-10% losses. It should be noted that the low incidence of product loss may be due in part to the preference of most produce managers to keep limited quantities of mangoes in the supermarket and to restock as they are sold.

Volumes and Prices

Supermarkets in Barbados generally do not keep records of fresh produce purchases and sales, therefore, it was necessary to elicit estimates of weekly volumes and prices from managers. Further compounding the collection of volume and price information is the seasonal supply situation. The typical mango season begins in May and ends in September. However, the mango production cycle results in peaks and troughs of supply throughout the season and corresponding variations in farmgate and wholesale prices. Commonly, production peaks in late May and June but one or two subsequent smaller peaks occur before the season ends in September. Fresh produce managers were therefore asked to estimate volumes and prices for the "low season" when mangoes are scarce, and the "peak season" when they are abundant.

The following observations about prices and volumes are mainly drawn from survey data contained in Tables 13, 14, and 15. It should be noted that the sample size for individual variety categories appearing in those tables varies as some supermarkets were unable to break down mango purchases according to variety. Therefore, the cultivar and seedling categories do not sum to the respective totals which appear at the bottom of the tables.

1. Supermarkets buy substantially more of the cultivars, mainly Julies and Imperials, than of the seedling mangoes both in the low and peak seasons. On average, supermarkets purchase 116 kgs. of cultivar mangoes in the low season and 137 kgs. in the peak season. In contrast, they buy an average of 76 kgs. of seedling mangoes in the low season and 122 kgs. in the peak season.

2. The sample of supermarkets also buys more Julies than Imperials in both the low and peak seasons. Most importantly, 11 managers said they cannot buy enough Julies during the season.

3. Overall, the 20 supermarkets surveyed purchase about 3,126 total kgs. each week in the low season and 4,564 kgs. in the peak season.

4. Not all supermarkets buy more mangoes in the peak season when supplies are more plentiful than in the low season. Four managers said they actually sell less and four reported they sell about the same. This was largely attributed to increased competition from domestic hucksters and reduced demand due to local harvest of the family tree(s).

5. It appears that wholesale and retail prices are over 20 percent higher in the low season when mangoes are scarce, than in the peak season when they are relatively abundant. Wholesale prices per kg. for seedling mangoes are $2.45 EC in the low season and $1.90 EC in the peak season. Julie cultivar wholesale prices are $2.78 EC in the low season and $2.12 EC in the peak season. Imperials sell for $2.95 EC in the low and $2.27 EC in the peak seasons.

6. The average retail supermarket gross margin or mark-up from wholesale price is about 36 percent.

Table 13

Average Weekly Mango Volumes Purchased by Barbados Supermarkets
(In Kgs.)

Variety	Volume		Sample Size
	Low Season	Peak Season	
Seedling	76	122	N = 14
Cultivar	116	137	N = 14
Julie	75	97	N = 14
Imperial	62	59	N = 14
Average Total	156	228	N = 20

SOURCE: Survey Data.

Table 14

Total Weekly Mango Volumes Purchased by Barbados Supermarkets
(In Kgs.)

Variety	Volume		Sample Size
	Low Season	Peak Season	
Seedling	916	1,704	N = 16
Cultivar	1,860[a]	2,205[a]	N = 16
Julie	1,053	1,381	N = 16
Imperial	744	787	N = 16
Total	3,126	4,564	N = 20

SOURCE: Survey Data.

[a] Two managers included the Graham cultivar in their totals for "cultivar" mangoes, therefore adding Julie and Imperial volumes does not exactly equal the total cultivar volume.

Table 15

1984 Average Barbados Supermarket Prices for Mango
(In EC Dollars/kg.)

Variety	Wholesale Price		Retail Price	
	Low Season	Peak Season	Low Season	Peak Season
Seedling	$2.45	$1.90	$3.31	$2.70
Julie	2.78	2.12	3.84	3.04
Imperial	2.95	2.27	4.03	3.15

SOURCE: Survey Data.

Potential for Market Expansion in Barbados

As mentioned previously, 89 percent (or 16 of the produce managers interviewed) rated the quality of the grafted mangoes they currently buy as "good," thus inviting the question of what volumes could they sell given a continuous supply of "very good" quality mangoes at a reasonable price. However, considering the fact that supermarkets have not been exposed to a continuous supply of "very good" quality mangoes in the past it is perhaps too early to tell how much volumes would increase. Most produce managers questioned agreed that the market would have to be tested by increasing quality and/or decreasing price, and then measuring consumer response. Nonetheless, 11 managers (about 60 percent) said they could sell more if the conditions cited above were met. Eight managers said they would not be able to sell more than they currently do.

Delivery

No clear weekly pattern of distribution to supermarkets emerges from the survey data for mangoes, with the exception of Wednesday when inter-island schooners are off-loaded at the shallow draft harbor facility in Bridgetown. This variability in weekly purchasing behavior is largely due to erratic deliveries of local suppliers and the need of produce managers to maintain a fresh supply throughout the week, given the high perishability of mangoes. However, 14 managers stated that high volume sales days for mangoes are Thursday through Saturday, and therefore they prefer to buy on Wednesday in order to meet peak demand.

High volume sales days for fresh produce in general are the same as for mangoes, Thursday through Friday. However, supermarket purchases of fruits and vegetables are

spread throughout the week in order to maintain fresh stocks. All 20 supermarkets in the sample reported that the highest volume sales week is at the end of the month when a large number of Barbadians receive paychecks.

All suppliers deliver mangoes to their client supermarkets, mostly packaged loosely in wooden crates, boxes of assorted sizes, banana cartons, vegetable sacks, and plastic bags. Barring a few produce wholesalers who pack mangoes in standard banana cartons, there is no uniformity of containers or packaging.

Retail Handling and Merchandising

The way individual supermarkets handle and merchandise mangoes varies considerably. In light of the highly perishable nature of mangoes, about 63 percent of the sample (or 13 managers) said that they stock smaller quantities than they can typically sell during the week and then re-order as this stock diminishes. The remaining 37 percent indicated they buy enough for the week, and restock only if necessary. Reasons given for buying a sufficient stock for one week include the mid-week arrival of inter-island schooners, and the fact that managers buy mangoes just before high volume sales days Thursday through Friday.

Ten of the managers interviewed (50 percent) place their entire stock of mangoes on display in the air-conditioned supermarket. Six managers (30 percent) divide their stock, displaying a portion under air-conditioning and leaving the balance in the back-room in cool storage. The remaining four managers also split their stock but store the portion not displayed in the back room in an air-conditioned environment. It should be stated that supermarkets turn off their air-conditioning units at closing time, therefore mangoes and other produce not displayed in cool-storage (which is usually left on overnight) may experience accelerated ripening. Alternating cool and warm temperatures may also produce condensation on the fruit which can potentially increase the spread of anthracnose. But most managers consider these risks a necessary trade-off against the high energy costs which may be incurred. One supermarket does move displayed mangoes into cool storage after closing every night.

About 90 percent of the supermarkets surveyed do not place mangoes in cool storage with other selected fresh produce items such as citrus despite the fact that mango needs cool storage more than citrus. For the most part mangoes were loosely displayed in separate bins, on shelves, or in metal shopping carts. Two stores use a center display table designed for bananas. Five supermarkets poly-pack mangoes in trays in an attempt to reduce consumer damage which all produce managers in the survey

reported as being "significant." Collecting estimates of supermarket losses attributable to consumer damage during the survey proved difficult, therefore managers were asked if it was a "significant" concern and whether or not it affected the profitability of merchandising mangoes.

The practice of displaying large quantities of mangoes in metal shopping carts is highly suspect. Not only can it increase losses by the sheer weight imposed on fruit at the bottom of the cart, but the ripening process may be accelerated by increased concentrations of ethylene gas.

Finally, in regard to merchandising, 12 supermarkets reported that employees monitor displays and sort out spoiled or damaged fruit once a day in the morning. Also, one supermarket monitors its displays twice a day while six supermarkets encourage employees to check displays more than twice. Monitoring in the morning is an appropriate practice, particularly since supermarkets turn off air-conditioning units in the evening at closing time. However, fruit in advanced stages of ripeness that become over-ripe by mid-day, coupled with consumer mishandling can reduce the quality and attractiveness of displays before closing time.

Characteristics of the Demand for Mangoes in the Trinidad Supermarket Sector

The supermarket survey conducted in Trinidad represented an abbreviated version of that carried out in Barbados. But the same central objectives applied: to identify product specifications, the types of suppliers, and opportunities for expanding sales; to collect and analyze volume and price information; and to examine problems supermarkets encounter in establishing continuous supplies of high quality mangoes.

The sample consisted of 23 major supermarkets affiliated with three chain groups in Trinidad (major supermarkets have been estimated to number about 42). [26] As the largest chain (17 stores) purchases a majority of its fresh produce supplies through a central purchasing warehouse, the manager and produce buyer of that operation were interviewed. Supermarkets in the two smaller chains (four and two stores) are responsible for buying their own fresh fruits and vegetables, therefore, produce managers of each supermarket were contacted.

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[26] Griffin, Michael. The Internal Food Marketing System of Trinidad and Tobago. Ph.D. Dissertation, Aberdeen University, 1981.

Types of Suppliers

Only the central purchasing unit of the largest supermarket chain buys mangoes from regional traffickers, who are mainly from St. Vincent. The central unit buys the remainder of its supplies from local gardeners and farmers. Individual stores affiliated with the chain also supplement mango stocks received from the central warehouse by purchasing from local suppliers who deliver directly to the supermarket.

Supermarkets in the two smaller chain groups buy mangoes exclusively from local gardeners and farmers. This is due to the fact that most traffickers sell their fresh produce at the Central Market in Port of Spain and have not directly penetrated the supermarket sector.

As in Barbados, all supermarket fresh produce buyers in Trinidad buy from several different individuals each week, face inconsistent quality, erratic quantities supplied, and pay varying prices from week to week. Nearly all mangoes supplied to the supermarkets surveyed are packaged loosely in a variety of containers such as bags, boxes, and banana cartons, albeit one exporter from Dominica packs mangoes in a carton with individual cells. Fresh produce managers had no specific preferences regarding packaging but all agreed it should be of sufficient strength and construction to insure that mangoes arrive in the same condition in which they were packed.

Due to the arrival of inter-island schooners on Tuesday which transport regional traffickers' fresh produce, the central warehouse of the largest chain receives its largest volumes of mangoes on Wednesday. However, the manager of that chain said he prefers to purchase mangoes on Monday or Tuesday in order to distribute to individual supermarkets in time for their high volume sales days of Thursday through Saturday. Managers of the other six supermarkets prefer to buy mangoes from Tuesday through Thursday.

Product Specifications

All managers interviewed defined high quality mangoes as fruit of good size, fully mature, firm and free of disease, bruises, and scarring. The Julie mango is the preferred variety of all supermarkets in the sample, although the Graham cultivar and several local seedling mangoes are purchased in smaller quantities. A majority of the managers surveyed said that Julie mangoes supplied, most of which are produced in Trinidad, are frequently too small and that larger fruit would be more acceptable.

Volumes and Prices

Unlike supermarkets in Barbados which use the pound or kilogram as the standard measure of weight, Trinidadian supermarkets generally sell mangoes by the unit. Also, fresh produce managers in Trinidad could not provide volume and price estimates for the "low season" when mangoes are scarce, and the "peak season" when they are abundant. Because of this difficulty, Trinidadian managers were asked to give a low and high weekly estimate of volumes and prices, which were then aggregated into a weekly average.

According to these estimates, the average number of grafted mangoes (predominantly Julies) purchased weekly by the sample is about 253. The low estimate was 227 and the high estimate 279. Table 16 shows that the average wholesale per unit price for the Julie is approximately $2.16 EC and the retail price $3.44 EC.

In order to compare average volumes and prices of mangoes flowing through supermarkets in Trinidad with those available from the Barbados survey, the Trinidad data were converted to kilogram equivalents. The results are as follows:

1. The average weekly quantity of cultivar mangoes purchased by the Trinidad supermarkets is estimated at about 86 kgs. This figure is significantly lower than the Barbados average which is estimated at 127 kgs.

2. The average 1984 wholesale price in Trinidad for the Julie mango was about $2.96 EC/kg. compared to $2.45 EC/kg. in Barbados.

Table 16

1984 Average Trinidad Supermarket Prices for Julie Mangoes
(Per Unit and Per Kg. in EC Dollars)

Price	Per Unit Price		Per Kg. Price[a]	
	Average	Range	Average	Range
Wholesale	$2.16	$1.79-$2.51	$2.96	$2.45-$3.46
Retail	$3.44	$3.37-$3.51	$4.72	$4.63-$4.81

SOURCE: Survey Data

[a] All prices were converted at the exchange rate of $1.00 TT = $1.15 EC. An average weight of 285 grams was used to convert Julie mango per unit prices into per kg. prices.

The reason(s) for the significant difference in the volumes of mangoes merchandised by supermarkets in Barbados and Trinidad are not clear. However, four possible explanations of the relatively low volumes sold by Trinidad supermarkets can be posed: larger volume of mangoes may be distributed through market channels other than supermarkets; supplies sufficient to satisfy effective demand may not be reaching supermarkets; domestic consumption may be lower in Trinidad than in Barbados; the estimates of volumes moving through supermarkets provided by managers were not accurate.

Potential for Market Expansion in Trinidad

Most supermarket managers in the Trinidad sample expressed dissatisfaction with the quality of mangoes currently supplied. Produce managers for 20 supermarkets said they would prefer to buy mangoes from a supplier capable of providing consistent high quality fruit at competitive prices. The other three managers said they would not replace their current local suppliers, but did indicate that they would buy from a consistent supplier before and after the Trinidad mango season. Production in Trinidad parallels that of the Windward Islands, beginning in May and ending in September.

The problems of estimating potential expanded sales in Trinidad are similar to those already discussed for Barbados. Nonetheless, the manager of the largest supermarket chain in Trinidad said that his organization could comfortably buy 40 percent more than it currently does if the above supply conditions are met (the central warehouse purchased about 1600 mangoes per week in 1984). Managers of the other six supermarkets did not offer an estimate.

Barbados Public Market Retail Prices

Retail prices for Julie and Imperial mangoes were collected from Fairchild and Cheapside public markets in Barbados over a twenty week period from May to September 1984. The resulting data are graphed in Figure 7 in EC dollars/kg. (see Appendix 3 for price observations).

During May and June prices tended to behave inversely with the mango production cycle in the Windward Islands, declining slightly in June as production peaked and then rising moderately at the end of the month as the first peak of production began to subside. Prices ranged from $3.00 EC/kg. to $5.20 EC/kg. in this period. However, prices moved sharply downward in July even though mango supplies became relatively scarce in the middle of the month. July prices varied from about $3.22 to $4.37 EC/kg. Several factors potentially contributed to this unexpected decline. First, markets in the

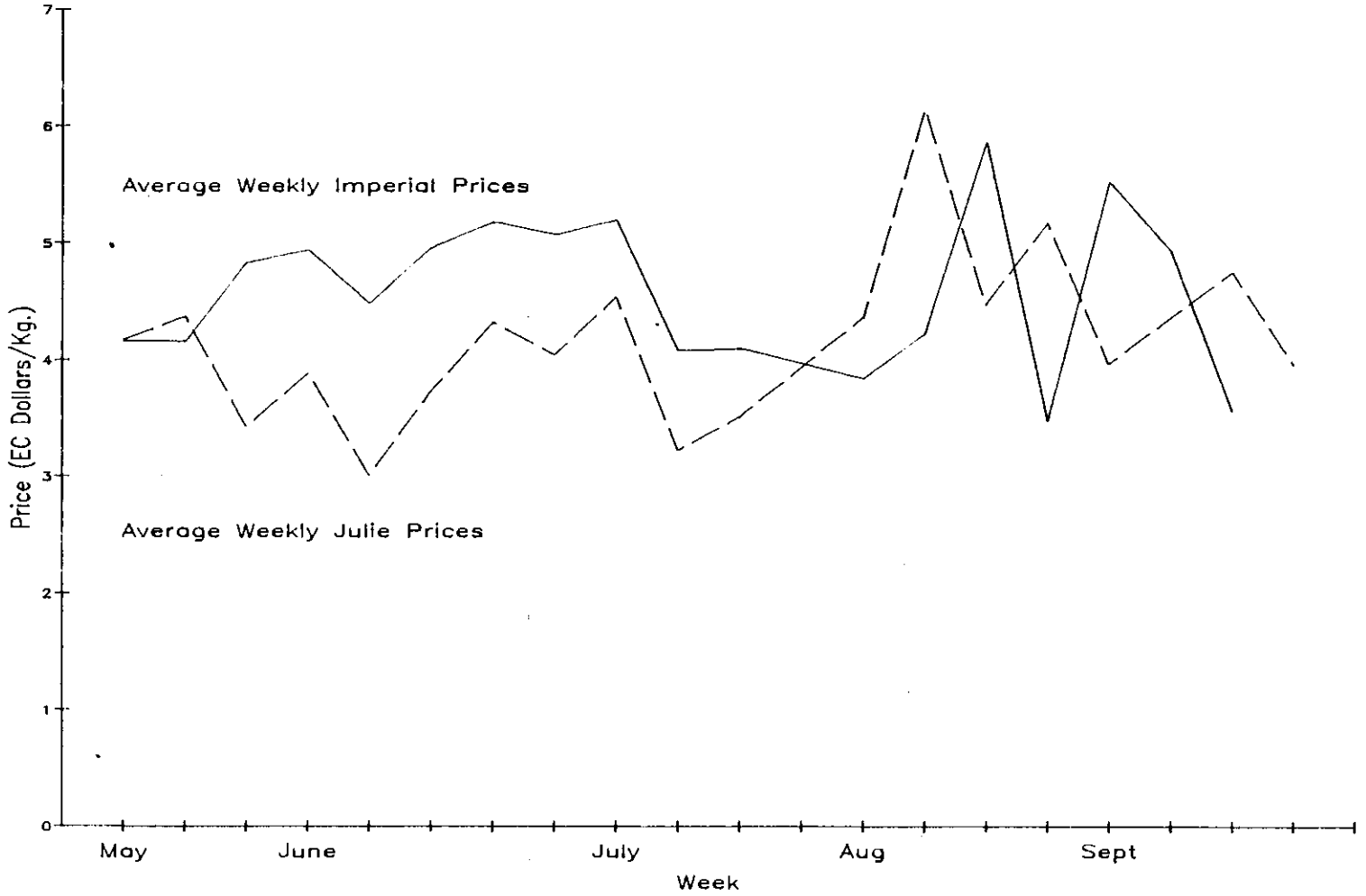
Eastern Caribbean do not appear to be particularly transparent and the process of price determination is not clearly understood. Second, consumer interest in mangoes may have waned after peak production ceased in early July, pushing prices downward. Third, the quality of mangoes imported into Barbados may have declined during July due to poor shipping conditions and handling practices, consequently affecting retail prices. Fourth, although all hucksters vending mangoes in the Fairchild and Cheapside markets were enumerated every week, and most of the hucksters operating on the surrounding streets as well, their numbers are relatively small. The weekly sample varied from 7 to 21 during the mango season. Also, errors and biases in data collection may have affected the average weekly price estimates.

Prices rose sharply in August despite the fact that supplies were relatively abundant. The ban on mango imports from St. Lucia may have significantly contributed to increased prices for imported Vincentian mangoes, which took up the slack in supply. Prices fluctuated between $3.48 and $6.15 EC/kg. in August. At the end of the mango season in September extremely poor quality supplies forced prices down substantially to a range of $3.57 to $4.94 EC/kg.

Throughout the 1984 season, Barbados public market retail prices varied from $3.00-$6.15 EC/kg. Public market prices were typically higher (by as much as 30 percent) than supermarket prices for mango, albeit they tended to follow the same general weekly pattern. Figure 8 in Appendix 3 provides these data. It should be mentioned that the supermarket prices used in this comparative analysis are an average for all varieties merchandised, therefore seedling mangoes, which cost less (about 15 percent) than cultivars such as the Julie and Imperial, tended to reduce the average weekly supermarket prices. Stated differently, the two price series would have been closer if average supermarket prices for the Julie and Imperial cultivars had been available.

Other possible explanations of higher prices in the public markets relative to supermarket prices include: higher per unit price expectations of hucksters due to the small scale of their operations; lack of economies of scale for hucksters in purchasing fresh produce supplies; price collusion among domestic hucksters or the regional traffickers who supply them; problems associated with price data collection encountered during the survey.

Figure 7. 1984 Barbados Public Market Retail Prices For Julie and Imperial Mangoes (In EC Dollars/Kg.)



SOURCE: Survey data.

Marketing Margins for Regional Mango Shipments: CATCO

In 1984 CATCO imported 11 weekly shipments of mangoes from the Windward Islands into Barbados. These imports were distributed to supermarkets through a single wholesaler. For illustrative purposes, marketing margins for different actors in the system are provided in Table 17 for the first six CATCO shipments, which mainly comprised the Graham cultivar and ranged from about 225 to 900 kgs. per shipment. The cost information contained in Table 17 is not complete, however. Marketing and overhead costs were not obtainable at the retail or wholesale stages, nor were overhead costs available from CATCO and the first handler in a form conducive to margin analysis for a single commodity. Net marketing margins should therefore be viewed with these limitations in mind.

The gross margin at each stage in the system was defined as the difference between the sale price and the purchase price. The difference between the gross margin at any particular stage and all costs paid to resource owners other than the agent is called the net margin. All costs and prices in Table 17 are averages computed for the six CATCO shipments.

Marketing Margins

Gross margins at different stages in the system ranged from $.96 EC/kg. at the retail level to $.55 EC/kg. at the first handler stage. CATCO's gross margin was $.74 EC/kg.

CATCO's major expense grouped under "marketing costs" in Table 17 is air freight. This cost varied considerably during the season depending upon the charter company used and the particular aircraft hired (an average of $.31 EC/kg. was paid). Additionally, the freight cost is significantly underestimated due to CATCO's accounting system. The underlying reason for using such a low average for air transport (which actually approximates the cost of shipping via inter-island schooner) is that CATCO considers the extra expense of shipping by air a "developmental cost," or one necessary to establish markets for fresh fruits and vegetables in Barbados. Therefore, the freight cost is partially subsidized. In fact, air transport would more likely range from $.55 - $.88 EC/kg.

And despite paying a significantly higher cost for air freight, the air service provided to CATCO was unreliable: on several occasions mango and banana shipments arrived too late for prompt distribution to supermarkets in Barbados, thus increasing product losses and reducing CATCO's net margin. Progress in resolving the

Table 17

Marketing Costs and Margins for Regional Mango Exports
(In EC Dollars/Kg.)

Marketing Stages	Costs and Margins
Retail	
Sale Price to Consumer	+3.66
Purchase Price	-2.70
Gross Margin+	.96
Costs	NA
Net Margin	-
Wholesale	
Sale Price to Retailer	+2.70
Purchase Price	-2.14
Gross Margin	+.56
Costs	NA
Net Margin	-
CATCO	
Sale Price to Wholesaler	+2.14
Purchase Price @ $1.32/kgs x 1.0628[a]	-1.40
Gross Margin	+.74
Costs	
Marketing (customs brokerage & duty, insurance, local transportation) @.13/kg. x 1.0638	-.14
Freight (air)	-.31
Overhead	NA
Net Margin	+.29
First Handler	
Sale Price to CATCO	+1.32
Purchase Price @ $.33 per fruit	-.77
Gross Margin	+.55
Costs	
Packaging Material @ $2.00/carton	-.15
Labor	-.07
Local Transportation	-.11
Brokerage	-.02
Net Margin	+.20

SOURCE: Survey Data.

[a] To analyze the cost to CATCO of selling one kg. of mangoes it was necessary to account for any spoilage or other product losses which occurred from the time the firm took title to the produce to the time they sold it. In the case of CATCO, spoilage includes any mangoes returned by the wholesaler that were unmarketable. As an approximate spoilage rate of 6% was incurred by CATCO during the six shipments analyzed, the following conversion factor was used for all costs incurred by the firm:

$$\frac{1.00}{1.00 - .06} = 1.0638$$

For example, the purchase price for mangoes would actually be $1.32 x 1.0638 or about $1.40. Marketing costs were similarly converted. In other words, the analysis begins by calculating the quantity of produce it is necessary for CATCO to purchase in order to provide the wholesaler with 1 kg. of mangoes, which in the event of spoilage, is greater than 1 kg. This quantity is then used as the conversion factor to express all costs and marketing margins in terms of 1 kg. of the final product (Smith, L. D. "A Methodology for Measuring Marketing Costs and Margins for Foodstuffs in Developing Countries." FAO/UN. 1981).

As the produce was not weighed by the supplier, it is not possible to determine the losses incurred due to spoilage from the time of purchase by the supplier to the time produce arrived in Barbados and was accepted and weighed by CATCO. Product losses incurred by supermarkets were not available for these shipments.

transportation problem in the Eastern Caribbean is therefore critical to CATCO's future viability as a regional trading company.

As stated earlier, CATCO does not break down overhead costs for individual commodities in its product mix. If such a figure were available, CATCO's net margin would be lower than $.29 EC/kg. Similarly, if the first handler's overhead costs such as depreciation, interest, etc. and his salary were considered in the costings, his net margin would be less. Also, it should be emphasized that the volumes of these shipments were small (255-900 kgs.), hence, the first handler's relatively high costs are spread over a small number of product units. Consequently, his net margin is relatively low.

In addition to expanding the volume of mangoes traded, continued efforts by CATCO to establish long-term arrangements with exporters and producers could increase the firm's net marketing margin in the future and help build solid markets in Barbados and Trinidad. That is, by providing suppliers with a steady flow of cash income from week to week CATCO may be able to negotiate more favorable supply prices for mango and achieve continuity of supply.

Summary

This chapter primarily described the supermarket systems for merchandising mangoes in Barbados and Trinidad. More broadly, however, the data reflects the general retail supermarket supply situation for regionally produced fresh fruits and vegetables. Regional traffickers from St. Vincent and St. Lucia are the major suppliers of mangoes flowing through supermarkets in Barbados. Traffickers account for about 48 percent of major supermarkets' mango supplies. The number of regional traffickers directly supplying the Trinidad supermarket sector is limited, due in part to the reduced shelf life of their fresh produce which forces them to sell in the Central Market in the Port of Spain. However, as traffickers appear to be handling nearly all mango imports into Trinidad, they are an important source of supply.

Supermarkets in Barbados and Trinidad rely on a large number of mango suppliers, experience a high number of individual transactions, and encounter inconsistency from week to week vis-a-vis prices, quantities supplied, and product quality. These procurement arrangements influence managerial behavior necessitating trading by inspection rather than description and making planning of supply difficult. Additionally, greater demands are placed on the produce buyer's time which could perhaps be better allocated to supervision and improvement of retail handling and merchandising practices.

In light of limitations of the scaling technique employed in the Barbados survey a question still exists about the quality of mangoes moving through the system. Yet fresh produce managers in both countries indicated that a continuous supply of high quality mangoes is not reaching their supermarkets. It is difficult, however, to predict how much supermarket mango purchases in Barbados and Trinidad would increase if the current supply situation improved. In the future, it is important to try to test the market over the course of a season with an appropriate volume of high quality fruit at competitive prices, and then measure consumer response. It does appear that the Julie mango has the greatest potential for increased sales in the Barbados and Trinidad supermarket sectors.

Overall, prices in the Barbados public markets behaved erratically in 1984 although they did seem to respond inversely to changes in supply at certain points in the season. Retail prices ranged from about $3.00 to $6.14 EC/kg. in 1984. Public market prices also tended to follow the general pattern of weekly supermarket retail prices but were usually higher.

CATCO's gross margin for mangoes was about $.74 EC/kg. for its first six shipments in 1984. However, if the actual cost incurred for air freight from the Windward Islands to Barbados and overhead costs were included in the analysis, the net margin would have been negative. Small quantities shipped and the high cost of air freight (about three times that of sea freight) contribute to this negative figure.

CHAPTER V

WESTERN EUROPEAN AND NORTH AMERICAN MARKETS FOR MANGOES

Introduction

Extra-regional markets for mangoes have expanded considerably in the past seven years particularly in the U.S., the United Kingdom, and France. However, extra-regional market requirements in terms of quality standards, grading, continuity of supply, and supply volumes are rigorous in relation to Eastern Caribbean markets. This chapter characterizes the western European and North American markets for mangoes and identifies factors which have limited market penetration and profits of Eastern Caribbean exporters shipping to the U.K. Also, 1984 costs and returns of two Eastern Caribbean public sector consignment exporters are compared.

Characteristics of the Western European Market for Mangoes

Overview: Trends and Imports

Despite the prolonged economic difficulties in western Europe, consumer demand for exotic fruit continues to grow. Large non-European ethnic populations, a more widely traveled European population which has acquired new culinary tastes in tropical countries, and improved and more aggressive marketing techniques practiced by European importers have fueled this market expansion for exotic fresh produce.[27]

Mango imports into the European Community (EC) have increased from about 3,181 tons in 1977 to nearly 13,000 in 1983. This is an average annual growth rate of about 28 percent. Table 18 shows EC imports of mangoes, mangosteens, and guavas for the period 1977-1983 of which mangoes represent about 95 percent. The U.K. and France are the largest markets followed by The Netherlands and West Germany although The Netherlands re-exports about one-fifth of its imports to other European countries. The U.K.

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[27] International Trade Centre, UNCTAD-GATT. Selected European Markets for Tropical and Off-Season Fresh Fruit and Vegetables. Geneva. May, 1981. p. 7; Fintrac International Ltd. Report on a Market Survey, Product Identification and Implementation Strategy for St. Lucia. Commissioned by the Commonwealth Secretariat. London. 1983.

imported about 4,724 tons in 1983 and slightly more in 1984.[28] French imports rose by 50 percent between 1982 and 1983 to 4,368 tons.

Ethnic groups constitute one share of market demand in the U.K. and the Netherlands, but it is difficult to predict whether consumption among this population will grow appreciably. Two factors may limit future increases in consumption within the ethnic community: most European governments have reduced immigration quotas in recent years; European-born children of Indian, West Indian, and Indonesian immigrants may adopt western tastes and dietary habits instead of those of their parents.

No single exporting country dominates the EC market because the production season for export quality mangoes in most countries is brief. However, the largest exporters are Mali and Mexico, both accounting for about 14 percent of all EC imports in 1983. Mali shipped 1,845 tons and Mexico 1,806 in 1983.

The main suppliers of the U.K. market are Mexico (980 tons in 1983), Pakistan (747 tons), India (515 tons), and Venezuela (221 tons). However, Pakistan and India export green varieties which are mainly used by the ethnic population to make chutneys and pickles. Most other exporting countries ship mangoes that ripen to a red or yellow color and are marketed as dessert fruit.

In comparison, St. Vincent, St. Lucia, and Dominica together exported about 373 tons of mangoes to the U.K. in 1983 representing an eight percent share of the market. Appendix 4 provides 1983 trade statistics for world producers shipping to the EC, 1982 monthly imports of EC countries, and indicates the export seasons of selected world producers. From these data it is apparent that the greatest export opportunities in the U.K. and the EC in general lie in the period from October to April, when world supplies are generally scarce.

The French and Dutch markets are principally supplied by West African countries, particularly Mali and Burkina Faso (formerly Upper Volta) where production peaks from April to June. Notwithstanding the fact that West African countries such as Mali, Burkina Faso, and Ivory Coast are major exporters of mangoes to the European Community, the quality of fruit they ship is variable and prices received are generally much lower than those realized by higher quality producers such as Mexico, Brazil,

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[28] Statistics available from The Statisical Office of the European Communities (NIMEXE) indicate that 4,794 metric tons of mangoes mangosteens, and guavas were imported into the U.K. from January to October (inclusive) in 1984.

Table 18

EC Imports of Mangoes, Guavas and Mangosteens: 1977-1983[a]
(In Metric Tons)

Importing Country	Year						
	1977	1978	1979	1980	1981	1982	1983
Great Britain	1,089	2,017	2,675	3,260	3,168	4,290	4,724
France	923	1,402	1,884	2,257	2,536	2,901	4,368
Netherlands	746	1,422	1,332	1,524	1,324	1,596	1,960
West Germany	222	499	638	929	742	746	1,135
Belgium-Luxemburg	131	127	166	460	529	499	382
Italy	36	57	140	N/A	164	160	233
Denmark	34	6	7	14	17	28	47
Ireland	-	-	-	N/A	15	110	40
Totals	3,181	5,530	6,842	8,344	8,494	10,300	12,889

SOURCE: Comite de Laison des Estats Afrique, Caraibes, Pacifique (COLEACP). Study of Tropical Fruit and Off-Season Vegetables, On The European Market. Paris. 1981, page 50; and NIMEXE. Statistical Office of the European Communities. 1982 and 1983.

[a] Mangoes represent about 95 percent of these total volumes.

Venezuela, and South Africa. Mango exports from Atlantic, Caribbean, and Pacific countries party to the Lome Convention may enter the EC tariff-free.

Grades and Standards

There are no legally binding grades or standards for mango in western Europe, but fruit color, grading, and overall quality play key roles in price determination in this market.

The Florida cultivars are the most widely imported into western Europe. Among the major world exporters, Mexico produces the Haden and Kent cultivars, Israel the Haden, South Africa the Sensation, Kent and Keitt. Brazil grows the Tommy Atkins and, of course, the U.S. produces and exports several Florida cultivars.

Since European consumers tend to "buy with their eyes," mango color is an important factor in price determination in EC markets. Mangoes ripening to yellow or green with a pinkish or especially red blush are preferred. The fruit should be non-fibrous, of good flavor, and free of terpene off-flavors.[29] The most acceptable fruit shape is roundish rather than long and cylindrical. Mangoes should be fully mature, firm, and free from disease, latex, bruises, and scarring upon arrival. Consumers prefer medium sized fruit from about 300-400 grams which keeps retail unit prices lower. The size of the stone should constitute a small percentage of the mango's weight, approximately 10 percent. The following cultivars are recommended for export to the EC: Irwin, Tommy Atkins, Zill, Eldon, Ruby, Sensation.[30]

Mangoes should be graded uniformly by size and stage of ripeness (mature but firm) and carefully packaged in single layer cartons containing between 8 to 16 fruit and weighing between 4.5 to 6 kgs. Even when the fruit are of superior quality, the absence of proper grading within each carton results in lower prices for the exporter. Cartons should also have ventilation holes to prevent accelerated ripening, should be divided with fibre-board into individual compartments to eliminate mechanical damage, and generally, should be of sufficient strength to ensure that the fruit reaches the retail outlet in the same condition it was packed. Some importers in Europe also recommend wrapping each fruit in tissue paper. Packaging may also enhance the physical appearance of the product. Attractively designed fresh fruit cartons are common in western European markets, serving to catch the wholesaler and retailer's eye. West Indian exporters could potentially realize higher prices with packaging designed to compete more effectively in

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[29] The description of quality characteristics in this section is based largely on the following reports: COLEACP. Study of Tropical and Off-Season Vegetables on the European Market. Paris. June, 1981; Proctor, F. L. "Notes on Mango: Quality Requirements; Packaging and Grading." Tropical Development Research Institute. London; Stother. The Market for Fresh Mangoes in Selected Western European Countries." Tropical Products Institute. London. April, 1971, p. 15.

[30] COLEACP. p. 60.

extra-regional markets; however, continuity of supply for a high quality product should be established first.

Although the Florida cultivars are most popular in western European markets, mainly because of their distinctive red blush, consumer interest in predominantly green/yellow mangoes of superior flavor such as some of the West Indian cultivars (although they usually have some reddish color) may be increasing. In a 1983 report, COLEACP indicated that cultivars produced by Mali and Burkina Faso, which are similar to those of the West Indies in color and flavor, have attracted the interest of European distributors in recent years.[31] COLEACP also identified the West Indian Julie cultivar as a candidate for increased sales to the large supermarket chains in western Europe. Previously, the Julie found its best market among the West Indian ethnic population in the U.K., where today, it remains extremely popular.

Prices

In 1984 U.K. wholesalers paid importers 10 to 40 percent less for St. Lucian and Vincentian mangoes than for high quality mangoes from other sources. Several factors explain this price difference: most world exporters air-freight mangoes to the U.K. therefore their prices partially reflect higher transportation costs; the quality of West Indian shipments are often variable; and other world producers exporting during the peak Eastern Caribbean production season grow preferred cultivars.

Brazilian mangoes fetched wholesale prices as high as £ 2.71/kg. in 1984, Israeli prices ranged from £1.77-£2.00/kg., and Mexican prices reached £1.50-£1.61/kg. In comparison, the highest weekly range for mangoes from the two Windward Islands was £1.30-£1.50/kg. (see Appendix 4, Table 33). Brazil's superior prices are partly attributable to its advantageous production season which begins as a number of other world exporters' growing seasons are ending.

Summary of Constraints to Market Expansion for Eastern Caribbean Exporters

In order to market on-coming production expected from mango trees planted by the tree crop diversification projects in St. Lucia, St. Vincent, and Dominica, Windward

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[31] COLEACP. Complementary Program of Caribbean Trade Promotion in 1982/83 (Progress Report). Paris. August 23, 1983, p. 17.

Island exporters will have to expand their shares in extra-regional markets significantly. If West Indian exporters continue to ship almost exclusively to the U.K., they would have to increase their collective U.K. market share from the eight percent achieved in 1983 to 25-35 percent by the late 1980's assuming no overall market growth. Major constraints which lie in the path of West Indian exporters shipping mangoes to the U.K. and other western European markets are summarized below.

1. West Indian exporters lost their foothold in the U.K. market after hurricanes David (1979) and Allen (1980) due to dramatic declines in production. During this time, other mango producing countries improved the packaging and presentation of their products and strengthened their commercial market positions.

2. Keen competition in terms of price and quality from several major world producers prevail during the West Indian peak production season from May to September (see Table 35 in Appendix 4).

3. Although the Julie cultivar is popular among the West Indian ethnic population in the U.K. and may be gaining broader acceptance in other market segments, cultivars ripening to a bright red blush are preferred --- especially certain Florida cultivars.

4. Lack of consistent quality and the absence of grading have contributed to lower prices for West Indian exporters. Specifically, western European importers lacking confidence in the quality of the produce s/he buys from a particular source will either not buy at all, buy only if no other sources are available on the market, or buy only at low prices.[32]

5. Variability in the West Indian growing season and relatively low supply volumes have made continuity of supply difficult to achieve. Once an importer has agreed to enter a relationship with a supplier, either contractually or more informally, s/he will accept marginal fluctuations in supply during the season in light of the uncertainties of trading perishable commodities, but will not accept gaps of two to three weeks. The initial quantities exported are generally unimportant as importers match customers with the appropriate quantities.[33]

6. Exporters are handicapped by high air freight costs and lack of frequent flights to the U.K. from the Eastern Caribbean. This constraint impairs the ability of exporters to capitalize on immediate market opportunities caused by lags in supplies from other sources.

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[32] Shaw, Ivan. "Marketing of Fresh Fruits and Vegetables (Excluding Bananas)." Paper written for the St. Lucia Banana Growers Association. St. Lucia. 1984, p. 2.

[33] Ibid, p. 2.

7. Although the availability of sea freight service gives Eastern Caribbean exporters a price advantage over world producers shipping by air, the 10-14 day voyage on the Geest ships reduces product shelf life and may cause deterioration of quality.

8. Dramatic declines in exchange rates due to the increased strength of the U.S. dollar have reduced profits to Eastern Caribbean exporters. The value of Eastern Caribbean Dollar declined by about 15 percent between the 1983 and 1984 mango seasons.

9. Increased plantings of mangoes by competitors may affect the marketability of Eastern Caribbean mangoes in the future. For example, Jamaica recently planted 500 acres of Tommy Atkins and Brazil, Peru, and Puerto Rico are reported to have made additional plantings of the Florida cultivars.

1984 Costs and Returns for Windward Island Consignment Exporters: Two Public Sector Firms Compared

In addition to its main activity of shipping and marketing bananas purchased from Windward Island Banana Grower Associations, Geest Industries Ltd. accepts relatively small quantities of other perishable commodities from Eastern Caribbean traders for sale on a consignment basis in the U.K. Table 19 presents 1984 average per carton (5-6 kgs.) costs and returns for two public sector firms that consign mangoes to Geest. These exporters are simply referred to as Consignors 1 and 2.

Costs

The itemized costs in Table 19 are divided into two major categories: local costs incurred for harvesting, purchasing, labor, packaging, and transportation; and export costs paid to Geest for freight, distribution in the U.K., handling, etc. Absent from Table 19 are overhead costs for both consignors which were unavailable.

Consignor 1 harvests and exports mangoes from trees originally planted on the estate as windbreaks, hence no cost for purchase of mangoes is given in Table 19. Due to financial constraints, Consignor 1 does not regularly use chemical inputs for mango production, therefore, per carton costs for herbicide, fertilizer, and pesticide inputs are minimal (less than $.01 EC) and are not included in Table 19. Also, a cost for land was unavailable. Consequently, the absence of production costs for Consignor 1 should be considered when comparing the relative profitability of the two consignors' mango exports for 1984.

Consignor 2, on the other hand, is a first handler that buys a mix of Julie, Imperial, Graham, and Ceylon mangoes from a large number of farmers. The average purchase

price for mangoes in 1984 was $.33 EC each or $4.48 EC/carton. Consignor 1 exported 3,746 cartons of mangoes in 1984 and Consignor 2 shipped 8,105 cartons.

Table 19 shows that Consignor 1's local costs for harvesting and assembling Graham mangoes for export to the U.K. were $4.36 EC/carton in 1984. Because no production costs are included, Consignor 1's local costs appear significantly lower than those of Consignor 2, who paid $8.72 EC/carton to acquire mangoes in 1984.

Looking more closely at individual local costs, labor costs for assembly (washing, sorting, packing) are fairly similar: $.71 EC/carton for Consignor 1 and $.79 EC for Consignor 2. It should be mentioned that labor costs for both public sector consignment exporters appear to be significantly higher than those of private sector firms operating on a comparable scale.[34] Packaging costs for the two consignors are widely divergent and may be partly explained by the fact that cartons produced in Consignor 2's country are generally a higher quality product and are priced accordingly. Also, since Consignor 2's operation is located nearer the wharf, its local transportation costs are lower ($.03 to $.17 for Consignor 2).

Export costs for Consignor 1 averaged $6.26 EC/carton in 1984 whereas Consignor 2 paid $5.73 EC/carton. Total costs (local + export) were about $10.62 EC for Consignor 1 and $14.45 EC/carton for Consignor 2. Once again, if production costs were available for Consignor 1, total costs for the two exporters would be more similar. Consignor 1's lower labor and packaging material costs, however, would probably still give the firm a cost advantage over Consignor 2.

Both consignors said that they improved the quality of mangoes they exported in 1984 by educating employees to sort fruit more carefully at the packhouse. Consignor 2 hired a consultant in order to accomplish this. Consignor 1 stated that its strategy in 1984 was to concentrate on packing higher quality mangoes rather than attempting to export larger proportions of the fruit harvested on the estate. Consignor 1 achieved this strategy by educating employees to reject a greater number of scarred, diseased, and slightly ripe fruit. Consignor 1's average per carton price increased by 25 percent over the 1983 price and Consignor 2 realized prices about 35 percent higher. Average gross revenue per carton was $16.18 EC for Consignor 1 in 1984 and $14.36 EC for Consignor 2.

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[34] Labor costs incurred by two Eastern Caribbean private sector firms were collected during field research. For an equivalent 5-6 kg. carton, the private sector firms paid about $.44 EC ($.09/kg.) and $.55 EC ($.11/kg.) for assembly of mangoes in 1984.

Table 19

1984 Average Costs and Revenue for Two Eastern Caribbean Consignment Exporters
(In EC Dollars Per Carton)[a]

Costs and Revenue	Consignor 1	Consignor 2
Gross Revenue	+16.18	+14.36
Local Costs[b]		
Mango purchase price @$.33 each[c]	-	-4.48
Harvesting labor[d]	-1.56	-
Assembly labor (washing, sorting, packing[e]	-.71	-.79
Packing materials	-1.92	-3.42
Transportation to wharf	-.17	-.03
	-4.36	-8.72
Export Costs		
Freight	-2.96	-2.09
Dock charges	-.56	-.54
Central distribution	-.42	-1.00
Transport in U.K.	-.56	-.53
Handling	-.14	-.14
Commission @ 10% of gross revenue	-1.62	-1.43
	-6.26	-3.73
Total Costs	-10.62	-14.45
Net Revenue	5.56	-.09

SOURCE: Geest Industries Ltd. in St. Lucia and survey data.

[a] The exchange rate of £ 1.00 = $3.52 EC which prevailed during the 1984 season was used to convert £'s into EC currency.

[b] Local costs for Consignor 1 are based on 16 shipments made during 1984. Local costs for Consignor 2 are based on specific costs for the firm's third largest weekly shipment in 1984 (1152 cartons or 5.3 tons).

[c] Consignor 1 harvests and exports mangoes from trees on the estate that were originally planted as windbreaks, therefore no purchase price is given. Also, accurate costs of production were not available, especially for land. If included, these costs would affect net revenue for Consignor 1.

The purchase price for Consignor 2 is an average for the five cultivars that it purchased for this shipment. That is, individual cultivars cost: $.30 EC per unit for the Julie; $.52 EC for the Imperial; and $.45 EC for the Graham, Round and Haidee.

[d] The labor cost incurred by Consignor 1 was adjusted to account for mangoes that were harvested but rejected for export to the U.K. because of poor quality or over-ripeness. Although some of these rejects are sold locally at a price of $3.00 EC/carton, this information was not available.

e Similarly, costs for washing and sorting are adjusted to include those rejected for export.

Table 20 provides more specific 1984 price information for both exporters. These data show that 76 percent of Consignor 1's cartons fetched between $15.01 - $21.00 EC while only 36 percent of Consignor 2's cartons achieved prices in this range. About 56 percent of Consignor 2's cartons were in the price interval $9.01-$15.00.

When the export seasons of many world producers end in August and September imports into the U.K. become relatively scarce. During this period in 1984 Consignor 1's gross revenue per carton rose about 23 percent above May, June, and July prices. Similarly, Consignor 2's prices increased by approximately 30 percent.

While it is difficult to isolate various factors that may have contributed to higher per carton prices for both consignors in 1984, it seems that more judicious fruit selection results in significantly higher prices and hence greater returns. Other factors which may have influenced prices are: an increase in the general level of market prices for mangoes in the U.K.; and larger volumes exported by the two consignors in 1984 during August and September.

Given the high cost of assembling and exporting mangoes to the U.K., larger volumes of lower quality fruit can result in marginal or even negative profits for Eastern Caribbean exporters. It should also be noted that the decline of the U.K. pound sterling between the 1983 and 1984 mango seasons increased export costs and decreased profits of Eastern Caribbean exporters by about 15 percent. Moreover, the pound has fluctuated considerably since the end of the 1984 season (currently it's worth about seven percent less) and therefore costs and returns to consignment exporters will be further diminished in 1985 unless exchange rates improve.

The North American Market for Mangoes

The U.S. Market

Trends and Imports

U.S. mango imports rose from 10,521 tons in 1977 to 29,395 in 1982 representing three times the volume of imports into western Europe during the same period (see Table 21).

Mexico accounted for 81 percent of all U.S. imports from 1977-1982 and Haiti exported about 17 percent. U.S. consumption peaks in the summer months June through August. Several major U.S. importers indicated that they believe mango will continue to

Table 20

1984 Per Carton Prices for Consignors 1 and 2
(In EC Dollars)[a]

Sales Revenue Per Carton	Consignor 1		Consignor 2	
	No. of Cartons	% of Total Cartons Exported	No. of Cartons	% of Total Cartons Exported
0	20	.5	45	.5
.01 - 3.00	0	0	50	6
3.01 - 5.00	0	0	72	.0
5.01 - 7.00	157	4.2	0	0
7.01 - 9.00	108	2.9	128	1.6
9.01 - 11.00	42	1.2	905	11.2
11.01 - 13.00	0	0	10.45	12.9
13.01 - 15.00	521	13.9	2605	32.1
15.01 - 17.00	1512	40.3	1039	12.8
17.01 - 19.00	359	9.6	1569	19.4
19.01 - 21.00	995	26.6	333	4.1
21.01 - 23.00	32	8	300	3.7
23.01 - 25.00	0	0	14	.2
Total	3746	100.0	8105	100.0

SOURCE: Geest Industries Ltd., St. Lucia.

[a] The average exchange rate of £ 1 = $3.52 EC which prevailed during the 1984 season was used to convert the £ price into EC currency.

be a strong growth market, thus they began importing from Brazil and Peru in 1984 in order to achieve year-round inventories. The Mexican production season coincides with the Florida season, beginning in May and ending in September. The Haitian season for the seedling Francene mango, its major export variety, extends from January to April. Brazil and Peru which export Florida cultivars also ship to the U.S. in the winter months.

Plantings of mango in Florida have increased significantly in the past four years reaching an historical peak of 2,589 acres in 1984, of which 1,684 acres are of bearing age.[35] Forty-two percent of the current Florida acreage has been set since 1978.

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[35] Florida Crop and Livestock Reporting Service. "Tropical Fruit." Orlando, Florida. October 23, 1984.

Table 21

U.S. Mango Imports 1977-1982
(In Metric Tons)

Exporting Country	Volume					
	1977	1978	1979	1980	1981	1982
Mexico	9,066	13,151	12,225	14,920	14,816	24,376
Haiti	1,217	1,566	2,552	3,741	4,303	4,848
Others	238	579	75	916	119	171
Total	10,521	15,296	14,852	19,587	19,238	29,395

SOURCE: United States Department of Agriculture, Foreign Agriculture Service. Tropical Fruits and Products, Trade Statistics in Selected Countries. Foreign Agriculture Circular, Supplement 3-84. February 1984. Page 15.

Grades and Standards

Currently there are no national grades and standards in the U.S. although government and industry are attempting to develop them. However, the industry does grade mangoes by number of fruit per carton (6, 7, 8 . . . etc.) with each carton weighing about 5-6 kgs. Generally, cartons for mango do not have individual cells. As in western Europe and Canada, color, grading, and general fruit quality contribute to higher prices in the U.S. market. The Florida cultivars are preferred by importers, especially the Tommy Atkins and Haden. Mangoes exported from the Eastern Caribbean and other countries participating in the Caribbean Basin Initiative (1983) may enter the U.S. duty-free.

Prices

Except for Mexico, exporting countries air freight mangoes to the U.S. which increases per carton prices by as much as $.50 U.S. In 1984 Florida importers paid between $3.50-$4.25 U.S. per carton for Mexican mangoes and $5.50-$7.00 U.S. for Haitian mangoes. Brazilian imports fetched about $8.00-$12.00 U.S. per carton.

Constraints to Eastern Caribbean Exports in the U.S. Market

For all practical purposes the U.S. market for mangoes is currently closed to Eastern Caribbean exporters due to restrictions on the use of Ethylene Dibromide

(EDB). EDB is used to fumigate fresh fruit and vegetable imports shipped from fruit fly infested countries. Presently, the USDA is closely supervising the use of EDB for mango exports in Brazil, Mexico, and Haiti, but it is expected that the chemical will be banned completely before the end of 1985. Alternative treatments are being investigated but this will be a lengthy process.

However, USAID is considering funding a survey to ascertain whether the fruit fly is actually present in St. Vincent. If not, St. Vincent would be eligible to export mangoes to the U.S. without fumigation. In this event, the survey would be replicated in other Eastern Caribbean islands.

Due to discovery of the mango seed weevil (Sternochetus mangiferae) in St. Lucia and Martinique in 1984, the U.S. has banned imports of mangoes from those countries. There is no known treatment for this pest and the possibility of it spreading to other islands threatens all Eastern Caribbean mango exports.

The Canadian Market

Demand for mangoes is also increasing in the Canadian market although import volumes are reported to be small. The Marketing and Economics Branch of Agriculture Canada does not collect import volumes for mangoes because of the small quantities marketed.

Although varietal preferences, quality standards, grades, and conventional packaging parallel that of the U.S. market, fumigation treatment for pests is not required for imports into Canada. Tommy Atkins, Haden, Kent, and Keitt are the cultivars preferred by Canadian importers.

As in the U.S., consumption in Canada is greatest in the period June through August. Toronto importers paid an average range of $5.00-$8.00 CAN per carton during the summer months of 1984 for Mexican and Florida imports. However, in November scarcity of supply and higher transportation costs for Brazilian and Peruvian air-freighted mangoes increased import prices to as much as $20.00 CAN per carton. In 1984 Toronto wholesale selling prices ranged from $9.00-$18.00 CAN during the winter months November through March, and $7.50-$13.00 from April through October.[36]

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[36] Market Information Services, Marketing Services Division. Agriculture Canada. "Wholesale-to-Retail Quotations on Imported Fruits and Vegetables." 1984.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The descriptive-diagnostic analysis presented in the preceeding chapters identified constraints in the production and marketing system for mangoes in the Eastern Caribbean which limit regional consumption and extra-regional market expansion. With significant increases in mango production possible by the late 1990's, progress in addressing and removing constraints in the mango commodity system takes on added importance. Without these changes, the possible production increases may not materialize. This chapter draws conclusions from the analysis of the production and marketing system for mangoes and prescribes actions designed to alleviate the identified constraints.

Market Expansion

Virtually no potential for market expansion exists in the diminutive domestic markets of the principal mango producing countries in the Eastern Caribbean Region. Major regional market countries hold greater promise for absorbing increased exports from the Windward Islands. Trade statistics show, however, that imports of mangoes into Barbados and Trinidad have returned to or exceeded pre-hurricane levels (1978) and therefore it will be difficult to sustain the high rates of regional export growth realized in the early 1980's. Yet there appears to be potential for increasing sales of mangoes in the supermarket sectors of Barbados and Trinidad if a consistent supply of high quality fruit can be provided at a reasonable price. The question of how much supermarkets would buy and at what price is difficult to answer at this time.

Most of the potential increases in regional mango production, largely to be brought on by the BDD supported tree crop diversification projects in the Windward Islands, will have to be exported to extra-regional markets. The U.K. and other western European countries will be key markets as the U.S. market is, at present, effectively closed to West Indian exporters. The availability of weekly sea freight service to the U.K. gives Eastern Caribbean exporters a substantial price advantage over world exporters shipping by air. However, St. Lucia and Dominica collectively would have to capture an additional 25-35 percent of the U.K. market in order to sell exportable mango volumes

that appear possible by 1990. And while it is anticipated that U.K. demand will grow, increased exports from other major world producers should be expected.

Also, as U.K. demand for the West Indian varieties is not as strong as demand for the Florida cultivars (Tommy Atkins, Haden, Kent, etc.), it is difficult to predict how much the Eastern Caribbean market share can be expanded. Mexico, which ships the Florida and other high quality cultivars, is the largest exporter to the U.K. accounting for about 20 percent of all imports in 1982 and 1983. Consequently, it is difficult to assume that Eastern Caribbean mango exports will surpass Mexico's 20 percent market share in the near future.

The tendency of West Indian traders has been to look only at the U.K. as an export market for mangoes. There are indications, however, that supermarket buyers in other European Community countries such as The Netherlands, West Germany, and France would accept trial shipments of West Indian mangoes, especially the Julie cultivar. Additionally, the Canadian market for mangoes is expanding, and fumigation treatment is not required for Eastern Caribbean exports into that country.

Profitable returns for West Indian producers and exporters depend on achieving the highest possible per unit prices in extra-regional markets, given the relatively high cost of purchasing, assembling, and exporting mangoes from the Eastern Caribbean to the U.K. and the sensitivity of regional currencies to changes in the international financial market. The experience of the two public sector consignment exporters documented in Chapter V demonstrates that higher per carton prices can be realized by improving the quality of mangoes selected for export to the U.K.

Quality/Continuity of Supply

Survey results indicate that the desired quality of product is not consistently reaching supermarkets in Barbados and Trinidad, although acceptable standards of quality are lower in the Eastern Caribbean region than in extra-regional markets. The quality of imported mangoes sold by hucksters in the public markets of Trinidad and Barbados is also frequently poor.

Discontinuity of supply in terms of regular shipments of high quality mangoes in adequate volumes has also hindered penetration of the supermarket chain groups in the U.K. Color, shape, size, and shelf life are significant factors in price determination in the U.K. supermarket sector as in other extra-regional markets. To establish continuity

of a high quality supply of mangoes and thereby successfully export on-coming production volumes, changes in research, extension, production, and marketing activities are needed.

Improving Fruit Quality and Financial Returns in the Short Run

Short-term research activities designed to increase yields and improve fruit quality are critically lacking in the region. CARDI does not have a tree crop specialist on its staff despite the importance of mango and other tree crops in the region. Beyond the efforts of one post-harvest specialist in Dominica on assignment with the BDD, no applied regional tree crop research is being conducted in the three island group. Applied research designed to improve cultural, harvesting, and post-harvest practices is needed. One of the most pressing research priorities upon which economically successful investments in infra-structure, training, and further research depend are basic economic and financial analysis of the production and export of mango.

Recommendation 1. Applied research priorities that should be immediately addressed by the appropriate regional institution(s) include:

- rigorous cost of production analysis for mango to assess an equitable return to the grower, and the costs and benefits of fertilizing, pruning, and disease control programs;
- financial analysis for exporting mangoes to extra-regional markets emphasizing possible changes in variables such as currency exchange rates, spoilage, fluctuations in market prices, assembly and shipping costs, and farmgate prices;
- definition of a pre-harvest disease control program to mitigate the spread of anthracnose, the major disease of mango, and/or a feasibility study for post-harvest hot water dip treatment;
- definition of workable indices for judging market maturity which will facilitate planning of harvesting, packing, shipping, and distribution;
- secondary research on flower induction treatments which have been successful in extending the season in other countries (particularly the Philippines) and which could potentially open windows of export opportunity for Eastern Caribbean exporters;

- development of more suitable cartons for shipping mangoes to regional and extra-regional markets;
- post-harvest research aimed at improving shipping conditions on the Geest ships is needed;
- investigation of ways to eliminate the mango seed weevil problem which has stopped all St. Lucian mango exports to Barbados, St. Lucia's major regional market, and which has prompted the U.S. to ban mango imports from St. Lucia and Martinique. This problem could also spread to other islands.

Varietal Research

Longer-term varietal research is not being conducted in the region. Although not as pressing as short-term practical research, varietal research could possibly identify cultivars that can extend the West Indian growing season consequently stabilizing supply and/or opening export opportunities.

Recommendation 2. Varietal research on cultivars that have been recommended for field trials in the West Indies deserves serious consideration by regional research organizations. Practically, this research might be conducted at the Roseau Model Farms Project in St. Lucia where about 160 acres of mango are scheduled for planting. The manager of that project has expressed interest in planting cultivars that have greater demand in extra-regional markets. Varietal research should address the following characteristics of mango cultivars: harvest season; resistance to fruit fly, the mango seed weevil, and anthracnose; post-harvest responses to handling, chilling temperatures for shipping, and hot water dips for anthracnose and fruit fly. In addition to identifying cultivars with the greatest sales potential in target markets, emphasis should be given to identifying cultivars that can be most easily grown and culturally managed by Eastern Caribbean farmers.

Extension Activities

Effective extension activities tailored to mango will ultimately hinge on research advances relating to the priorities outlined above. However, certain extension activities regarding cultural, harvesting, and handling practices at the farm level are immediately needed.

Recommendation 3. The Caribbean Agricultural Extension Project (CAEP) has plans to produce a technical package for mango which should be expanded to include marketing information useful to mango growers. Activities designed to improve fruit quality at the

farm level and satisfy the rigorous requirements of extra-regional markets should concern:

- the importance of maturity and fruit size, and the need to eliminate latex stains, disease, and mechanical damage;
- the role that proper grounds maintenance (burning mango seeds, removing fallen fruit, etc.) can play in reducing the spread of disease and pests;
- recommended harvest practices such as hand-picking and use of the harvesting pole which may potentially increase farmers' income and reduce time and cost of labor allocated by export firms to sorting out damaged mangoes;
- the advantages of harvesting during periods of the day when latex flows are minimal, and coordinating harvest with transport to the pack-house;
- the benefits of packing mangoes in sturdy field boxes for transport to the pack-house.

Market Information

Market information plays a coordinative role guiding planning and production and providing feedback on the performance of exports in the marketplace. However, relevant market information is generally lacking in the Eastern Caribbean. This is an area where regional island governments could have a significant impact in improving Eastern Caribbean fresh fruit and vegetable trade. The Dominica and Barbados governments already support marketing intelligence units which have improved their services in the past year. Other countries have more recently established similar information units. However, as the level of government commitment and support varies from island to island so does the quality and usefulness of the information supplied.

Recommendation 4. Regional governments should continue to support and improve market information services, and where appropriate, donor grant assistance for training and infrastructure could be provided. Major informational priorities (in appropriate order of importance) that relate to mango but which could be expanded to embrace other crops include:

- more immediate and continuous feedback to Eastern Caribbean exporters and growers about export product quality and prices in destination markets;
- collection, analysis, and dissemination of information regarding the quality and prices of mangoes marketed by major world producers, and the improvements they are making in packaging, harvesting, and handling practices;

- accurate and timely export trade statistics for Eastern Caribbean countries because the current system of collecting external trade statistics is unreliable and a constraint on export planning;

- weekly farmgate price information on various Windward Island mango cultivars and crop outlook reports detailing factors that influence supply availability. Price information should be standardized in terms of data collection methods and by weight (i.e. the pound or kilogram). Additionally, linkages between intelligence units in the different island-states will be needed to increase regional market transparency.

Shipping to the U.K.

Geest Industries Ltd. indicates that sufficient transport capacity for export of West Indian mangoes is available on a weekly basis. However, the relationship between Geest and Eastern Caribbean exporters needs improvement. Exporters contend that Geest's freight charges are high and that port facilities and shipping services are not always adequate. Similarly, traders argue that governments are unresponsive to their specific business needs and interests. On the other hand, Geest maintains that traders do not communicate weekly export plans in advance and that the quality of mangoes shipped is inconsistent.

Fresh produce traders in the Eastern Caribbean exporting countries should therefore explore the feasibility of forming export trade associations for the purposes of joining together to overcome industry-wide problems; for example, improving shipping and sales arrangements with Geest Industries, improving the quality of mango and other perishable exports by establishing common grading and packaging standards, providing input into government agricultural planning activities, and promoting orderly industry expansion. Also, these associations could possibly arrange for self-financed, applied research to solve immediate production and marketing problems.

Recommendation 5. Assistance from USAID and other donors would be appropriate to initiate the formation of these export trade associations and might involve grant funded training and technical assistance. Eventually, it may be expedient to develop a regional association from national organizations. A regional association would strengthen Eastern Caribbean exporters' ability to compete against large and well organized marketing organizations in the international marketplace.

Regional Shipping

The effectiveness of investments in other components of the production and marketing system for perishable commodities in the Eastern Caribbean is contingent upon efficient regional shipping facilities. The Dominica Farmers Union recently secured donor financing to purchase a small refrigerated vessel that will be used to export fresh produce, including mangoes, to Trinidad and eventually Barbados. CATCO has plans to acquire a small vessel for similar trade purposes.

Recommendation 6. The transportation problem will require additional investment on the part of international developmental agencies and regional governments. Improving port facilities by organizing wharf areas for more efficient on and off-loading of produce, provision of packing and storage facilities, and elimination of cumbersome customs procedures are critical priorities.

CATCO

CATCO was originally envisioned as a commercially viable trading company capable of removing production/marketing constraints in the agricultural system by introducing improved marketing services and innovations, and strengthening private sector involvement in agriculture in the Eastern Caribbean. This dual mandate of financial viability and market improvement poses a peculiar dilemma for CATCO: at times CATCO may be forced to compete with private sector traders in regional markets in order to increase sales of its product lines, and also compete for available regional supplies. However, CATCO's developmental role is equally, if not more, important. Progress needs to be achieved in providing innovative leadership regarding packaging, grading, cultural and post-harvest practices, and in facilitating increased private sector trade.

CATCO was successful in establishing weekly shipments of mangoes from the Windward Islands to Barbados in 1984. Expansion of CATCO's regional sales beyond the modest five tons traded in 1984 will, however, require development of more reliable high quality supply sources, reduction of spoilage due to inadequate transportation, and penetration of the Trinidad supermarket sector and extra-regional markets.

Recommendation 7. CATCO should carry out financial analysis concerning the profitability of exporting mangoes regionally and extra-regionally. The following variables should be included in the sensitivity analysis: farmgate and destination market prices; currency exchange rates; product losses; freight. In the region, it will be

necessary to make provisions for weighing mangoes at ports of embarkation in order to assess product losses incurred during transport.

Recommendation 8. CATCO should take the leadership in seeing that someone conduct training sessions on fruit quality in St. Vincent and St. Lucia (providing markets for St. Lucian mangoes are accessible) at the beginning of the 1985 season. These sessions could involve:

- suppliers and producers;
- agronomic and post-harvest technical assistance from available EDF-funded consultants;
- practical formats of discussion and demonstration conducted during initial shipments of the 1985 season;
- provision of literature describing quality specifications and harvesting, handling, and packing procedures.

CATCO should also help organize a program to monitor progress in achieving the desired production and exports of mangoes during the season and provide for further training where needed.

Recommendation 9. CATCO should consider establishing a small credit facility for its agent-suppliers and producers. Due to the relatively small scale of their operations, Eastern Caribbean exporters often require short-term financing which is unavailable from conventional lending institutions. This facility would provide financing for inputs such as harvesting equipment, fertilizer, fungicides and packaging materials. Provision of such a service would also promote CATCO's developmental role among exporters in the region and could open up new supply sources.

Recommendation 10. It appears that cartons currently used for shipping mangoes and other horticultural products in the Eastern Caribbean do not allow for maximum air circulation, therefore CATCO should investigate suitable alternatives. As volumes of exports increase, CATCO could examine the feasibility of purchasing cartons in bulk and selling, or perhaps, renting these to suppliers. Carton costs could be deducted from payments made to suppliers and be shipped to the supply islands on the vessel CATCO expects to charter.

Concluding Comment

Successful integration and implementation of priority activities in the production/marketing system for mangoes outlined in this chapter will require liaison among system participants involved in development organizations, governments, and

agricultural research, extension, and trade. It is hoped that this report will facilitate improved communication among these participants by identifying constraints in the mango production/marketing system and by suggesting actions aimed at their removal.

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APPENDICES

APPENDIX I

EASTERN CARIBBEAN TRADE STATISTICS FOR FRESH FRUITS AND VEGETABLES (1979–1984)

Table 22

Major Fresh Fruit and Vegetable Exports of St. Lucia
(In Metric Tons and EC Dollars)

Commodity	Year									
	1980[a]		1981		1982		1983		1984[b]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Bananas	32,825	28,375,220	42,891	39,592,834	41,697	42,208,267	46,928	50,167,912	36,906	35,790,471
Other fruit (except citrus)	457	280,860	625	458,654	444	310,413	268	258,751	160	115,322
Coconuts (in shell)	472	237,089	109	74,897	180	109,920	86	47,201	1	543
Mangoes	116	100,260	89	103,984	165	214,528	304	414,071	NA	NA
Plantains	102	103,415	185	166,801	109	76,515	170	147,431	248	205,888
Dasheens & Eddoes	34	46,404	44	58,101	19	25,103	23	33,183	12	16,158
Yams	11	14,548	20	27,968	18	26,527	24	36,697	15	21,238

SOURCE: Government of St. Lucia Overseas Trade Reports.
[a] Hurricane Allen struck in August.
[b] Only statistics for the first two fiscal quarters of 1984 were available.

Table 23

Major Fresh Fruit and Vegetable Exports of Dominica
(In Metric Tons and EC Dollars)

Commodity	Year									
	1980[a]		1981		1982		1983		1984[b]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Bananas	8,081	7,977,071	27,322	24,618,323	27,478	26,910,394	29,305	30,333,921	18,416	16,893,896
Grapefruit	1,378	1,032,147	1,524	1,003,777	2,653	1,954,685	2,484	1,700,071	1,088	416,555
Sweet Oranges	132	84,713	307	198,928	349	226,111	526	337,944	90	58,139
Limes	173	125,709	260	188,800	207	150,249	191	139,909	169	123,936
Plantains	140	212,283	224	339,627	310	474,650	502	762,206	315	478,793
Dasheens & Eddoes	107	121,048	192	219,129	174	198,583	331	378,736	195	223,273
Pumpkin	84	103,562	62	85,979	106	153,829	131	187,082	58	81,752
Tannias	55	139,864	139	380,678	123	333,851	174	477,456	111	302,365
Coconuts (in shells)	73	55,408	96	82,567	85	74,283	39	32,316	4	3,247
Mangoes	47	31,701	26	17,523	98	65,541	77	52,483	87	58,704
Yams	12	32,102	27	76,310	39	111,297	70	199,224	49	138,939
Avocadoes	6	5,487	29	31,492	28	31,089	67	73,434	1	1,625

SOURCE: Government of Dominica Statistical Unit.
[a] Hurricane Allen struck in August.
[b] Only statistics for the first two fiscal quarters of 1984 were available.

Table 24

Major Fresh Fruit and Vegetable Exports of St. Vincent
(In Metric Tons and EC Dollars)

Commodity	Year									
	1980[a]		1981		1982		1983		1984[b]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Bananas	18,813	16, 893,264	29,995	25,371,193	24,995	24,688,727	33,919	29,759,660	14,655	15,026,543
Dasheens & Eddoes	1,980	2,784,472	3,719	5,542,952	4,902	7,422,756	8,384	11,533,514	5,598	8,424,524
Tannias	533	770,624	1,400	2,141,114	1,781	2,633,799	2,691	4,150,747	2,125	3,287,424
Plantains	876	618,674	1,827	2,040,330	1,789	1,964,608	1,430	1,594,663	1,315	1,475,874
Sweet Potatoes	1,637	1,373,114	1,098	805,742	954	693,380	944	1,186,524	919	1,212,939
Yams	276	427,712	408	679,708	635	1,045,322	1,236	2,087,838	1,059	1,763,673
Coconuts	1,749	1,494,039	834	751,237	32	27,250	50	41,434	60	24,090
Mangoes	245	436,511	247	438,865	277	473,643	244	516,139	399	604,905
Ginger	436	500,142	99	136,493	NA	NA	168	185,037	NA	NA
Pumpkin	NA	NA	84	91,752	85	87,536	58	64,328	41	45,633
Grapefruit	NA	NA	43	29,868	61	41,165	40	27,279	31	20,901

SOURCE: Government of St. Vincent Statistical Unit.
[a] Hurricane Allen struck in August.
[b] Only statistics for the first two fiscal quarters of 1984 were available.

Table 25

Major Fresh Fruit and Vegetable Imports of Barbados
(In Metric Tons and Barbados Dollars)

Commodity	Year									
	1980[a]		1981		1982		1983		1984[b]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Onions (fresh or chilled)	1,841	1,623,082	1,731	1,631,501	1,733	1,211,502	1,402	1,140,615	1,305	1,329,041
Oranges (fresh or dried)	993	1,531,095	797	1,273,623	726	1,181,684	1,068	1,554,334	111	105,617
Apples (fresh)	636	1,232,521	876	1,729,230	410	1,071,377	478	1,046,071	90	170,636
Plantains (fresh)	305	29,045	621	666,264	366	389,798	201	139,908	308	644,831
Bananas (fresh)	49	3,496	30	43,563	92	82,878	173	186,314	452	172,895
Mangoes (fresh)	221	201,880	194	162,610	171	229,697	140	80,516	223	116,436
Grapefruit (fresh or dried)	252	290,434	145	177,318	179	226,386	129	143,198	114	97,657
Pineapples (fresh)	27	77,829	52	97,315	119	202,183	114	185,881	223	116,436
Dasheens & Eddoes	17	26,036	63	94,370	40	50,786	24	16,933	89	24,227
Mandarins, Tangerines & Citrus Hybrids (fresh & dried)	13	17,403	30	45,168	7	19,984	93	159,433	50	80,596
Grapes (fresh)	63	231,007	7	35,291	13	71,922	31	132,221	60	273,667

SOURCE: Government of Barbados Trade Statistics.
[a] Hurricane Allen struck in August.
[b] Only statistics for the first two fiscal quarters were available.

Table 26

Major Fresh Fruit and Vegetable Imports of Trinidad
(In Metric Tons andTrinidad and Tobago Dollars)

Commodity	Year									
	1980[a]		1981		1982		1983		1984[b]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Potatoes (not sweet)	23,416	19,107,730	28,388	29,231,783	24,867	20,794,657	28,339	28,567,247	4,523	2,724,046
Onions	16,734	7,970,489	6,365	7,622,861	6,621	6,665,170	7,303	5,743,423	834	827,580
Apples	3,275	6,231,005	3,010	6,468,547	3,944	7,916,886	4,197	7,810,379	313	806,941
Carrots	3,684	6,921,691	3,452	8,073,614	4,971	10,569,111	4,002	10,328,201	501	1,276,752
Garlic	1,202	4,845,070	1,157	6,114,809	1,509	8,970,318	1,735	7,275,347	119	412,316
Dasheens & Eddoes	4,158	1,035,251	1,534	811,451	1,458	1,140,033	6,391	9,169,784	1,258	1,805,240
Sweet Potatoes	2,389	1,216,199	1,119	845,423	463	425,134	1,435	1,878,461	190	249,252
Grapes	587	2,119,554	956	2,902,703	1,477	4,173,043	1,544	4,108,757	60	274,158
Tannias	1,171	284,276	979	306,035	467	355,425	2,278	3,325,000	440	659,110
Plantains	359	141,613	2,021	419,848	1,556	698,884	12,207	1,569,548	1,717	140,348
Bananas	6	3,338	1	2,047	24	325	105	41,667	5	506
Yams	814	219,899	614	201,700	168	254,599	1,172	2,013,966	300	481,922

SOURCE: Central Statistical Office--Government of Trinidad.
[a] Hurricane Allen struck in August.
[b] Only statistics for January and February were available for 1984.

Table 27

St. Vincent Mango Exports by Country of Destination
(In Metric Tons and EC Dollars)

Importing Country	Year											
	1979[a]		1980[b]		1981		1982		1983		1984[c]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
United Kingdom	132.54	269,417	148.54	284,947	118.88	224,208	66.66	135,440	89.59	289,854	53.98	91,954
Barbados	70.10	91,898	88.65	139,129	93.86	157,896	119.03	193,940	55.35	88,690	106.76	NA
Canada	1.04	1,482	--	--	26.72	44,176	31.78	49,678	32.81	53,485	34.12	51,488
Trinidad	3.76	4,852	7.30	12,335	7.56	12,585	58.46	93,010	66.19	84,110	249.76	369,183
Others	.02	60	.05	100	--	--	.43	1,575	--	--	--	--
Total	207.46	367,709	244.54	436,511	247.02	438,865	276.36	473,643	243.94	516,139	398.62	604,805

SOURCE: Government of St. Vincent Statistical Unit.
[a] Hurricane David stuck during mid-season.
[b] Hurricane Allen stuck at the end of the season.
[c] Only statistics for the first two fiscal quarters were available.

Table 28

St. Lucia Mango Exports by Country of Destination
(In Metric Tons and EC Dollars)

Importing Country	Year											
	1979[a]		1980[b]		1981		1982		1983		1984[c]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
United Kingdom	173.65	93,796	127.88	83,695	30.77	24,319	96.58	126,786	181.66	251.839	102.00	108,936
Barbados	46.81	75,239	104.59	107,160	49.94	68,620	65.65	90,076	118.83	156,438	105.18	78,450
U.S. Virgin Islands	10.12	6,343	3.60	1,667	.20	220	.07	86	2.71	4,723	--	
U.S.A.	49.10	82,340	--	--	8.10	10,685	--	--	--	--	--	--
Others	1.03	1,701	2.42	1,420	--	--	.7	1,000	.52	571	.09	624
Total	280.71	259,419	238.49	193,942	89.01	103,844	163.00	217,948	303.27	413,571	864.00	188,010

SOURCE: Government of St. Lucia Overseas Trade Reports.
[a] Hurricane David stuck during mid-season.
[b] Hurricane Allen struck at the end of the season.
[c] Only statistics for the first two fiscal quarters were available.

Table 29

Dominica Mango Exports by Country of Destination
(In Metric Tons and EC Dollars)

Importing Country	Year											
	1979[a]		1980[b]		1981		1982		1983		1984[c]	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
United Kingdom	6.82	4,590	2.97	2,003	4.24	2,852	.54	592	19.49	13,112	.84	563
French West Indies	38.49	26,763	4.03	2,721	8.84	6,006	15.21	16,885	22.57	15,182	28.85	19,463
Antigua	16.98	11,507	24.30	16,237	5.04	3,398	8.44	9,357	11.15	7,566	19.38	2,081
Virgin Islands (U.S.)	4.98	3,353	.54	360	5.15	3,465	.33	364	11.40	7,687	4.75	3,196
St. Kitts	17.90	12,122	13.58	9,209	--	--	.85	932	2.20	1,475	--	--
Barbados	6.05	4,078	.17	113	1.43	958	.48	479	2.91	1,964	3.30	2,216
Netherland Antilles	2.41	64,641	.90	608	1.19	844	2.18	2,408	6.10	4,079	.20	135
Trinidad	--	--	--	--	--	--	1.16	1,276	--	--	28.40	19,125
Others	.90	608	.67	450	--	-- --	.02	22	.22	142	.53	360
Total	94.53	127,662	47.16	31,701	25.89	17,523	29.27	32,315	76.04	51,207	86.25	47,139

SOURCE: Government of Dominica Statistical Unit.
[a] Hurricane David struck during mid-season.
[b] Hurricane Allen struck at the end of the season.
[c] Only statistics for the first two fiscal quarters were available.

Table 30

Eastern Caribbean Consignment and Non-Consignment Mango Exports
Shipped by Geest Industries Ltd.
(In Metric tons)

Exporting Country	Year				
	1980	1981	1982	1983	1984
St. Lucia	312.21	31.83	89.63	146.91	172.87
St. Vincent	161.92	79.26	66.49	216.71	97.35
Dominica	4.27	4.28	27.30	10.12	1.85
Total	479.40	115.37	183.42	373.38	272.07

SOURCE: Geest Industries Ltd. Castries, St. Lucia.

APPENDIX 2

RESEARCH METHODOLOGY

Appendix 2

Research Methodology

The methodology employed in this study of the mango production and marketing system in the Eastern Caribbean involved three major components: review of the available literature and secondary data concerning the production and export of fresh fruits and vegetables to regional and extra-regional markets; interviews with key informants who participate in the Eastern Caribbean mango commodity system or observers of the broader agricultural production and marketing system; and formal surveys of supermarkets in Barbados and Trinidad.

Secondary Sources of Information

Secondary information was collected and reviewed at the beginning of this study in order to: provide an overview of the production and marketing system for fresh fruits and vegetables in the Eastern Caribbean; gain more specific knowledge about mango regarding regional and extra-regional markets, production/marketing processes and functions, post-harvest treatments and practices, and technical aspects of production; and to identify key gaps in the data base for mango. A majority of the literature and data reviewed for this study were collected from the following organizations and institutions:

- Geest Industries Ltd. (St. Lucia)
- US AID Regional Development Office in the Caribbean (Barbados)
- British Development Division (Barbados)
- Food and Agriculture Organization of the United Nations (Barbados)
- Barbados Agricultural Statistical Information Service (BASIS)
- Market Intelligence Unit/Dominica Division of Agriculture
- Market Intelligence Unit/Government of St. Vincent
- St. Lucia Banana Growers Association
- Inter-American Institute for Cooperation on Agriculture (Barbados)
- Systems Caribbean Limited (Barbados)
- Caribbean Agricultural Research and Development Institute (CARDI/St. Lucia)

- Caribbean Development Bank Library (Barbados)
- University of the West Indies (Trinidad)
- Agricultural Statistical Offices of the governments of St. Lucia, Dominica, St. Vincent, Barbados, and Trinidad
- Tropical Development and Research Institute (TDRI/London)
- Liason Committee for African Caribbean and Pacific Countries (COLEACP/Paris)
- Post-Harvest Institute for Perishables (University of Idaho; Moscow, Idaho, USA)
- Foreign Agricultural Service/United States Department of Agriculture (Washington, D.C.)
- Agriculture Canada, Marketing and Economics Branch (Toronto)
- North American Mango Importer's Association (Los Angeles)

Interviews With Key Informants

Key informants interviewed in the Eastern Caribbean during this study can be divided into two categories: those who actually participate in producing, assembling, exporting, shipping, importing, wholesaling, retailing, and consuming mangoes; and knowledgeable individuals who have a broader perspective on the agricultural production and marketing system such as researchers, managers of agricultural projects and government officials.

Eastern Caribbean exporters proved an invaluable source of information about the production and marketing system for mangoes in the region and represent an important part of this study. Development of the case studies of export trading firms presented in Chapters II, IV, and V involved four basic steps: identification of the universe of firms that export mangoes; extensive interviews with five selected firms and observation of their operations; corroboration of information collected from these firms with other knowledgeable sources where possible; and additional interviews with the five firms intended to clarify and supplement information gathered previously.

Fifteen Eastern Caribbean firms that export mangoes (mainly to extra-regional markets) were identified through interviews with key informants from government agencies, research organizations, agricultural grower associations, and international development organizations. These firms are listed below:

- Caribbean Agricultural Trading Company (CATCO)

- Eastern Caribbean Agencies Ltd.
- St. Vincent Marketing Corporation
- Dennery Farmco Ltd.
- Orange Hill Estates
- St. Lucia Marketing Board
- C. P. L. Gunsam & Son
- Trec
- TNT Produce Ltd.
- Valton Enterprise Ltd.
- Dominica Farmers Union
- Dominica Agricultural Marketing Board (not currently trading)
- R. Prevost
- Jean Baptiste
- Video Shack

From this universe of firms, five firms that appear to be the largest and most consistent Eastern Caribbean exporters of mangoes were selected for more in-depth case study. Specifically, the research focused on interactions of these firms with other system participants such as producers, shippers, and wholesale distributors; and on standard operating procedures employed by the selected firms to collect, assemble, and export mangoes to extra-regional sources (two firms do ship regionally). Observations of various physical functions performed by these firms such as sorting, packaging, and shipping were combined with interviews involving the exporters and their employees to develop the case studies. Cost information and export volumes were also collected for the five firms, but in some cases, were incomplete.

Mango producers were also interviewed at pack-houses of various export firms on market days in order to learn more about their methods of operation and the problems they encounter in producing and marketing mangoes. Several of these farmers were later visited so that primary observations could be made at their orchards. Other farmers were identified through the ministries of agriculture in St. Vincent and Dominica to acquire similar information.

While no formal survey instruments were used for the interviews conducted with exporters and producers, question sets were developed to guide the conversations and facilitate subsequent analysis. For example, the sequence of questions posed to export firms followed their performance of physical functions (collection, sorting, packaging, etc.), probed the nature of the firm's interactions with other system participants (producers, shippers, wholesalers, etc.), explored problem areas, and sought opinions about how to remove identified constraints. Producers were also asked a standard, but similarly flexible, set of questions.

Supermarket Surveys in Barbados and Trinidad

The Barbados Supermarket Survey

Fresh produce managers of 20 major supermarkets were interviewed in Barbados, 15 of which were drawn from the BASIS weekly supermarket sample.[a] The remaining five supermarkets were identified through key informants and an informal telephone survey. A major supermarket was defined as a self-service retail store employing ten or more individuals and predominantly merchandising food items mainly sold in pre-packaged form. The definition excluded mini-marts and small shops which generally do not merchandise fresh fruits and vegetables or that sell them inconsistently in limited quantities. The sample also excluded supermarkets which otherwise satisfied the definition but which do not merchandise fresh fruits and vegetables. One supermarket contacted does sell fresh produce but because of high losses due to consumer damage, does not retail mangoes. Therefore, this supermarket was not included in the survey. The sample of 20 supermarkets drawn for the survey represents approximately 80 to 90 percent of the major supermarkets in Barbados that merchandise fresh fruits and vegetables.

In order to obtain the most accurate results possible the interviews were conducted with produce buyers who interact with suppliers on a daily basis. The questionnaire was designed to elicit both quantitative and qualitative information from buyers. Quantitative information comprised estimates of weekly volumes of mangoes flowing through supermarkets, prices paid by supermarkets, and retail prices charged. Pre-

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[a] The BASIS REPORT is a weekly report published by the Barbados Agricultural Statistical Information Service which reports agricultural price, production, and crop situation information. Their weekly sample of supermarkets includes the major retailers of fresh produce iin Barbados.

testing of the questionnaire indicated that volumes and prices change from the beginning of the season (April and May) to the peak season (mid to late May and June) and then again in the post-peak months (July through September). However, difficulty in collecting estimates which capture changes between these three periods of supply was also encountered during pretesting of the questionnaire. Hence, fresh produce managers were asked to estimate volumes and prices for the "low season" when mangoes are scarce, and the "peak season" when they are abundant.

Qualitative information incorporated into the questionnaire explored areas such as types of suppliers; supply patterns; handling and merchandising practices; product quality; potential for increasing volumes sold; consumer trends; and supermarket preferences. In some cases, interviewees did not answer certain questions or gave inadequate responses which could not be tabulated. In such instances, the number of managers responding are reported in the presentation of research findings. All managers were interviewed by the researcher in approximately 30 minute sessions at the respondents' respective supermarkets.

To corroborate supermarket managers' descriptions of display techniques for mangoes and the display locations in the supermarkets, observations of the various types of displays, their position in respect to other fresh fruit and vegetables, packaging methods, etc. were made by the researcher.

The Trinidad Supermarket Survey

The Trinidad sample consisted of 23 major supermarkets, affiliated with three chain groups: Hi-Lo; Tru Valu; and Allum's. This sample represents about 50 percent of the major supermarkets in Trinidad.

Although the Trinidad survey was an abbreviated version of the Barbados survey, the same major objectives applied: to identify product specifications, the types of suppliers, and opportunities for expanding sales; to collect and analyze volume and price information; and to examine problems supermarkets encounter in establishing continuous supplies of high quality mangoes.

The largest chain group (17 stores) purchases a majority of its fresh produce supplies through a central purchasing warehouse, therefore the manager and produce buyer of that operation were interviewed. Supermarkets in the two smaller chains (and two stores) are responsible for buying their own fresh fruits and vegetables, hence, produce managers of each supermarket were interviewed.

APPENDIX 3

BARBADOS PUBLIC MARKET AND SUPERMARKET

PRICES FOR MANGOES

Table 31

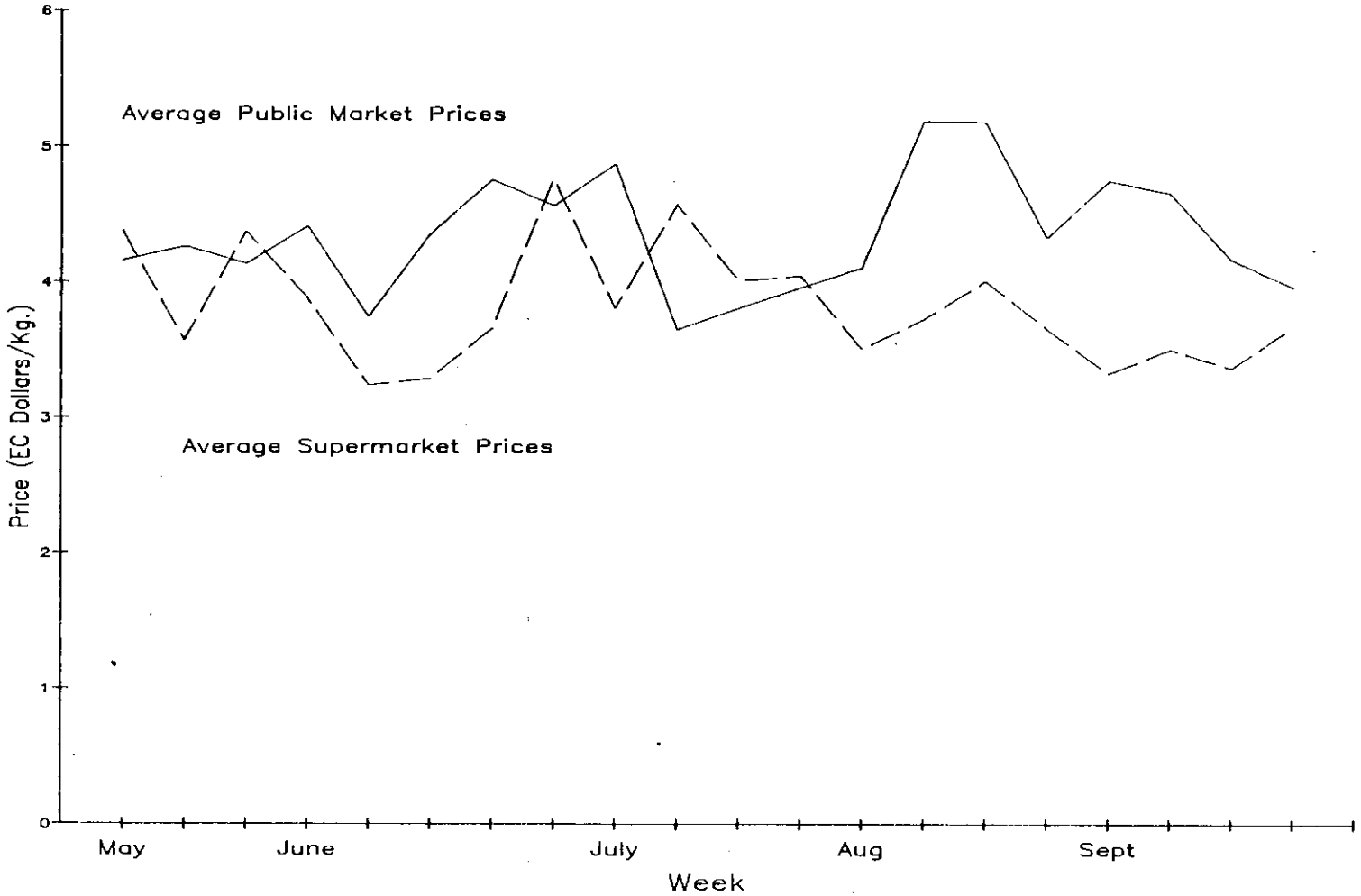
1984 Barbados Public Market Prices for Julie and Imperial Mangoes
(In EC Dollars/Kg.)

Week	Cultivar		Week	Cultivar	
	Julie	Imperial		Julie	Imperial
5/12	4.17	4.16	7/21	3.51	4.10
5/19	4.37	4.15	7/28	NA[a]	NA
5/26	3.42	4.83	8/04	4.37	3.84
6/02	3.88	4.94	8/11	6.15	4.23
6/09	3.00	4.48	8/18	4.48	5.87
6/16	3.73	4.96	8/25	5.18	3.48
6/23	4.32	5.18	9/01	3.97	5.53
6/30	4.04	5.07	9/08	4.37	4.94
7/07	4.54	5.20	9/15	4.76	3.57
7/14	3.22	4.08	9/22	3.97	NA

SOURCE: Survey data.

[a]NA = no data was available.

Figure 8: 1984 Barbados Public Market and Supermarket Retail Prices for Mangoes (In EC Dollars/Kg.)



SOURCE: Survey data; and the Barbados Agricultural and Statistical Information Service.

APPENDIX 4

EUROPEAN COMMUNITY TRADE STATISTICS

AND PRICES FOR MANGOES

Table 32

Major Exporters of Mangoes to the European Community in 1983
(Volumes in Metric Tons)

Exporting Country	Importing Country							Total Exports[a]
	U.K.	France	Netherlands	West Germany	Belgium/ Luxembourg	Italy	Denmark	
Mali	98	793	830	101	17	2	4	1,845
Mexico	980	382	248	149	20	27	-	1,806
Burkina Faso	6	889	84	-	3	-	-	982
Brazil	276	338	55	146	43	79	-	937
South Africa	186	297	93	195	23	42	1	841
Pakistan	747	1	-	4	-	1	2	755
Kenya	220	108	38	115	60	-	4	545
India	515	2	3	3	18	1	-	542
Ivory Coast	42	425	26	1	42	-	-	536
U.S.A.	99	115	142	12	7	3	-	378
Israel	113	137	40	48	6	18	3	366
Peru	80	208	39	13	15	2	-	357
Venezuela	221	1	-	-	-	5	-	227
Guinea	4	124	10	-	52	-	-	190
St. Lucia	187	-	-	-	-	-	-	187
Senegal	3	110	48	-	13	-	-	174
Jamaica	139	-	-	-	-	-	-	139
St. Vincent	117	-	-	-	-	-	-	117
Congo	-	81	7	-	-	-	-	88
Guatemala	47	11	14	13	1	-	-	86
Thailand	2	19	54	6	1	-	-	82
Total Imports[b]	4,724	4,368	1,960	1,135	382	233	47	11,180

SOURCE: NIMEXE. Publication of the Statistical Office of the European Communities.
[a]Exports for South Africa and Israel do not sum to the total export figure as small volumes exported to Greece are not included in the table. South Africa exported four metric tons to Greece in 1983 and one ton to Israel.
[b]Imports for individual European Community countries do not sum to the total import figure as small export volumes from other exporting countries are not listed.

Table 33

1984 Average Weekly Price Ranges Paid to Mango Exporters in the U.K.
(In Pounds Sterling/Kg.)

Exporting Country	7/30-8/3	8/6-8/10	8/13-8/17	8/20-8/24	8/27-8/31	9/3-9/7	9/10-9/14	9/17-9/21	9/24-9/28
Mexico	1.60-1.65	1.00-1.60	1.00-1.60	1.40-1.60	1.50-1.60	1.50-1.60	-	-	-
Israel	-	-	-	1.80-2.00	1.80-2.00	1.80-2.00	1.80-2.00	-	-
Brazil	-	-	-	-	-	-	2.70	2.40	2.20
St. Lucia/ St. Vincent	1.20-1.45	1.20-1.45	1.20-1.45	1.20-1.45	-	1.30-1.50	1.30-1.50	1.30-1.50	-

SOURCE: COLEACP

Table 34

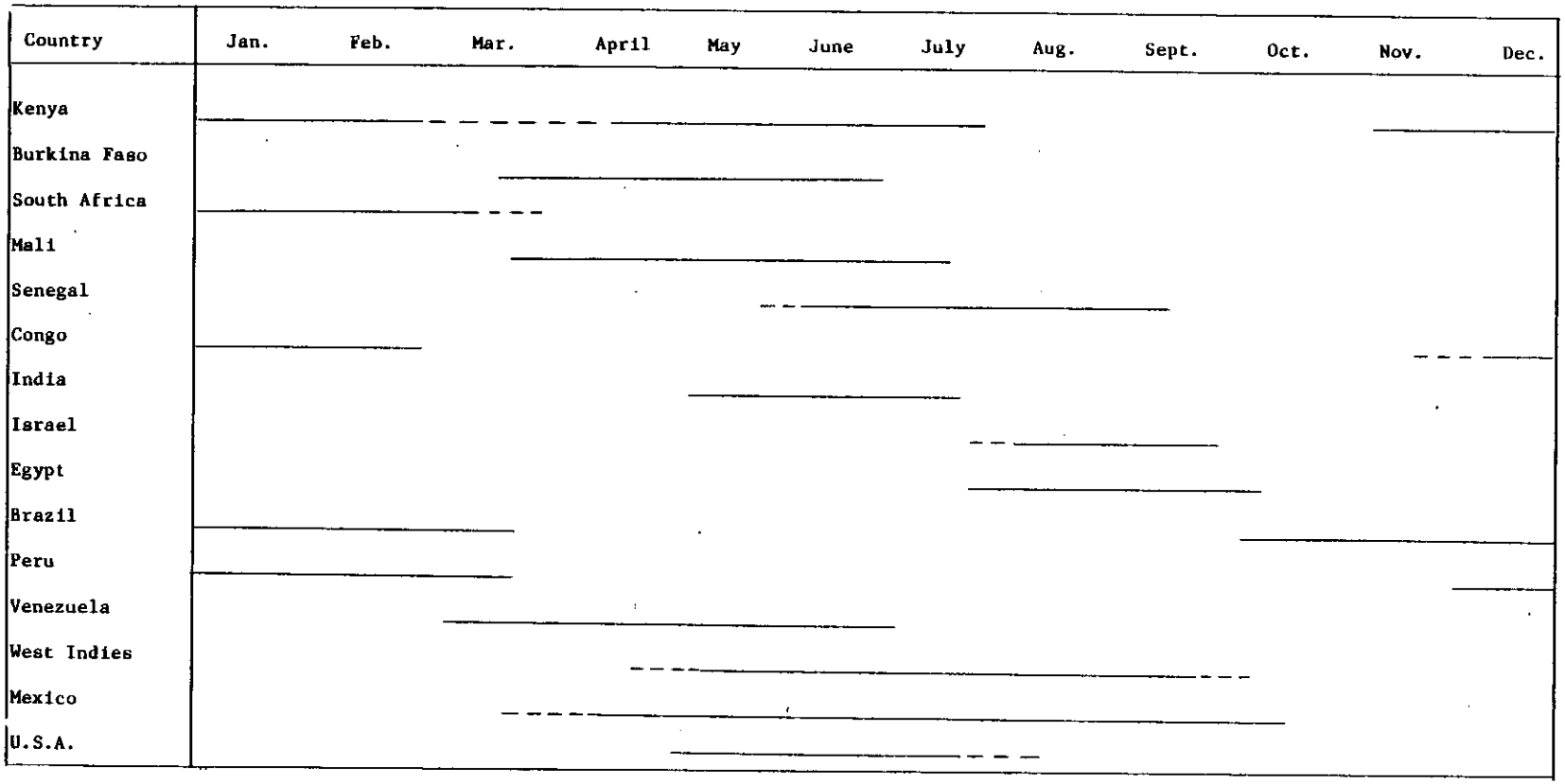
1982 Monthly Mango Imports of European Community Countries
(In Metric Tons)

Country	J	F	M	A	M	J	J	A	S	O	N	D	Total 1982
Great Britian	101	95	189	320	688	723	911	536	289	126	191	120	4,290
France	142	127	150	491	806	426	204	131	94	55	76	199	2,901
Netherlands	41	49	60	221	415	347	104	145	79	30	52	53	1,596
F.R.G.	47	58	57	66	88	110	75	66	38	28	47	66	746
U.E.B.L.	8	10	17	90	112	83	60	34	13	16	28	28	499
Italy	13	13	16	20	29	9	5	-	3	16	9	27	160
Denmark	1	1	2	2	3	4	2	4	2	2	4	1	28
Ireland	1	0	0	1	2	5	44	2	16	34	1	4	110
E.C. Total	354	353	491	1,211	2,143	1,707	1,405	919	534	307	408	498	10,330

SOURCE: COLEACP

Table 35

Major Mango Exporting Seasons of Selected World Producers[a]



SOURCES: Geest Industries Ltd.; COLEACP. Study of Tropical Fruit and Off-Season Vegetables on the European Market. 1981; Stother, Jacqueline. The Market for Fresh Mangoes in Selected Western European Countries. Tropical Products Institute. 1971; Market Information Services, Marketing Services Division. Agriculture Canada.

[a] Solid lines represent major export periods while broken lines indicate periods of limited exports.

APPENDIX 5

LIST OF INDIVIDUALS AND ORGANIZATIONS PROVIDING INFORMATION AND ASSISTANCE

List of Individuals and Organizations Providing Information and Assistance

Thomas Ambrose

Kennedy D'Auvergne

Michael Bharett
TRIN STORES, Ltd.

Mike Boulais
Kendall Foods

Vasantha Narendran-Chase
CARDI

Andrew Collins

Percival Combe
Dennery Farmco Ltd.

Joe Davis
Systems Caribbean Limited

David Dayes

Marcus and Douglas DeFreitas
Eastern Caribbean Agencies

Michael Griffin

C.P.L. Gunsam

John Hailwood
Geest Industries Ltd.

Ken Heinds

David Jackson
BDD

Claude John

Edward Kent
St. Lucia Model Farms

Rafael Marte
IICA

Atherton Martin
Dominica Farmers Union

John McIntyre

Richard Plumbley

Mr. Rodriquez
Geest Industries Ltd.

Cynthia Scott

Gilbert Telemarque
St. Vincent Marketing Corporation

Eustace Valton

The Ministries of Agriculture in:
St. Lucia, St. Vincent, Dominica, and Barbados

APPENDIX 6

PRELIMINARY WORKING PAPERS

Appendix 6

PRELIMINARY WORKING PAPERS

Seven working papers were written during field research conducted in the Eastern Caribbean for this report on the production/marketing system for mangoes. The working papers, which are listed below, are available from the USAID/Regional Development Office in the Caribbean (Barbados) or the Department of Agricultural Economics/Michigan State University.

Number	Title
1.	A Rationale for a Commodity Case Study of Mango
2.	Progress Report on Mango Commodity Channel Study: St. Vincent Interviews
3.	Briefing Report on Mango Commodity Study: The BDD Tree Crop Diversification Project in the Windward Islands; Geest Industries Ltd.; Dennery Farmco Ltd.
4.	Field work in St. Vincent: Eastern Caribbean Agencies' Export Marketing System for Mangoes and Interview with a Grower in St. Vincent
5.	The Barbados Supermarket System of Procurement and Merchandising for Mangoes: A Survey
6.	A Commodity Case Study of Mango: Preliminary Report
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