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AN ANALYSIS OF SUPPLY AND DEMAND  
CONDITIONS FOR CAPE VERDE'S BANANA INDUSTRY

By

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CHAPTER I  
INTRODUCTION

1.1 Overview of the Agricultural Sector

Agriculture is the main economic activity in Cape Verde, an archipelago-country 400 miles off the West coast of Africa. The country has an estimated population of about 300,000, and a land area of 4,030 square kilometers. With a population density of 75 inhabitants per square kilometers it is the most densely populated country in the Sahelian region.

Two types of farming are practiced in the (ten) Cape Verde islands: irrigated and rainfed farming.

Rainfed farming takes about 97 percent of cultivated land and is dependent on natural rainfall between August and October. Corn, beans, sweet potatoes and other dryland crops are planted with the "hope" that rain will fall and strong winds will not destroy the harvest. Presently due to the effects of the Sahelian drought on rainfed farming, most corn and beans (which are subsistence crops) come from abroad in the form of food aid and imports.

Yields on rainfed land are generally low due mainly to rain shortfalls. Corn yields vary from 800 kg/ha under optimal rainfall to 400 kg/ha; and bean yields vary from 200 kg/ha to 80 kg/ha under optimal and poor rainfall conditions, respectively.



Irrigated farming in Cape Verde takes only about 1,850 ha, i.e. three percent of the total agricultural land. Almost all irrigated farming takes place in the valleys of the Santo Antao and Santiago Islands. This type of farming is dependent on pumped groundwater and surface water from rainfall. In recent years, due to rain shortfalls, and their effects on groundwater status, water for irrigation has been more and more scarce. The increasing cost of fuel for pumping groundwater has also made this situation quite difficult.

The main crops competing for irrigated land are sugarcane, banana and cassava. About sixty percent of the country's irrigated land is under sugarcane production, while most of the rest is shared between bananas, cassava and potatoes.

## 1.2 Problem Statement and Need for the Study

Before 1974 Cape Verde was an important supplier of bananas to Portugal. For example, about 25 percent of Portuguese imports of bananas were supplied by Cape Verde in 1969. At the same time banana exports contributed about 22 percent of total export earning to Cape Verde in 1970 when approximately 60 percent of total production was exported. During this period Cape Verde was a Portuguese colony and enjoyed good ocean transport links with Portugal.

Since Cape Verde's independence in 1974-75, total production of bananas has increased from about 3,500 metric tons to 6,000 in 1979. However, the proportion which is exported has dropped from about 60 percent in 1972 to less than 6 percent in 1979; while total export earnings from banana exports has decreased from 15 percent in 1972 to about 4 percent in 1979.

Given that domestic production of bananas in Cape Verde has increased between 1974 and 1979, the drop in the proportion of banana production which is exported is hypothesized to be due to:

- a substantial increase in Cape Verde's domestic consumption, thus reducing the availability of bananas for export;
- a substantial decrease in total demand for imported bananas by Portugal and/or an increased price competition among suppliers to that market;
- less frequent and reliable ocean transportation services between the two countries after 1975, which could hamper the shipping of bananas to Portugal; and
- the change in ownership of the major banana plantation of Almeida Henriques, which was taken over by the government of Cape Verde in 1974. This could have been accompanied by a partial destruction of the export marketing organization, and arrangements.

The present government of Cape Verde, aware of the losses in export earnings from banana export, intends to study potential ways of regaining the level of export sales of bananas prior to 1974.

### 1.3 Purpose and Specific Objectives of the Study

The general purpose of this study is to analyze selected factors affecting Cape Verde's ability to increase production and sales of bananas. In this process the export market of Portugal will be examined as it has traditionally been the only export market for Cape Verdian bananas.

In specific terms the objectives of this study are:

1. To analyze factors affecting the supply of bananas in Cape Verde.
2. To review trends in demand for bananas in Cape Verde and in Portugal as an attempt to discover potential reasons for the drop in banana exports from Cape Verde.
3. To suggest additional research and policy considerations which could improve Cape Verde's ability to produce and sell bananas.

#### 1.4 Sequence of Analysis

In Chapter I an overview of the agricultural sector in Cape Verde is presented. The effects of the Sahelian drought on both rainfed and irrigated farming are indicated. The problem statement is translated into the purpose and objectives of this study.

In Chapter II a review of previous studies is presented along with the methodological approach for carrying out the objectives of this study.

In Chapter III an econometric model for the short-run supply response will be estimated and, the empirical results will be analyzed.

In Chapter IV a discussion of the demand for bananas in Cape Verde and in Portugal will be presented. The concern here is especially with the influence of this import demand on Cape Verde's export of bananas.

Finally, in Chapter V a summary of major findings, recommendations, and suggestions for further research will be provided.

CHAPTER II  
METHODOLOGY

2.1 Review of Previous Studies

Several studies have analyzed factors affecting the performance and the future of the banana industry. A review of some of these studies will be particularly relevant in understanding the banana industry, the analytical procedure generally used in supply and demand analysis of bananas, and the conclusions reached by these studies.

In The World Market of Bananas Jean-Paul Valles<sup>1</sup> identified major factors influencing banana demand (retail price of bananas, consumers' income, price of other fruits, and taste) and supply (climatic and soil conditions, banana diseases, wind damage, costs of opening and operating a banana plantation, price paid to the producer, and costs of distributing bananas to the consuming country). His main concerns were with "sheltered markets" which restrict free trade and put a downward pressure on prices (considering that there is a trend for over-production in certain countries).

In World Demand Prospects for Bananas in 1980, USDA researchers<sup>2</sup> used regression models to forecast future trends in banana consumption in the world. The modeling of demand took into consideration the

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<sup>1</sup>Valles, "World Market of Bananas."

<sup>2</sup>USDA, "World Demand Prospects for Bananas in 1980."

potential saturation levels (about 10 kg) in per capita consumption of bananas in developed countries, while the supply model indicated a tendency for increasing exports.

In Tropical Agribusiness Structures and Adjustments, Bananas, a group of Harvard Business School researchers<sup>1</sup> presented a comprehensive analysis of potential problems and desirable adjustments in the banana industry within a global context. The authors "found it necessary to go beyond the customary procedures (i.e. regression analysis) in order to deal with problems of geographic segmentation, episodic changes, and most particularly with the complexities of decision structures." In their "agribusiness commodity system" approach (see also Goldberg)<sup>2</sup>, the emphasis is put on functions performed in the industry, on the decision making points, and on the environmental framework within which decisions are made. Of particular interest in this study is its market-orientation and the attention given to management requirements in coordinating and integrating functions needed for improved performance in the industry. Moreover, the concept of "episodic impacts" presented is quite relevant because it calls for decision makers in the industry to be alert to short-run political changes and flexible with their future plans.

In general the main conclusions from these studies are:

- any expansion of availability of bananas for export should be in line with growth of demand, otherwise the potential oversupply in the world market would put a downward pressure on export prices;

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<sup>1</sup>Arthur, Houck, Beckford, "Tropical Agribusiness Structures and Adjustments, Bananas."

<sup>2</sup>Goldberg, "Agribusiness Management for Developing Countries: Latin America."

- the export pricing of bananas from each country has to be very competitive in order for each supplier to maintain its position in an excess capacity world situation;
- existing trade restraints, quotas and discriminatory tariffs, in certain importing countries affect the direction of banana trade, and give competitive advantage to countries which would otherwise be at a disadvantage; and
- the per capita consumption of bananas in developed countries has been growing at a slower rate or even declining despite rises in per capita income in these countries (saturated markets).

## 2.2 The Economic Model of the Banana Industry in a Producing Country

Economic relationships in the banana industry are complex. They involve both the supply and demand conditions for this commodity in the exporting countries and, most often, the import demand conditions in the importing country. Figure 1 on the next page illustrates major relationships concerning the supply and demand structure<sup>1</sup> of the banana industry in a producing country. The relationships implied in this diagram are consistent with economic theory and knowledge of existing factors of the banana industry. This economic model indicates that:

- the production of bananas is dependent on: the producers' price of bananas in the preceding year, the price of the competing crop, the availability of water for irrigation, institutional

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<sup>1</sup> Foote defines structure as "the process by which a set of economic variables is believed to be generated." See R. Foote "Analytical Tools for Studying Demand and Price Structure," pg. 7.

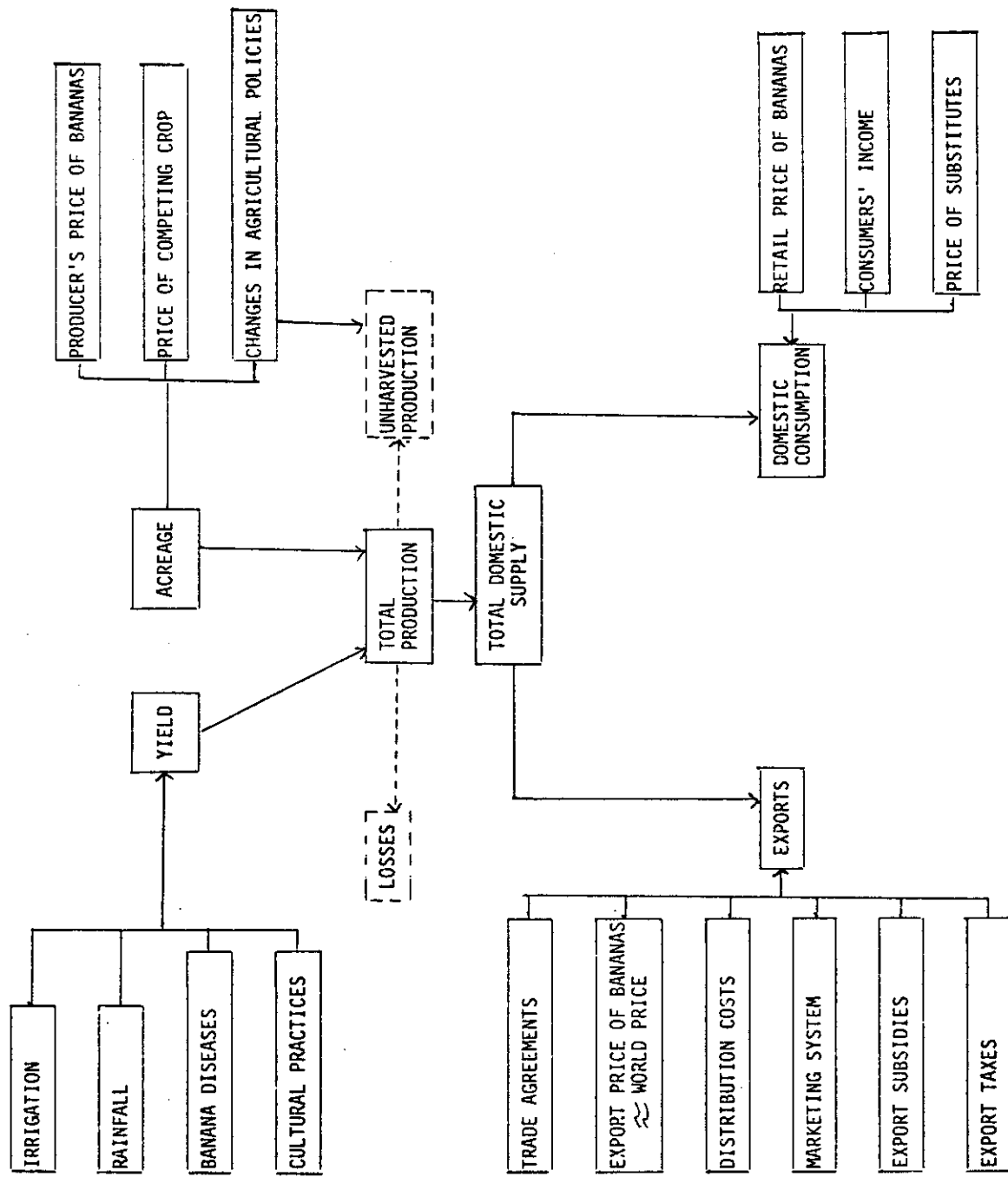


Figure 1. Banana Industry: Supply and Demand Structure in a Producing Country

factors affecting the banana industry, cultural practices and banana diseases;

- the total supply of bananas is equal to the quantity produced after losses and unharvested production has been deducted. Total supply includes the supply for local consumption, and for export. (For this study total supply will be assumed equal to total production); and
- the export of bananas is basically determined by a series of factors including: the export price of bananas, the costs of distribution of bananas to the importing countries, the availability of an infrastructural system for export, export taxes, export subsidies, and preferential trade agreements. Here, the export price is expected to be nearly equivalent to the world export price, indicating that the country is competitive in the world trade of bananas.

### 2.3 The Statistical Model

A statistical model is a functional representation in algebraic form of economic relationships so as to facilitate a quantitative analysis of major factors of the economic model.

The simplified economic model described above is then presented below in algebraic form:

Demand

$$\text{domestic: } Q^d = f(P^d, P^s, Y)$$

$$\text{export : } Q^x = f(P^x, D, T, S, M)$$



## Supply

$$\text{total supply: } Q^S = f(P^X, W, I, P^C)$$

$$\text{Identity : } Q^S = Q^d + Q^X$$

where:

$Q^d$  = quantity of bananas demanded in the domestic market

$Q^X$  = quantity of bananas demanded for export

$Q^S$  = total quantity of banana supplied

$P^d$  = price of banana in the domestic market

$P^X$  = price of bananas for export

$P^C$  = price of another crop competing for the same resources as  
banana

$P^S$  = price of substitutes for bananas in the domestic market

$Y$  = consumers' income in the domestic market (per capita basis)

$D$  = distribution costs for exporting bananas

$T$  = taxes on bananas for export

$S$  = subsidies on bananas for export (preferential trade agreements)

$W$  = water for irrigation (from rainfall and pumped groundwater)

$I$  = institutional factors affecting the banana industry

$M$  = availability of transportation for the export of bananas

In this complete model the four endogenous variables for the systems of equations are: the domestic price of bananas, the export price of bananas, the total supply, and the quantity which is exported. All the other variables are assumed predetermined. Variables such as availability of transportation are important institutional factors. Though not easily quantifiable, these are included in the model because of their hypothesized effects on the results, if ignored.

#### 2.4 The Extended Economic Model (Including the Importing Country)

For a perishable commodity, like bananas, with very limited preservation and processing alternatives, demand conditions are considered crucial because short-run surplus results in such economic losses. Therefore an extended economic model, including the demand conditions in the importing countries is generally necessary in the analysis of the banana industry. This is particularly true when most of a country's production is exported.

The demand and price structure in the importing country(s) is illustrated on the diagram on the next page (Figure 2).

The demand for imports is presented as a function of domestic consumption. Here domestic consumption is influenced by the retail price of bananas, the price substitutes, and consumers' income. Retail price itself is affected by the import price, taxes, duties and marketing costs. Here import prices are expected to be approximately the same from any source of supply, i.e., equivalent to the world price, in a competitive world market of bananas. Yet, the world trade of bananas is not so perfectly competitive, and there are no world-wide commodity agreement for bananas. Individual importing countries' trade policies, such as tariffs and quotas, affect import prices, according to the sources of supply.

#### 2.5 The Redefined Statistical Model

This model is developed taking Cape Verde as an exporting country of bananas and Portugal as an importing country. The fact that all bananas exported from Cape Verde were (and still are) for the Portuguese import market, makes the demand of bananas for export in Cape Verde equal

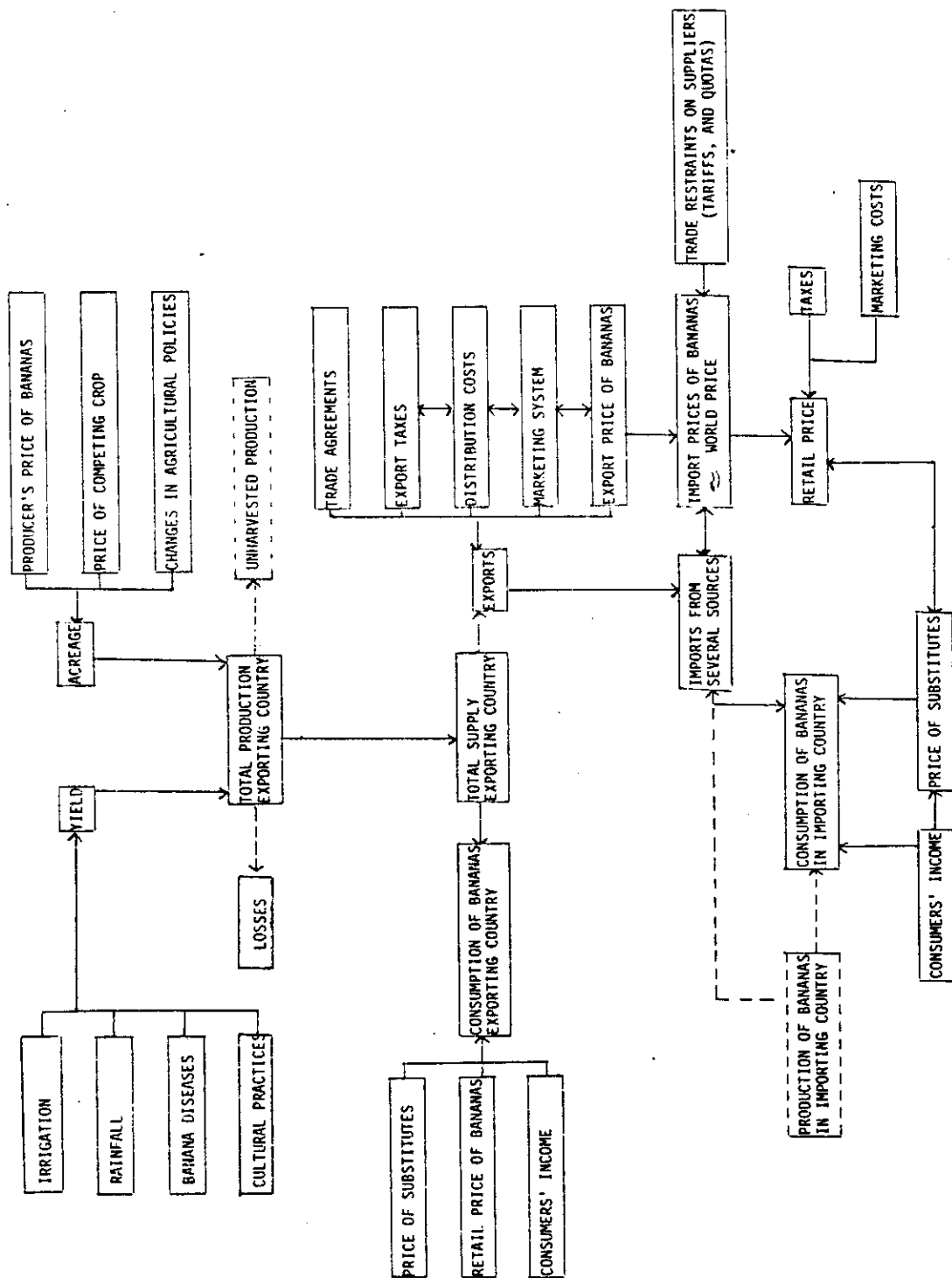


Figure 2. Banana Industry: Supply and Demand Structure (Including Importing Country)

to Portugal's demand for import of bananas from Cape Verde. That is, what Cape Verde exports is what Portugal imports from Cape Verde. Therefore an equation for the import demand for Capeverdean bananas in Portugal can replace the equation for the export demand for bananas in Cape Verde. The statistical model already specified will, therefore, be redefined and adjusted to the realities of the conditions of the banana industry in Cape Verde.

#### Demand

$$\text{domestic: } Q^d = f(P^d, P^s, Y)$$

$$\text{imports : } Q^m = f(P^m, PI^s, YI, MS, TR)$$

#### Supply

$$\text{total supply: } Q^s = f(P^d, W, I, P^c)$$

$$\text{Identity: } Q^s = Q^d + Q^m$$

where, the new variables are:

$Q^m$  = quantity of bananas Portugal imports from Cape Verde

$P^m$  = import price for bananas, is expected to be equivalent to world price

$PI^s$  = price of substitutes for bananas in Portugal

$YI$  = per capita income in Portugal

$MS$  = market shares of other suppliers to the Portuguese market

$TR$  = trade restraints on "new" suppliers to the Portuguese market

Again the model is complete in the sense that there is one equation for each endogenous variable. The endogenous variables are: price of banana in the domestic market ( $P^d$ ); import price of bananas ( $P^m$ ); quantity supplied ( $Q^s$ ); and, quantity of bananas imported ( $Q^m$ ). Complete models are required if we wish to derive from them equations to be used

for analytical purposes or prediction. It is generally advisable to at least formulate a complete economic model, even if a decision may be reached at a later stage to fit statistically only part of the equation.<sup>1</sup>

Due to lack of sufficient and reliable data for the analysis of the complete model as specified, only the total supply equation will be fitted to data and then analyzed.

However, a tabular and graphical analysis of trends in Cape Verde's domestic consumption and the import demand of bananas into Portugal will be examined. For this purpose data will be collected on the volume of Cape Verde consumption; Portugal's imports; the sources of this supply; the market shares of these suppliers; and on the export and import prices by these different sources of supply. We will also examine changes in Portugal's trade restraints and in the level of per capita income in Portugal (for the period 1962 to 1979). Here, the main concerns will be on understanding the nature of changes in Cape Verde's consumption and Portugal's total volume of imports, changes in competition among Portugal's suppliers, and the effects of preferential trade arrangements on alternative Portuguese suppliers.

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<sup>1</sup>Ibid., p. 9.

## CHAPTER III

### ANALYSIS OF THE SHORT-RUN SUPPLY RESPONSE OF BANANAS IN CAPE VERDE

#### 3.1 Banana Production in Cape Verde: A Historical Perspective

Historically, the banana industry in Cape Verde can be divided into two periods: the colonial period, while Cape Verde was a Portuguese colony, and the post-independence period after 1975.

During the colonial period two types of farms existed: plantations in the island of Santiago, and small farms in the island of Santo Antao. With the exception of the banana plantation of Tarrafal, which was publicly administered, all farms were privately owned. At this time, most of the bananas exported from Cape Verde were from the banana plantation of Almeida Henriques, a Portuguese colonizer, in the valley of Santa Cruz. This banana plantation was the largest one in Cape Verde. On the other hand, in the island of Santo Antao where banana production was characterized by more "traditional" cultural practices and organizations, smaller farmers produced bananas mostly for the domestic market. In this mountainous island inadequate roads and ports make it difficult to produce bananas for export.

After the independence of the country in 1975, the government took over the banana plantation of Almeida Henriques and turned it into a

state-owned farm.<sup>1</sup> The production of bananas in this farm and in the Tarrafal plantation have been benefitting from government's policy of limiting the production of the competing crop, sugarcane. Presently these state-owned farms are attempting to diversify into producing other fruits and vegetables, yet, bananas still represent their major crop.

In the island of Santo Antao no major change took place with the independence of the country. Here, private farmers still decide on how much and what to produce to their perception of trends in the market. That is, these farmers allocate their resources (labor and irrigated land) to the production of bananas or sugarcane (or potatoes) according to the profitability (and risks) involved in producing them.

#### Trends in Production

Cape Verde is not as well-endowed as most banana producing countries. The amount of water available for irrigation is dependent on poor and erratic rainfall and pumped groundwater. In fact, due to the effects of the Sahelian drought, there has been a greater use of (costly) pumped water rather than spring as a source of irrigation since the early 1970s.

As can be seen in Table 1, banana production in Cape Verde increased from about 5,700 in 1966 to about 9,000 metric tons in 1969. A declining trend followed between 1970 and 1975 as production decreased to its lowest level of 3 thousand metric tons in 1975. This is thought to be due largely to the Sahelian drought. From 1975 onwards increased production has been reported, at an average level of 6,000 m.t.

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<sup>1</sup>Beckford in "Underdevelopment in Plantation Economies of the Third World," indicates that plantations were major targets in the independence struggle of many colonial people.

TABLE 1

Bananas in Cape Verde:  
Cropped Areas, Yields, Production (1966-1979)

Year	Cropped Areas <sup>a</sup> (ha)	Yields <sup>b</sup> (KG/ha)	Production <sup>c</sup> (M.T.)
1966	282	20.3	5,730
1967	292	22.1	6,470
1968	336	20.5	6,900
1969	332	27.6	9,180
1970	297	28.7	8,530
1971	319	17.0	5,400
1972	245	21.1	5,190
1973	187	25.1	4,690
1974	180	19.4	3,500
1975	170	17.6	3,000
1976	190	23.7	4,500
1977	250	25.2	6,300
1978	230	26.1	6,000
1979	265	22.6	6,000

<sup>a</sup>Source: Cape Verde: Direcçao Geral De Estatística, Unpublished data.

<sup>b</sup>Ibid.

<sup>c</sup>Source: FAO: Production Yearbooks, 1966-1979.



### 3.2 Econometric Procedures

To meet the first objective of this research, i.e., to analyze factors affecting the supply of bananas in Cape Verde, econometric methods will be used. Here, econometric methods are the application of economic theory, mathematics, and statistical techniques for the purpose of estimating relationships among economic variables considered relevant in the analysis.<sup>1</sup> In this process the steps to be followed are:<sup>2</sup>

- specifying the model in explicit equation form and describing the hypothesized relationships between the economic variables;
- collecting data on the variables of the model and estimating the coefficients of the model;
- evaluating the estimated coefficients of the model on the basis of economic, statistical and econometric criteria; and
- using the results of the model, i.e., elasticities, projections, etc.

### 3.3 Model Specification

#### 3.3.1 Economic Model

The main factors considered relevant in determining the quantity of bananas supplied in Cape Verde are:

- the price of banana in the preceding year;
- the price of sugarcane in the preceding year;
- the amount of rainfall; and
- institutional changes, after the country's independence in 1975.

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<sup>1</sup>Salvatore, "Statistics and Econometrics," p. 12.

<sup>2</sup>Tomek and Robinson, "Agricultural Product Prices," p. 303.

The rationale for considering these variables is as follows:

Banana is an annual crop. This biological growth process indicates that actual supply is not determined by current price but by the price of bananas in the preceding year.<sup>1</sup> That is, the higher the price of the commodity at the planting time, the more will be planted, and, generally the more will be supplied a year later.

When two crops compete for the same type of resources (irrigated land) the relative price of these crops is expected to determine the amount of resources allocated to each crop.<sup>2</sup> Here the price of sugarcane is expected to be a determinant of the amount of land allocated to the production of bananas. Because of lack of data on the price of sugarcane, or of a conversion factor, the price of "aguardiente" (which is made from sugarcane) will be considered as affecting the supply of bananas.

In Cape Verde the sources of water for irrigation are rainfall and pumped water. As banana is an irrigated crop it is believed that a year of good (bad) rainfall would have a positive (negative) effect on the quantity of banana produced and supplied that year. A binary variable<sup>3</sup> will be used to take care of this effect on supply.

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<sup>1</sup>Ibid., p. 315.

<sup>2</sup>Ibid., p. 84.

<sup>3</sup>Gujaraty, Basic Econometrics, "In regression analysis, it frequently happens that the dependent variable is influenced, not only by variables which can be readily quantified on some well-known defined scale (e.g., income, prices) but also by variables which are essentially qualitative in nature (e.g., strikes, changes in government economic policy)." Binary variables usually takes care of the presence or absence of a "quality" or an attribute.

Institutional changes, i.e., changes in government policy can induce an expansion as well as put a constraint in the supply of bananas. A binary variable will be included in the model to capture any effect of institutional changes on the banana industry after the country's independence in 1975. Such policies include the nationalization of the major banana plantations in 1975 and policies regarding the limitations of sugarcane production.

### 3.3.2 Statistical Model

The above mentioned relationships are then expressed in stochastic equation form. Here, stochastic means a non-exact relationship, indicating that the model is not expected to represent the real phenomena exactly. The alternative regression equations which will be fitted to data and the theoretical expectations about the signs of the parameters of each equation are consistent with the biological and economic relationship already discussed. Thus it is anticipated that the quantity of bananas supplied will be: 1) positively related to the price of bananas ( $b_1 > 0$ ); 2) inversely related to the price of ayardiente ( $b_2 < 0$ ); and 3) positively related to the amount of rainfall ( $b_4 > 0$ ).

$$\text{I. } QBN = b_0 + b_1 \text{ PBN } (-1) + b_2 \text{ PCC } (-1) + b_3 \text{ DVI} + b_4 \text{ DVR} + e_t$$

$\qquad \qquad \qquad >0 \qquad \qquad \qquad <0 \qquad \qquad \qquad >0$

$$\text{II. } \text{LOGQBN} = b_0 + b_1 \text{ LOGPBN } (-1) + b_2 \text{ LOGPCC } (-1) + b_3 \text{ DVI} + e_t$$

$$\text{III. } \text{LOGQBN} = b_0 + b_1 \text{ LOGPBN } (-1) + b_2 \text{ LOGPCC } (-1) + b_4 \text{ DVR} + e_t$$

$$\text{IV. } QBN = b_0 + b_1 \text{ PBN } (-1) + b_2 \text{ PCC } (-1) + b_4 \text{ DVR} + e_t$$

where:

QBN = quantity of banana supplied (in 10 metric tons)

PBN (-1) = price of banana (lagged one year) in cents kg, deflated

- PCC (-1) = price of aguardiente (lagged one year) in cents per liter, deflated
- DVI = institutional changes; binary variable for policy changes after the independence of the country in 1975
- DVR = rainfall, binary variable takes values of 1 for good rainfall in 1962 to 1967, 1969, 1971, 1975 and 1976; and the value of 0 for the bad years.
- $b_i$  = regression coefficients to be estimated
- $e_t$  = error term, assumed normally distributed with zero mean and finite and constant variances.

### 3.4 The Data

The data was collected from secondary sources for the period 1962 through 1979. The main sources consulted are: Cape Verde Statistical Bulletins, FAO Production and Trade Yearbooks, and AID Publications.

In the supply equations export price of bananas is used as a proxy for the producers' price, which was not available. The price of aguardiente is also used as a proxy for the price of the "real" competing crop, sugarcane, as the lack of a conversion factor did not allow for the computation of the price of sugarcane. The effect of the general price level is included through the use of consumer price index which takes into account the fact that producers are also sensitive to the changes of the general price levels. Changes in government policies are represented by a binary variable that takes the values of 0 before 1975, and 1 in 1975 and thereafter. The erratic rainfall distribution is also

included through the use of a binary variable carrying values 1 during the years of "good" rainfall in 1962 to 1967, 1969, 1971, 1975 and 1976; e.g. rainfall above 100 mm. during the rainy season, July-November, for the principal sites; and the value of 0 for the years of rainfall below 100 mm.<sup>1</sup>

### 3.5 Evaluation

The above-defined equations are estimated by means of ordinary least squares (OLS). It is assumed that the errors are normally distributed with zero mean and constant and finite variances. The estimated coefficients will be then consistent, asymptotically efficient and have approximately a normal distribution. This will make it possible to use t-test for statistical inferences.

The results of the estimation procedures of the regression equations predicting the supply of bananas in Cape Verde are summarized in Table 2.

### 3.6 Evaluation

The evaluation of the models will be done on the basis of economic, statistical and econometric criteria.<sup>2</sup>

The economic criteria are concerned with the logic of the model, i.e., with the signs of the coefficients.

The statistical criteria refer to: (a) the proportion of the variation in the dependent variable that can be "explained" from changes in the explanatory variable; in short the value of  $R^2$ ; (b) the statistical significance of each explanatory variable as defined by the t-tests; and (c) the overall significance embodied in the F-tests.

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<sup>1</sup>USAID, "Cape Verde: Assessment of the Agricultural Sector," pg. 100.

<sup>2</sup>Salvatore, op. cit., p. 6.

TABLE 2  
 Regression Equations Predicting the Supply of Banana (1963-1978)

Dependent Variable, Quantity of Banana Supplied QBN	Explanatory Variables							R <sup>2</sup>	$\bar{R}^2$	D.W.	F Ratio
	Intercept C	Lagged Price of Banana PBN(-1)	Lagged Price of Aguardiente PCC(-1)	Dummy Variable Policy DVI	Dummy Variable Rainfall DVR						
I-OLS	293.05 (1.85)	62.9 (3.93)	-2.70 (-2.45)	23.84 (.32)	122.68 (1.94)			.78	.70	1.4	9.9
II-OLD LOG-LOG	6.35 (35.7)	.55 (4.61)	-.25 (-4.05)	.99 (.78)				.66	.57	1.5	7.6
III-OLS LOG-LOG	6.01 (31.40)	.65 (6.05)	-.23 (-4.72)		.23 (2.50)			.76	.70	2.2	12.
IV-OLS	266.97 (2.04)	65.3 (4.81)	-2.49 (-2.97)		128.86 (2.23)			.78	.72	1.8	14.

\*t-values in parentheses.

The econometric criteria refer to the tests of the assumptions of the basic regression model about the error term (assumed normally distributed with zero mean, and finite and constant variances).

Based on these criteria and looking at Table 2, the following general conclusions are possible:

- all the specified equations met the economic criteria, i.e., the signs of the coefficients are consistent with a priori economic theory;
- the overall statistical significance as measured by the F-test is quite satisfactory in all equations (F-ratio  $> 7.0$ ); and
- the explanatory power of the independent variables in the models, i.e., the  $R^2$  is relatively acceptable ( $R^2 > .66$ ).

However, a more detailed analysis indicated that:

- Equations I and II do not meet the statistical criteria, i.e., these equations include variables which do not meet the t-tests. For instance, the DVI variable is not statistically significant in equations I and II as its t-ratios is lower than the tabulated  $t_{12} = 1.35$  at the 10 percent level.
- Equation III meets all the criteria (already discussed). For instance, the logical tests do indicate that the include explanatory variables behave as hypothesized by economic theory. The signs of the coefficients are all consistent with the theoretical expectations. The estimated parameters are all significant at the 5 percent level. This equation "explains" 76 percent of the variation in the dependent variable ( $R^2 = .76$ ). Auto-correlation was not a problem as indicated by the D.W. statistics

(D.W. = 2.2). This value is close to 2.0 which is considered an indication of no serial correlation.<sup>1</sup>

- Equation IV includes the same variables as equation III. However, the equation is a linear regression model while equation III is a double log model. The performance of equation IV is as good as that of equation III. In equation IV,  $R^2 = .78$  provides an adequate explanation of the overall power of the explanatory variables included. The t-statistics indicates that each parameter estimated was significant at the 5 percent level. The F-test provides the conclusion that the model as a whole is statistically significant at the 1 percent level. Multicollinearity, i.e., high correlation between explanatory variables, can be checked. This problem makes it impossible to isolate the effect of each explanatory variable on the dependent variable. Since each parameter estimated was statistically significant and the partial correlation coefficients among explanatory variables were not high, it can be concluded that there is no clear evidence of serious multicollinearity in equation IV. Autocorrelation, i.e., the problem of the error term in one time period being correlated with the error in any other time period, was also tested. As the D.W. is equal to 1.8 this problem was not relevant for equation IV.<sup>2</sup>

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<sup>1</sup>Salvatore, op. cit., p. 192. Wonnacott and Wonnacott, "Econometrics," p. 61.

<sup>2</sup>Note that the presence of autocorrelation can lead to unbiased but less efficient estimator; and biased sampling variances. Salvatore, op. cit., p. 142.



- The two best models are therefore, equations III and IV. Both models are theoretically logical. Serial correlation is not relevant as indicated by the D.W. statistics (2.2 and 1.8 respectively). The t-statistics showed that each of the included variables are significant at the 5 percent level. The explanatory power,  $R^2$ , is quite acceptable, i.e., 78 percent of the variation in the dependent variable could be "explained" by the variables in equation IV; and 76 percent in equation III.

Based on the general and detailed conclusions presented it is decided to consider equation IV as the representative model.

### 3.7 Elasticities

Elasticities are very useful in applied economics. They enable economists to understand the behavior of economic participants facing economic changes (price incentives, income changes, etc.).

In this study two types of short-run supply elasticities will be considered: the own-price elasticity and the cross-price elasticity.

By definition the own-price elasticity is the percentage change in the quantity supplied to the percentage change in the price of the product, other factors being held constant. Since an increase in quantity supplied is normally associated with a rise in price, the sign of this elasticity usually is positive.<sup>1</sup>

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<sup>1</sup>Tomek and Robinson, op. cit., p. 77.

From the linear regression model (equation IV) the own-price elasticity of supply, in the short-run, was derived as the following:

$$d Q_{BN}/d P_{BN} \times \overline{P_{BN}/Q_{BN}} \text{ or } b_1 \overline{P_{BN}/Q_{BN}}$$

that is:

$$65.3 \times 5.58/568 = 0.65$$

This elasticity is positive as expected.

Comparison of this estimated elasticity with that obtained by Niane<sup>1</sup> for groundnuts in Senegal, i.e., a price elasticity of 0.69 (both bananas and groundnuts are cash crops for export), indicates that such estimate is reasonably acceptable. For policy purposes, it indicates that producers are quite responsive to changes in prices. Here, this elasticity implies that a 10 percent increase in the price of banana would result in an increase in the supply of bananas by 6.5 percent. This supply elasticity might vary according to the (location of production) island considered. For instance, for the small private farmers in the island of Santo Antao it tends to be higher as they (these farmers) are in a position to expand or contract banana acreage within a short period; while, for the state-owned farms (large plantations) in the Santiago island this elasticity might be lower since the two large plantations are publicly owned and operated, and present government policies are aimed at limiting the production of sugarcane in benefit of bananas and other fruits and vegetables.<sup>2</sup> This government policy could in fact be the major reason for increased production since 1975, in spite of rapid decrease in exports.

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<sup>1</sup>Niane, "Supply and Demand of Millet and Sorghum in Senegal," Appendix II, p. 66.

<sup>2</sup>USAID "Cape Verde, Country Development Strategy Statement."

The cross-price elasticity of supply measures the responsiveness of quantity supplied of a certain commodity to a change in the price of the competing crop.<sup>1</sup> In a sense, it means what will be the percentage in the quantity of banana supplied due to a certain percentage change in the price of sugarcane (more specifically, the price of "aguardiente"). Other things remaining the same, a rise in the price of "aguardiente" can be expected to lead to a decrease in the supply of bananas (e.g., a negative response in the supply of bananas will be expected for an increase in the price of "aguardiente").

This elasticity was computed from model IV, at the means of PCC (price of competing crop) and QBN (quantity of banana supplied) that is:

$$b_2 \times \overline{PCC} / \overline{QBN} = 2.49 \times 57.3/568 = -.25$$

This cross-price elasticity is negative as expected. It implies that as the price of "aguardiente" increases less of bananas will be supplied. Again, one should not, however, infer a chain of causality from this as many factors do interact in the production of bananas. Here, this cross-elasticity means that, other things remaining the same, sugarcane (which is used for aguardiente production) is a good competitor for irrigated land in the Cape Verde, mainly in the island of Santo Antao.

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<sup>1</sup>Tomek and Robinson, op. cit., p. 84.

## CHAPTER IV

### REVIEW OF TRENDS AND SELECTED FACTORS AFFECTING DEMAND FOR CAPE VERDE BANANAS

#### 4.1 Trends in Cape Verde Domestic Consumption and Exports

As explained in the preceding chapter the supply of bananas in Cape Verde is utilized for both the domestic consumption and for exports.

Data in Table 3 indicates that while the demand for exports increased between 1962 and 1968, Cape Verde's domestic consumption declined within the same period. That is, while export of bananas to Portugal rose from about 1,800 to 5,000 metric tons, domestic consumption decreased from about 3,000 to 1,700 metric tons between 1962 and 1968. In a context where exporting could have been more profitable than supplying the domestic market, it comes as no surprise that about 65 percent of bananas produced were exported to Portugal during this period (1962-68).

Between 1969 and 1973 production of bananas in Cape Verde declined considerably, but the proportion of bananas exported was still higher than bananas consumed domestically.

However, after 1975, Cape Verde's political and economic systems were radically transformed following the country's independence in 1975.<sup>1</sup>

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<sup>1</sup>Following the April Revolution in Portugal (1974), Cape Verde became independent on July 5, 1975.

TABLE 3

## Banana Utilization in Cape Verde, 1962-79

Year	Production <sup>a</sup> (M.T.)	Export <sup>b</sup> (M.T.)	Domestic Consumption <sup>c</sup> (M.T.)
1962	4,900	1,780	3,120
1963	5,010	2,490	2,520
1964	5,220	3,110	2,110
1965	5,410	3,390	2,020
1966	5,730	4,030	1,700
1967	6,470	3,973	2,497
1968	6,900	5,183	1,717
1969	9,180	5,191	3,989
1970	8,530	5,034	3,496
1971	5,400	3,500	1,900
1972	5,190	3,494	1,696
1973	4,690	1,539	3,151
1974	3,500	659	2,841
1975	3,000	27	2,973
1976	4,500	684	3,816
1977	6,300	414	5,886
1978	6,000	401	5,599
1979	6,000	344	5,656

<sup>a</sup>Source: FAO: Production Yearbooks, 1962-79.

<sup>b</sup>Source: FAO: Trade Yearbooks, 1962-79.

<sup>c</sup>The difference between domestic production and exports, assuming zero losses and excesses.

The nationalization of the two major banana plantations and the almost complete disruption of ocean transportation services seriously affected the export of bananas from Cape Verde, since 1975.

In trying to describe the events that shaped the demand for Cape Verde bananas since its independence, one is faced with the problem of portraying a series of simultaneous domestic and export adjustments.

A convenient starting point to examine this process is the increase in Cape Verde's domestic demand for and consumption of bananas which took place after 1975. A combination of factors led to this. First, the terms of trade turned in favor of supplying the domestic market (even at a less competitive price than that obtained from export) as ocean transportation services became less frequent and reliable after 1975 and as the Portuguese government reduced imports. Second, the significant increase in domestic supply because of the difficulties of export could have led to a decrease in the domestic price of bananas. Third, with the independence came a relatively increase in private and public remittances from abroad (including donor aid) and this is thought to have increased the level of per capita income in Cape Verde.<sup>1</sup>

With the combination of these factors, it is plausible that domestic consumption could have increased from about 3 thousand in 1975 to above 5.6 thousand metric tons in 1979. It should be pointed out that in the context of virtually no increase in domestic consumption over the period 1962 through 1973, this apparent increase in consumption is not as large

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<sup>1</sup>USAID, "Cape Verde: Assessment of the Agricultural Sector," p. 106.

as it might seem. In fact, when compared to other developing countries per capita consumption of bananas ranging as high as 45 kilograms a year,<sup>1</sup> Cape Verde's present level of approximately 16 kilograms a year is entirely feasible. (In section 4.5 projection of possible future consumption will be made.)

#### 4.2 Portuguese Banana Trade Agreements and Restraints

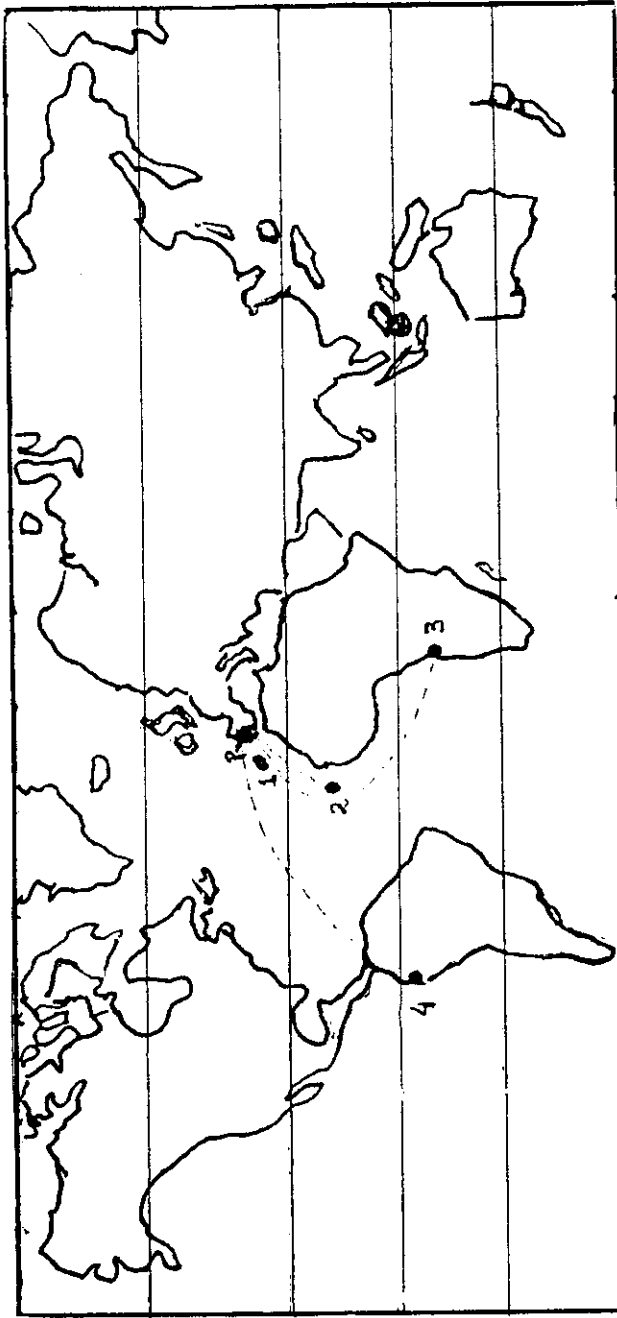
Turning our attention to export market, it is necessary to assess the position of Cape Verde vis-a-vis other suppliers to the Portuguese market. In doing this, it is necessary to take into account the conditions of access to that market. Conditions like geographical proximity and trade preferences play a major role in determining the trade shares of suppliers of bananas in any particular market.

Historically there are three groups of suppliers in the Portuguese market: "domestic" supplier (Madeira island), preferential suppliers (ex-colonies), and free-market suppliers (Ecuador and Puerto Rico).

Bananas "shipped" from the Portuguese island of Madeira (see Figure 3 on the next page) are not regarded as imports and as such are free of tariffs. Bananas imported from the Cape Verde and Angola (ex-colonies) enjoyed in the past and still enjoy preferential treatment in relation to other supplying countries (e.g. a tariff rate of 33 dollars per metric ton is paid on bananas from the ex-colonies, while a rate of 112 dollars

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<sup>1</sup>USDA, op. cit.; in this study it is indicated that per capita consumption of bananas in developing countries ranges as high as 45 kilograms.



- P - Portugal
- 1 - Madeira
- 2 - Cape Verde
- 3 - Angola
- 4 - Equador

Figure 3. Portugal Market Suppliers



is levied on imports from other countries.<sup>1,2</sup> That is a highly discriminatory system of tariff exists on bananas flowing into the Portuguese market.

The net effect of these provisions is that it enables Portugal, when it desires, to import primarily from Madeira (which is the closest supplier) and from its ex-colonies and, in effect, restricting its "sheltered" market from nonassociated suppliers. At the same time these provisions can have a negative effect on domestic consumption through higher prices than what would prevail under free trade.

#### 4.3 Trends in Portuguese Banana Consumption

As shown in Table 4 banana consumption in Portugal was about 37 thousand metric tons in 1964. At this time per capita consumption was about 4 kilograms a year. However, by the end of the sixties it rose to about 55 thousand metric tons (6.0 kg in per capita consumption in 1969).

Perhaps the most striking figures in Table 4, however, relate to the rapid increase in per capita consumption (from about 6.0 to 9.9 kilograms) between 1969 and 1974.<sup>3</sup>

There are a number of factors which are thought to explain this increase. First there is the fact that the five years preceding April 1974, were years of rapid economic growth (about 7.0 percent a year) for Portugal,

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<sup>1</sup>I.C.T.B. "Portugal: International Customs Journal," Years 72-73 and 78-79, p. 21 and p. 8, respectively.

<sup>2</sup>USDA, "World Demand Prospects for Bananas in 1980," p. 57.

<sup>3</sup>It should be realized that some of the bananas imported will never actually be consumed because of wastage and shrinkage at the various stages of the distribution process. As such this per capita consumption might be overstated.

TABLE 4  
Portuguese Banana Consumption, 1962-79

Years	(1)=5+6 Total Availability Of Bananas For Consumption (1,000 M.T.)	(2) Population <sup>a</sup> (Million)	(3)=1/2 Banana Per Capita Consump- tion (kg)	(4) Gnp <sup>b</sup> Per Capita (Deflated) (1,000 Escudos)	(5) Production of Bananas in the Madeira Island <sup>c</sup> (1,000 M.T.)	(6) Total Imports of Bananas <sup>e</sup> (1,000 M.T.)	(7) Average <sup>f</sup> Import Price For Bananas (Deflated) (US Cents/Kg)
1962	35.2	9.0	3.9	8.7	31	4.2	6.1
1963	36.1	9.1	4.0	9.6	31	5.1	6.7
1964	36.9	9.1	4.0	9.4	31	5.9	7.1
1965	37.7	9.2	4.1	9.9	31	6.7	7.0
1966	41.6	9.1	4.6	10.5	34	7.6	9.5
1967	46.4	9.0	5.2	11.1	36	10.4	12.2
1968	51.7	8.8	5.9	11.7	35	16.7	12.0
1969	54.4	8.7	6.1	11.7	33	21.9	12.2
1970	71.0	8.6	8.2	13.2	35	36.0	12.2
1971	77.5	8.6	9.0	13.7	29	48.5	11.3
1972	81.6	8.6	9.4	14.0	21	60.6	13.3
1973	78.2	8.6	9.1	15.3	21	57.2	14.0
1974	91.3	9.2	9.9	14.0	20	71.3	10.5
1975	53.8	9.6	5.6	12.4	23	30.8	9.8
1976	48.2	9.7	5.0	13.0	23	18.2	11.6
1977	50.9	9.7	5.3	13.4	26	10.9	8.9
1978	44.0	9.8	4.5	15.1	26	4.0	7.2
1979	44.1	9.9	4.5	17.3	26	4.1	7.0

<sup>a</sup>Source: USDA: Selected Agricultural Statistics on Portugal.

<sup>b</sup>Ibid.

<sup>c</sup>Source: FAO: Production Yearbooks, 1962-79.

<sup>d</sup>Source: FAO: CCP:BA "Current Situation and Outlook for 1980," 1978-79.

<sup>e</sup>Source: FAO: Trade Yearbooks, 1962-79.

<sup>f</sup>Ibid.

leading to an increase in real per capita income (also indicated in Table 4).<sup>1</sup> Second, the negative growth rate of the agricultural sector during this period led to sharp increases in imported food<sup>2</sup> (thus, including bananas). Third, Portugal increased imports of bananas from Angola could also be considered a sort of aid to prevent the (political) independence of this ex-colony.

In a nutshell, the rapid increase in consumption of bananas, mainly from imports, between 1969 and 1974, may be generally attributed to rising incomes, to the sluggish agricultural growth in Portugal, and, most importantly, to changes in policy directed at avoiding the independence of Angola.

Since the revolution of April 1974, Portugal's political and economic systems were radically transformed. The story of the Portuguese economy since then involves a complex and often confusing interaction of cause and effect, which makes it difficult to explain the sharp decline in per capita consumption of bananas from about 9.9 in 1974 to about 5.6 in 1976. However, much of it can be related to the following combined factors.

First, with Angola's independence, Portugal no longer found it necessary to accept such large imports from Angola.<sup>3</sup> Second, Portuguese government policies since 1975 has been aimed generally at reducing domestic demand and imports. Such measures like higher taxes, surcharge on imports, and depreciation of the Escudo (by 62 percent between 1974 and 1978)<sup>4</sup> certainly affected the amount of bananas that was imported. Third, real per capita

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<sup>1</sup>World Bank "Portugal: Current and Prospective Economic Trends," p. 4 and 5.

<sup>2</sup>Ibid.

<sup>3</sup>Angola went through a period of political and and economic crisis after its independence in 1975. Note that Angola was the largest supplier of bananas to Portugal just before 1974.

<sup>4</sup>World Bank, op. cit., p. 3.

income decreased between the end of 1973 and the end of 1978 (see Table 4). Fourth, the shortage of bananas in the world market, which prevailed between 1974 and 1977,<sup>1</sup> could have prevented Portugal to import larger amounts.

#### 4.4 Cap Verde's Position in the Portuguese Import Market for Bananas

The concern here is to examine Cape Verde's position vis-a-vis other suppliers to the Portuguese market, as an attempt to discover potential reasons for the relatively large decline in Cape Verde's export of bananas.

As shown in Table 5 about 60 to 80 percent of the bananas consumed in Portugal before 1970 were "domestically" supplied by Madeira island. However, between 1970 and 1974, the amount supplied by Madeira declined from about 33 to 20 thousand metric tons while total consumption in Portugal rose from about 71 to 91 thousand, thus resulting in a much larger proportion of consumption which is supplied from imports. Nevertheless, this upward trend in consumption from imports which prevailed until the end of 1974 changed drastically thereafter (following the effects of the revolution of 1974 in Portugal). These trends can be seen in Figure 4.

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<sup>1</sup>F.A.O., "Agricultural Commodity Projections, 1975-85," p. 76. "World trade in bananas declined in 1974-76 partly due to a supply problem caused by floods and hurricanes in central America, and drought in Africa and in the Carribean."

TABLE 5  
Market Share of Portugal's Banana Imports, 1962-79

Years	Production in the Madeira Island (1,000 M.T.)	Portugal Total Imports (1,000 M.T.)	Portugal Total Availability of Bananas (1,000 M.T.)	Sources of Imports								
				Cape Verde	Angola	Equador	Puerto Rico	Volume (M.T.)	% Import	Volume (M.T.)	% Import	
1962	31	5.2	35.2	1,780	2,420							
1963	31	5.1	36.1	2,490	2,650							
1964	31	5.9	36.9	3,110	2,830							
1965	31	6.7	37.7	3,390	3,390							
1966	34	7.6	41.6	4,030	3,570							
1967	36	10.4	46.4	3,973	6,481							
1968	35	16.7	51.7	5,183	11,576							
1969	33	21.9	54.4	5,191	16,222							
1970	35	36.0	71.0	5,034	30,970							
1971	29	48.5	77.5	3,500	44,990							
1972	21	60.6	81.6	3,494	57,121							
1973	21	57.2	78.2	1,539	55,724							
1974	20	71.3	91.3	659	70,689							
1975	23	30.8	53.8	27	30,764			14,344	.78			
1976	23	18.2	48.2	684	3,177			10,413	.95			
1977	26	10.9	50.9	414				3,679	.90			
1978	26	4.0	44.0	401								
1979	26	4.1	44.1	344				3,271	.80			.12

<sup>a</sup>Sources: FAO: Trade Yearbooks  
UN: Commodity Trade Statistics  
FAO: Production Yearbooks

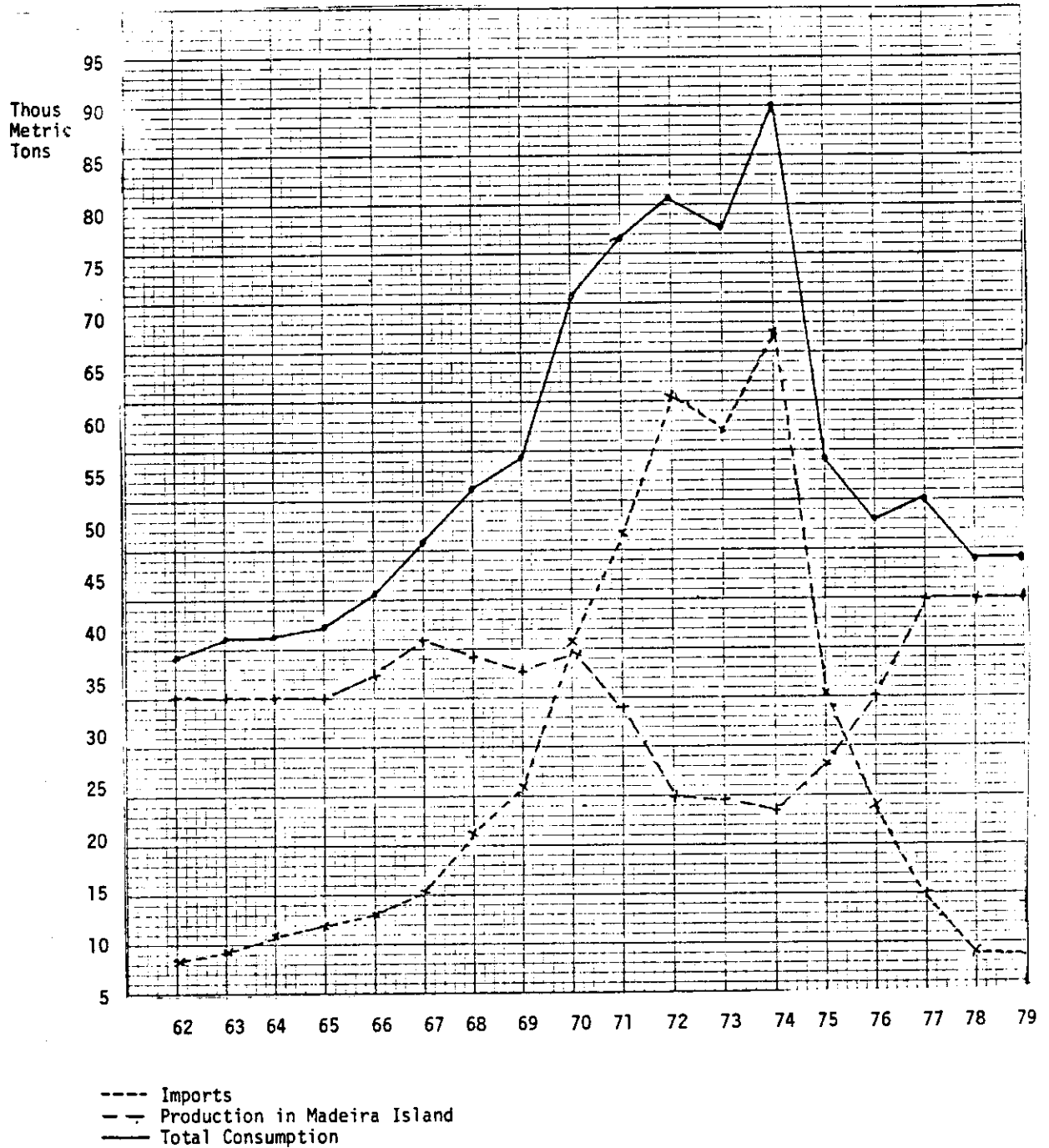


Figure 4.

Portugal: Trends in Banana Production, Consumption and Imports

During the period 1962-74, Cape Verde supplied a proportion of Portugal's rapidly increasing import demand. Its absolute level of exports increased from about 1,700 metric tons to 5,000 metric tons in 1970. However, between 1970 and 1974, Cape Verde saw Angola increasingly capture almost all the import demand of bananas into Portugal. During this period Angola increased its export to Portugal, from about 36 to 71 thousand metric tons.

As indicated in Table 6 the computed import unit values (value divided by quantity imported) for bananas imported from Cape Verde are lower than those from Angola. This would lead one to expect that Portugal would have imported more bananas from the Cape Verde, on the basis of lower prices. Yet, the contrary has happened: Cape Verde lost a good part of its market share in favor of Angola. Portugal special trade policies with regard to Angola (i.e. to prevent the independence of this ex-colony) could have made it more difficult for Cape Verde to export to that market.

From 1975 onwards Cape Verde supplied an increasing proportion of a much smaller and decreasing demand for imports in Portugal. More specifically, Cape Verde increased its import market share from about 4 percent in 1966 to about 8 percent in 1979, nevertheless, both its volume of exports and Portugal volume of imports were declining. Thus, the position of the Cape Verde in the import market of Portugal has been relatively insignificant since 1975.

TABLE 6

Portugal: Import Unit Value of  
Bananas by Source of Origin, 1963-1979

Year	From Cape Verde Import Unit Value US Cents/kg	From Angola Import Unit Value US Cents/kg	From Ecuador Import Unit Value US Cents/kg
1963	6	6	
1964	7	7	
1965	6	8	
1966	8	13	
1967	9	17	
1968	10	17	
1969	10	18	
1970	13	20	
1971	12	17	
1972	13	22	
1973	14	25	
1974	15	25	
1975	13	28	
1976	38	25	45
1977	38		38
1978	36		
1979	37		34

Sources: FAO: Trade Yearbooks, Years 1963-79,  
UN : Commodity Trade Yearbooks, 1963-79.



#### 4.5 Projection of Alternative Demand Possibilities

To assess potential demand for Cape Verde bananas, alternative projections of total demand will be attempted. This will be accomplished in two steps: first, domestic consumption will be projected and second, the results will be added to alternative assumptions of levels of export demand in order to project total demand for the period 1980 to 1985.

The fact that export demand is contingent on Portugal's import policy and on ocean transportation services makes the projection of domestic demand more important in the short run (say 3 years).

For the projection of domestic consumption (demand) the F.A.O. method will be used. This assumes that income and population are the key determinants of demand, and is based on the following relations:

$$(1) \quad d = p + \eta y$$

$$(2) \quad D_t = D_0 (1 + d)^t$$

where:

$d$  = rate of growth of consumption

$\eta$  = income elasticity

$y$  = rate of growth of per capita income

$p$  = rate of growth of population

$D_0$  = consumption in time  $t = 0$

$D_t$  = projected consumption in time  $t$

$T$  = time in years from  $D_0$  to  $D_t$

This projection will assume two alternative growth rates in per capita income: 1.5 and 3.0 percent. It will also assume two alternative elasticities of demand: .5 and .3. A 1.5 percent annual population

growth rate, as obtained from the Cape Verdean Statistical Bulletin, will be assumed for the projected period (1980 to 1985). With these values  $d$  is calculated.  $D_0$  is the domestic consumption of bananas in the basis year (1979 in this study) and it will be used to project domestic consumption up to 1985. The results of the projection of this demand is summarized in Table 7 and shows that domestic consumption of bananas in Cape Verde is expected to increase (depending on the assumptions) by about 700 to 1000 metric tons between 1979 and 1985, representing about 2 to 3 percent annual rate of increase. In a sense this is a relatively small increase which should be easily met by domestic supply given remunerative price for banana producers.

However, as shown in Table 8, different scenarios could be expected when export demand is considered. For instance, total demand projection at the existing export demand level of 500 metric tons, in 1976-79, is expected to grow to about 7000 metric tons in 1985 (scenario I); while this total demand could reach 10,000 metric tons in 1985 under scenario II, which assumes a previously obtained level of 3500 m.t. as in 1971-72.

Again, this total demand is the sum of domestic and export demand, assuming no competition between these two types of demand. However, it should be noted that under import demand and infrastructural conditions favorable for exporting the relative importance of domestic demand and export demand would be significantly different. In summary then, under present export market and infrastructural conditions, one should not expect more than relatively small changes in the demand for Cape Verde bananas. The situation could be reversed in the long run if exports to Portugal or other countries can be increased.

TABLE 7

## Domestic Demand Projections (M.T.)

YEARS	Alternative I (Assumptions) n=.3; p=1.5; y=1.3	Alternative II (Assumptions) n=.5; p=1.5; y=1.3	Alternative III (Assumptions) n=.3; p=1.5; y=3.0	Alternative IV (Assumptions) n=.5; p=1.5; y=3.0
1979	5656	5656	5656	5656
1980	5762	5777	5791	5825
1981	5871	5901	5933	6001
1982	5982	6028	6074	6182
1983	6095	6158	6221	6368
1984	6210	6290	6368	6555
1985	6327	6425	6520	6753

TABLE 8

TOTAL DEMAND PROJECTIONS<sup>a</sup> (M.T.)

YEARS	SCENARIO I - (Export Demand Level of 500 M.T.)				SCENARIO II - (Export Demand Level of 3500 M.T.)			
	ALTERNATIVE I	ALTERNATIVE II	ALTERNATIVE III	ALTERNATIVE IV	ALTERNATIVE I	ALTERNATIVE II	ALTERNATIVE III	ALTERNATIVE IV
1979	6000	6000	6000	6000	6000	6000	6000	6000
1980	6162	6177	6191	6225	9262	9277	9291	9325
1981	6271	6301	6333	6401	9371	9401	9433	9501
1982	6382	6428	6474	6582	9482	9528	9574	9682
1983	6495	6558	6621	6768	9595	9658	9721	9868
1984	6610	6690	6768	6955	9710	9790	9868	10055
1985	6727	6825	6920	7153	9827	9925	10020	10253

a: Note total demand is the sum of domestic and export demand.

b: These alternatives are under the same assumptions as those for domestic demand projections.

## CHAPTER 5

### SUMMARY, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

#### 5.1 Summary

Cape Verde, which used to export between 3,000 to 5,000 tons of bananas per year before its independence in 1975, is now exporting only around 400 tons annually. However, past levels of production has been maintained and even increased in relation to output obtained just before 1974.

It has been alleged that the decline in the proportion of banana production which is exported was due to:

- a substantial increase in domestic consumption of bananas;
- the less frequent ocean transportation services between Cape Verde and its traditional export market of Portugal since 1975;
- the change in ownership of the major banana plantations after the country's independence in 1975; and
- a substantial decrease in total demand for imported bananas by Portugal and/or an increase in price competition among suppliers to that market.

This study has investigated this problem of declining banana exports with the following set of specific objectives:

1. To analyze factors affecting the supply of bananas in Cape Verde.
2. To review trends in the total demand for Cape Verde bananas as an attempt to discover the decline in bananas exported.
3. To suggest additional research and policy recommendations which could improve the production and sales of bananas.

The methods used for carrying out these objectives were:

- econometric methods in the modeling of the supply response of bananas in Cape Verde; and
- tabular and graphical analysis in reviewing past trends of demand for bananas in Cape Verde and in the export market of Portugal.

Due to the lack of sufficient and reliable data for the analysis of the complete model as specified in Chapter II, only the total supply equation was fitted to data. However, the importance of demand characteristics was not neglected in the study of such perishable commodity, bananas. That is, changes in Cape Verde's domestic and export demand, as well as changes in the demand in the importing country, Portugal, were considered. In addition, the effects of changes in trade restraints and competition in the import market were examined, because of their influence on the level of exports from Cape Verde.

The results of the econometric analysis of the short-run supply response indicated, in general, that:

- the supply of bananas in Cape Verde is responsive to price changes. For instance, a 10 percent increase in price could lead to a 6.4 percent increase in the supply of banana in the following year; and

- changes in the price of sugarcane (more specifically aguardiente) do affect the production and supply of bananas in Cape Verde. For instance, the negative cross-elasticity of  $-.25$  obtained indicates that sugarcane production is strong competitor for irrigated land in Cape Verde. However, it was pointed out that the price-elasticities results of this analysis, which are in accordance with Neoclassical economic theory, should be interpreted with due consideration to weather-related factors, location of production and size of holdings. For example, small farmers in the island of Santo Antao are expected to be more responsive to changes in the price of bananas and/or in the relative price of sugarcane than larger farms (state-owned) in the island of Santiago. Another consideration in the interpretation of the results is related to the prices variable used. The export price used in this study was a more relevant factor before 1974 when over 50 percent of total supply was exported. But since that time, domestic price is likely the more relevant factor. However, data on domestic prices were not available to be included in the analysis.

The tabular and graphical analysis of (the changes in) the demand for bananas in Cape Verde and in Portugal since 1975 (the more relevant period) suggested that:

- While demand for exports in Cape Verde sharply decreased after 1974, the domestic consumption of bananas had about doubled to about 5,500 metric tons since then. It is believed that this rapid increase in domestic consumption is due to the rise in per capita income (mainly from public and private remittances from abroad and donor aid) and to a lower domestic retail price for bananas (for lack of means of transportation for exporting).
- The consumption of bananas in Portugal decreased from about 9.9 kg. to 4.5 per capita between 1974 and 1979, leading to a substantial reduction in the demand for import (i.e., the proportion of banana consumption from imports decreased from about 60 percent in 1974 to only 10 percent in 1979). It was found that such reduction in consumption and imports was related to several interacting events and factors which affected the economy of Portugal after the 1974 revolution, and the independence of its ex-colonies in 1975. More specifically, changes in government policies aimed at restricting imports, such as devaluation of the currency and surcharge on imports, coupled with Portugal's loss of interest in "aiding" the banana industry of the now independent Angola, were considered as major determinants of the decline in imports, and thus, the consumption of bananas in Portugal. Moreover, supply problems in Angola, and in the world market of bananas (which prevailed between 1974 and the end of 1977) seemed to have driven this decline even faster.



- Cape Verde position in this much reduced Portuguese import market has been relatively insignificant since 1974 and it appears that any further contraction in that market may prevent Cape Verde of exporting bananas to Portugal.
- Projections of alternative demand possibilities showed that only a relatively small increase can be expected in the domestic consumption of bananas in Cape Verde which should be easily met by domestic supply given remunerative price for banana producers. However, an additional export demand level of 3500 metric tons as previously obtained in 1971-72 can not be expected under presently unfavorable export market and infra-structural conditions.

## 5.2 Recommendations

This study provides insights into the banana industry in a context of episodic impacts (droughts, changes in trade policies of the importing country, discontinuity of ocean transportation services, and changes in ownership of major plantations). These episodic impacts which are often unpredictable (though certain to occur) call for decision makers in the industry to be alert and flexible with their future plans.

In this regard the focus here is on proposing alternative ways to adjust total supply to domestic and export demand.

In terms of supplying the domestic market, the projections of domestic consumption indicate that relatively small increases can be expected. Therefore, it is recommended that production goals be rationalized with respect to the size of this domestic market to ensure equilibrium between supply and demand.

With respect to the potential for increasing sales for export, which would contribute needed foreign exchange earnings, it has not been possible with the information available to determine if the country has comparative advantage in the Portuguese market. However, the tabular analysis showed that the prospects of export increases to Portugal are not highly likely and Cape Verde's present position in that market is relatively insignificant. In this context, it is recommended that information be sought in close cooperation with Portuguese importers (or planners) on future import requirements before establishing Cape Verde's export goals. In addition, infrastructural conditions to facilitate effective transportation and careful handling for export of bananas need to be carefully examined.

The following policy recommendations are made so as to be of assistance to Cape Verdean policy makers in pursuit of the goal of improving the performance of the banana industry.

- Generate a better data base for policy decisions on bananas i.e. domestic and export market information needs to be improved to assist decision makers.
- Look for ways to cooperate with the importing country (Portugal) in assessing a medium-term outlook for their import demand to help in the establishment of production and export goals in Cape Verde.
- Look more towards supplying the domestic market in the short run while building infrastructural conditions (packing houses and transportation services) to facilitate careful handling and effective transporting of bananas.

- Undertake research and development to increase banana productivity, and to improve the technology of banana production and distribution.

### 5.3 Suggestions for Further Research

This study has attempted to explain the reasons for the decline in bananas exported from Cape Verde. The use of qualitative and partial data calls for caution in the interpretation and use of the results. Moreover, the level of aggregation upon which this study is based leaves much to be desired.

It is therefore suggested that a less aggregated analysis of supply and demand determinants be made on an island basis, with possibly including more detailed information such as prices paid to producers, costs of transportation, amount of losses, and domestic prices to consumers, may lead to greater insights.

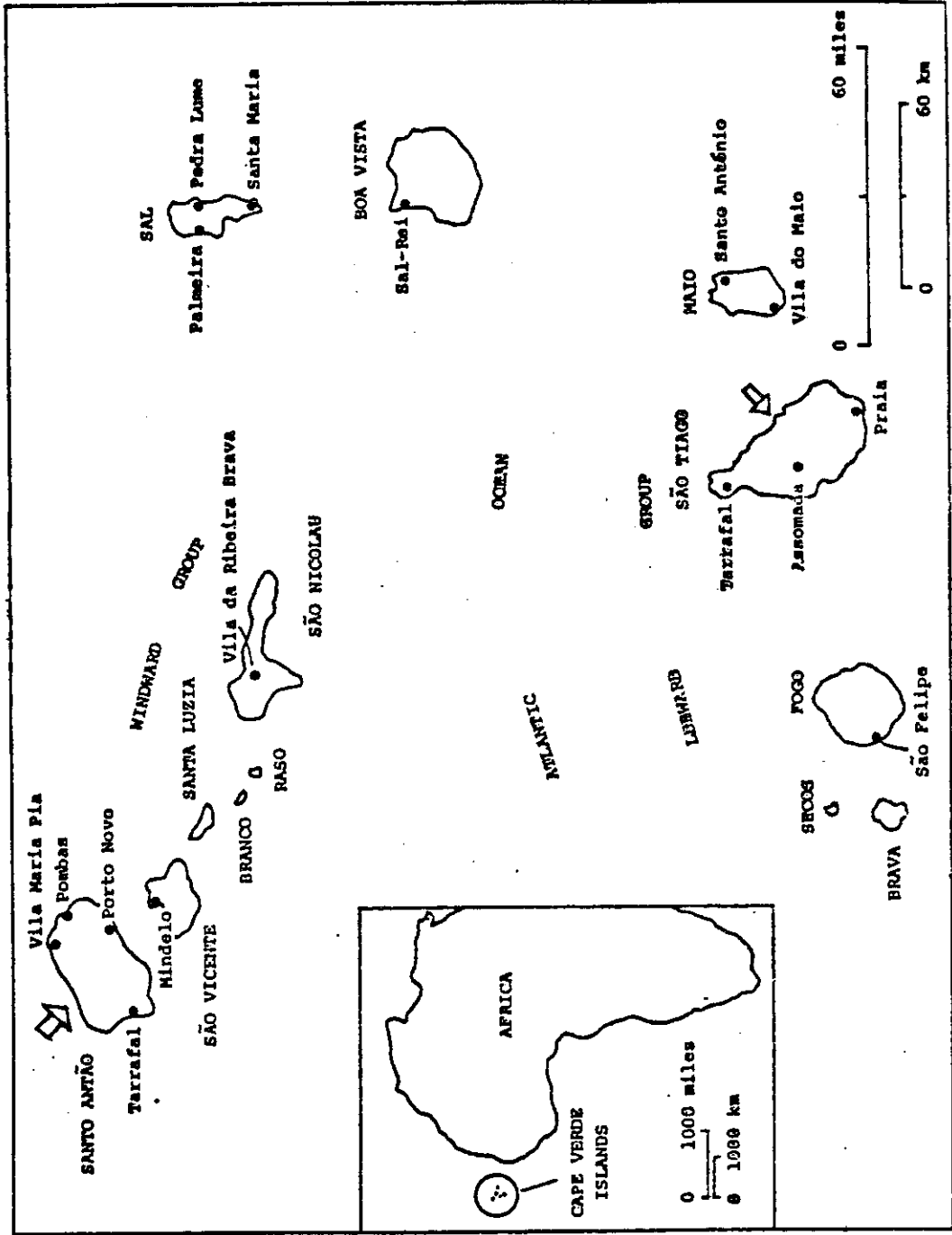
For instance the use of a complete model of simultaneous equations, as presented in this study, might be an approach for the study of interactions between supply and demand including the domestic and the export markets.

Separate studies would also be needed on the determination of detailed enterprise budgets for bananas production, as well as on distribution costs for the domestic market and for export. Here, an important area where research is particularly needed is that of determining the profitability of state-owned farms, specially the influence of input costs and prices of bananas on the amount of this commodity they would supply for the domestic market and for export.

APPENDICES

APPENDIX A

APPENDIX A  
MAP OF CAPE VERDE ISLANDS



APPENDIX B

APPENDIX B

EXTENT OF IRRIGATED LANDS, BY ISLAND AND TYPE OF CULTIVATION

	Total	Sugarcane	Banana	Manioc	Potatoes	Horticulture	Others
	-----ha-----						
Santiago	950	476	96	92	58	180	48
Fogo	9	-	-	-	3	6	-
Maio	17	-	-	4	2	3	8 (maize)
Brava	31	25	-	-	2	1	3
Santo Antao	800	544	62	29	35	80	50
San Vinciente	18	-	-	2	-	12	4
San Nicolao	29	20	4	1	-	4	-
Boavista	1	-	-	-	1	-	-
Total	1,855	1,065	162	128	101	286	113

<sup>a</sup>Source: Report of the FAO/WFP Mission to Assess Food Supply, Agricultural and Livestock Situation, November 1979.



APPENDIX C

## APPENDIX C

DATA USED IN ESTIMATING SUPPLY RESPONSE OF BANANAS IN CAPE VERDE, 1962-72

	Banana <sup>a</sup> Production (10 M.T.)	Bananas Export Unit <sup>b</sup> Values (Deflated) (US Cents/Kg)	Price of <sup>c</sup> Aguardiente (Deflated) (US Cents/Lit)	Price <sup>d</sup> Index (1970=100)
1962	490	4.4	33	91.0
1963	501	4.5	35	91.0
1964	522	4.7	36	91.5
1965	541	3.7	38	93.0
1966	573	6.1	36	93.7
1967	647	7.3	36	93.7
1968	690	7.5	36	93.0
1969	918	7.1	40	97.2
1970	853	6.9	49	100.0
1971	540	6.8	66	118.3
1972	519	5.9	77	130.3
1973	469	5.5	113	148.6
1974	350	3.7	103	225.0
1975	300	3.8	98	287.5
1976	450	10.5	95	310.0
1977	630	9.5	82	335.0
1978	600	7.3	85	376.0

<sup>a</sup>Source: FAO, Production Yearbooks, 1962-78.

<sup>b</sup>Source: FAO, Trade Yearbooks, 1962-78.

<sup>c</sup>Source: Direccao Geral De Estatistica, Cabo Verde.

<sup>d</sup>Ibid.

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