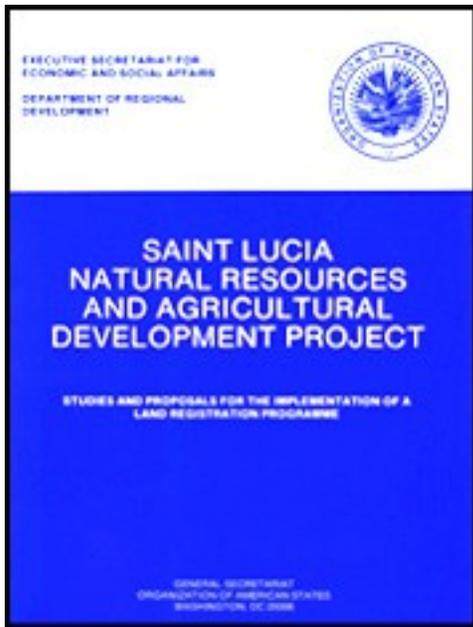


# Saint Lucia Natural Resources and Agricultural Development Project - Studies and Proposals for the Implementation of a Land Registration Programme

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**Executive Secretariat for Economic and Social Affairs**

**Department of Regional Development**

GENERAL SECRETARIAT OF THE ORGANIZATION OF AMERICAN STATES

DEPARTMENT OF REGIONAL DEVELOPMENT EXECUTIVE SECRETARIAT FOR ECONOMIC AND SOCIAL AFFAIRS

Washington, D.C. 1986

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# Preface

The unique land tenure problems inherited by Saint Lucia have represented a major constraint for the development of the agricultural sector. They are one of the most important factors preventing the farming community from diversifying production and increasing productivity. Conscious of the complexity of the problem, and cognizant of the far-reaching social and economic impact that possible solutions could have, the Government of Saint Lucia requested technical cooperation from the Organization of American States. This cooperation had two objectives: to undertake the studies required to design feasible technical alternatives and to identify complementary actions capable of taking full advantage of the solution of land tenure problems.

The present report synthesizes the technical studies undertaken during 1981 by a team of national and international specialists working with the Ministry of Agriculture. This work led to the identification, design and evaluation of a pilot project on land registration, the objective of which was to test the feasibility of the technical solutions proposed for the establishment of a land cadaster and the granting of land titles. The pilot project was also designed to enlarge existing knowledge of the multiple constraints affecting the development of the small farming community in Saint Lucia and to investigate the extent of the existing land tenure problems in a fairly representative community. The results obtained from the implementation of the pilot project in 1982-1983 were used in the design of an eight year nation-wide Land Registration and Titling Project to be implemented with financing provided by the United States Agency for International Development (USAID) between 1984 and 1992.

In researching the land tenure problems of Saint Lucia many valuable insights were obtained concerning the natural resource base of the country and the development potential of the agricultural sector. These studies have a value that goes beyond their usefulness for the design and evaluation of solutions to the land tenure problems: they constitute a source of information for policy makers and technicians concerned with other areas of the development effort. Although dated with respect to certain socio-economic factor, the studies contain valuable information on the natural resource base of the country and the many structural characteristics of Saint Lucian society. In consideration of this, the Department of Regional Development is publishing a limited number of the present report, which contains the initial studies of an ongoing technical cooperation project.

As such, the contents of this publication are neither self-contained nor are its specific conclusions final. Rather, they represent the clarification of an important step in the understanding of the development problems of one of the new member states of the Organization. In this effort, the technical staff of the General Secretariat and the international consultants who worked on this project benefited from the support provided by Government officials, who made a substantial and original contribution to the information compiled for this technical cooperation effort.

The results obtained confirm the usefulness of the Department's integrated approach to development planning and implementation in a small country. Carrying out these studies has given the staff of the Department of Regional Development the opportunity to develop a specific approach to the delivery of

technical cooperation services in a nation of the English-speaking Caribbean. This experience has provided valuable guidance for the Department's activities in other member states with similar characteristics.

Kirk P. Rodgers - Director - Department of Regional Development

[Saint Lucia - Location of Saint Lucia](#)

[Saint Lucia - General Reference](#)

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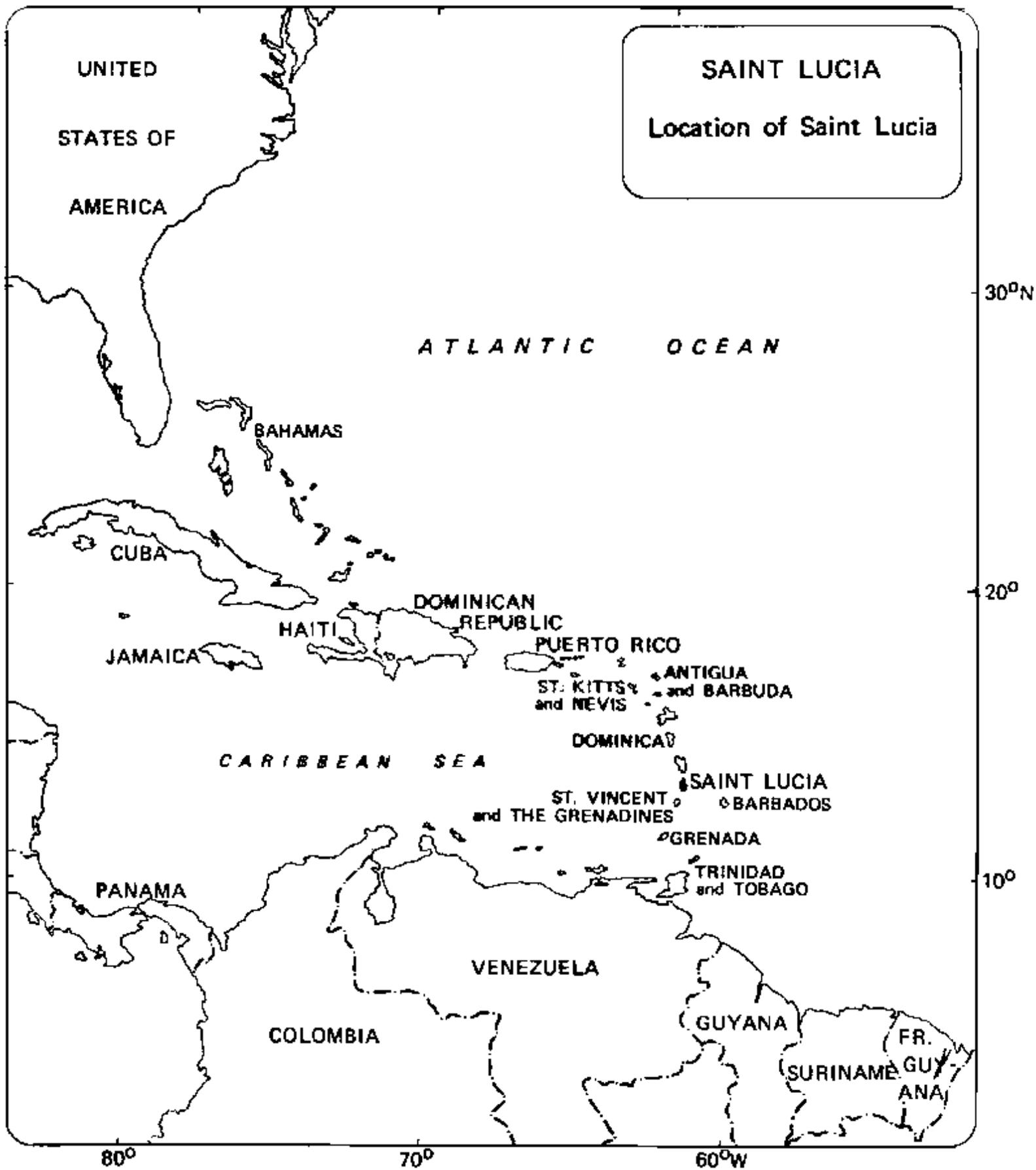




# Glossary of acronyms

BAI	Booker Agriculture International
CARDI	Caribbean Research Development Institute
CDB	Caribbean Development Bank
CDC	Commonwealth Development Corporation
CFC	Caribbean Food Corporation
CIDA	Canadian International Development Agency
CPU	Central Planning Unit
CWA	Central Water Authority
EDF	European Development Fund
LDA	Land Development Authority
MOA	Ministry of Agriculture
NDC	National Development Corporation
OAS	Organization of American States
SLLRC	Saint Lucia Land Reform Commission
SLMF	Saint Lucia Model Farms
UNDP	United Nations Development Programme
WINBAN	Windward Islands Banana Growers Association





# SAINT LUCIA

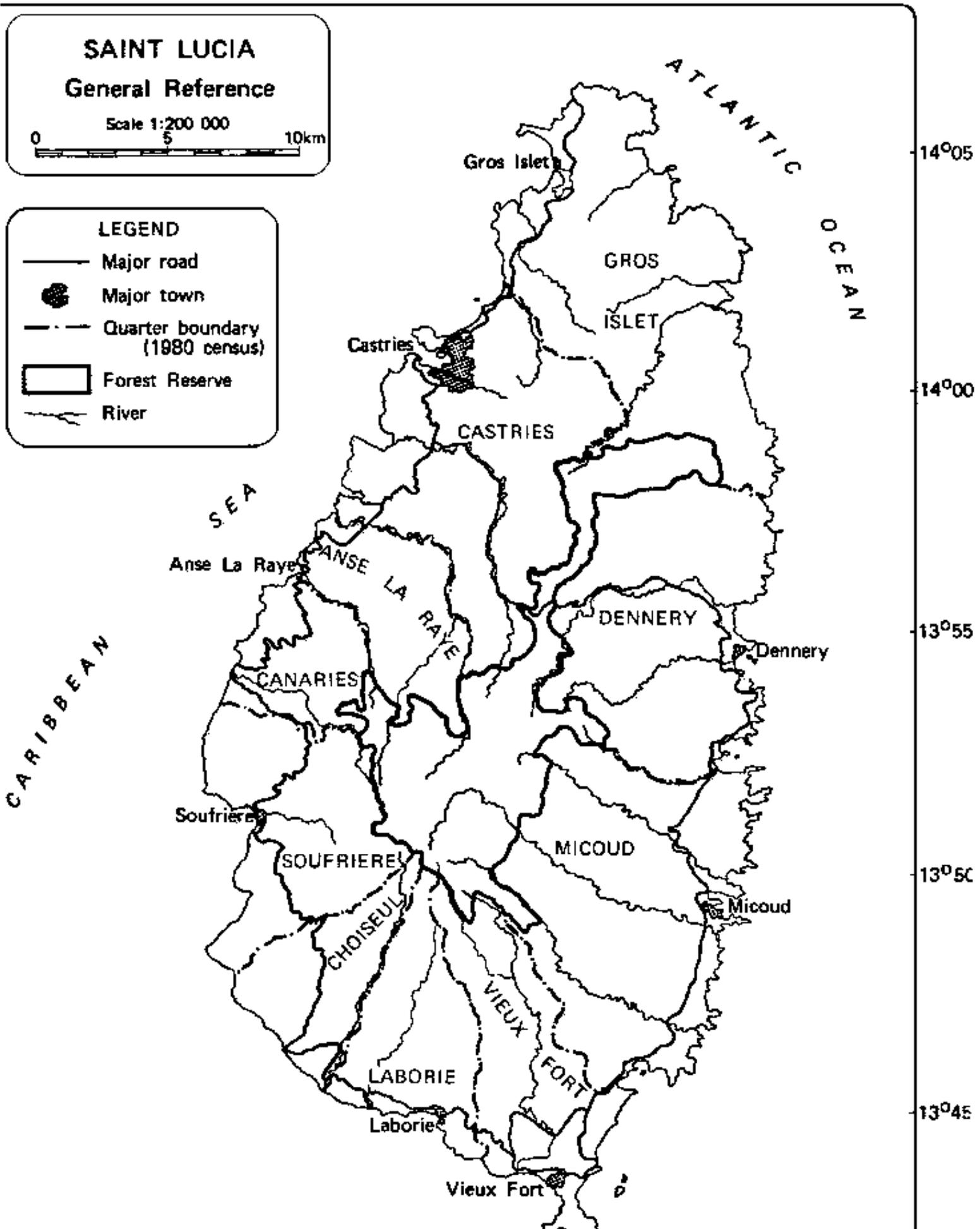
## General Reference

Scale 1:200 000



### LEGEND

- Major road
- Major town
- - - Quarter boundary (1980 census)
- ▭ Forest Reserve
- ~ River



Source: Directorate of Overseas Surveys, U. K., Original Scale 1:100 000

61°05'

61°00'

60°55'



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# Equivalencies

## CURRENCY EQUIVALENTS

Since 1976:

Currency Unit = East Caribbean dollar

EC\$ 1.00 = US\$ 0.370

US\$ 1.00 = EC\$ 2.68

## WEIGHTS AND MEASURES

Kilometer = 0.62 mile

Square kilometer (km<sup>2</sup>) = 0.386 square mile

Hectare (ha) = 2.47 acres

Meter (m) = 39.37 inches





# Executive summary

This document is a synthesis of the studies carried out in Saint Lucia as part of the Natural Resources and Agricultural Development Project. The Project was the result of a technical cooperation agreement between the Government of Saint Lucia and the Secretariat for Economic and Social Affairs of the General Secretariat of the Organization of American States. Project activities were jointly executed by the Department of Regional Development of the OAS and the Ministry of Agriculture of the Government of Saint Lucia. The studies were undertaken between February 1981 and February 1982 by a team of technicians based in Castries and consisting of personnel of the Ministry of Agriculture and staff and consultants of the OAS.

The Project was designed to assist the Government in the implementation of the Land Registration Programme and to find solutions to land tenure problems adversely affecting agricultural development. Furthermore, the Government was provided with information and advice regarding policy options for the transformation of the inherited and concentrated land ownership pattern. Finally, the Project included the design of a Pilot Project on Land Registration in a selected rural settlement to help initiate the Land Registration Programme and to facilitate field research on land shortages currently being faced by small farmers in Saint Lucia.

To supply the Government of Saint Lucia with the studies requested, Project activities were concentrated on (1) evaluation of natural resources and recommendations on environmental management; (2) analysis of land-related constraints affecting agricultural development in the rural settlements of Saint Lucia; (3) identification of alternative land transformation policies; and (4) design of a pilot project on land registration. Twenty-one technical reports were prepared by OAS experts and consultants and national specialists as a result of these efforts (see Annex F). The information gathered during the Project provided the basis for the preparation of a Development Atlas of Saint Lucia.<sup>1</sup>

<sup>1</sup> The maps contained in the Atlas are: Geology, Water Resources, Land Capability, Life Zones, Land Use and Human Settlements, and Land Tenure.

The eight chapters in the present document deal with the main topics researched by the projects and the recommendations made to the Government. They are supported by six technical annexes containing the detailed information upon which specific conclusions and recommendations are based.

## Chapter One: Characteristics of the Rural Settlements in Saint Lucia

Saint Lucia is basically a village society, with settlements clustered around Castries and along the coast. Urban/rural distinctions are difficult to define. A population of 118 900 inhabitants was recorded in 1980, representing an annual growth rate of 1.59 percent during the 1970-80 decade. Agriculture is the major productive sector; 40 percent of the population was employed in this sector in 1970; 60 percent of exports were agricultural of which 80 percent were bananas. Saint Lucia has a monoculture economy tied to export agriculture and dependent on preferential access to the United Kingdom market. Transport and distribution of exports is organized through an agreement between the Windward Islands and Geest

Industries, a diversified multinational corporation.

A combination of factors related to population distribution, land tenure, land distribution and land use allows the identification of five different types of rural settlements: urban areas; very poor small farming communities settled on areas of low agricultural productivity; settlements fully engaged in the production of export crops in small farms of over five acres located in areas of high agricultural productivity; small farming communities (farms predominantly of less than five acres) engaged in the production of export staples; and rural settlements highly dependent on urban sources of income.

## Chapter Two: Land Tenure and Distribution as Constraints to Agricultural Development

An examination of land tenure and distribution provides definition of the structure of production and power in the rural sector. Man/land relations, characterized in Chapter 2, show the extent to which these relationships represent constraints to agricultural development.

In 1973/74, data of the last Agricultural Census, 70.6 percent of all landholdings were owned or held in owner-like possession; 92.6 percent of farmland was held this way. Renters accounted for 18.3 percent of all holdings but controlled only 2.8 percent of farmland; farm rental units averaged 1.0 acre in size. The skewed nature of land distribution is evident from the fact that more than 80 percent of the holdings in Saint Lucia (of less than five acres) control only 14 percent of all the land in farms while 1 percent of the agricultural holdings (of fifty acres or more) exercise control over almost 60 percent of the land.

The complex land tenure is further, complicated by the antiquated system of land registration, the registration of deeds, and the succession laws that grant inheritance rights to all descendants of the deceased. The former makes land transfer difficult, costly and risky; the latter leads to excessive land fragmentation or creates situations of ownership in common, "family lands."

The "family land" situation is considered an obstacle to development for five reasons: 1) co-owners seldom have legal evidence of their right to ownership; 2) lack of documentation makes it difficult for owners to obtain credit; 3) investment is discouraged by the conventional right of harvest by co-owners whether they participate in cultivation or not; 4) since not all owners are interested in farming, some land is idle or underutilized; and 5) successive subdivision over time has fragmented the land. Advantages of the system are that it has served as a mechanism to avoid the excessive fragmentation implicit in succession laws, guaranteed significant portions of the population access to land, and provides garden plots which subsidize urban wages and wages of commercial farms workers, serving as a form of social security.

Land fragmentation is particularly severe in Castries, Canaries and Gros Islet where 50 percent or more of holdings fall in the 0.1-4.9 acre size range. Concentration is noticeable in Gros Islet, Vieux Fort and Anse La Raye where it comprises more than 70 percent of farmland.

Land use varies according to farm size and the relation is inverse for crop land uses. The latter comprise 94 percent of land use in the 0.1-0.9 acre category but drop to 42 percent of land use on farms larger than 500 acres. There is a direct correlation between idle land and plot size, i.e. only 3 percent of land is idle (forest and other land) in the smallest category while nearly half is idle in the largest. The pressure on land in small plots is considered excessive because of the fact that many are hillside farms located in lands that require careful conservation.

## Chapter Three: Legal and Institutional Framework for Natural Resources Conservation and Development

The analysis of the legal and institutional framework addresses institutional capacity for natural resources conservation and development, particularly land resources for agricultural development. Four areas of concern have been identified.

First, the system of land registration is complicated and inefficient, making the acquisition and disposal process difficult for individuals. The land market is sluggish due to this problem. A system of title registration and the introduction of a "trust for sale" would facilitate land and credit acquisition thereby improving the land market situation.

Second, the lack of a cadastral survey is an important information gap in the definition of ownership. This lack of information precludes land control and effective taxation. A tax system can be used as a development tool to gradually reduce land ownership concentration and land underutilization.

Third, existing land use legislation concentrates primarily on control of urban land and building construction. Legislation addressing natural resources development and environmental issues is insufficient. Misuse of land, water, mangrove forests and other natural resources has proceeded unchecked.

Fourth, there are 18 institutions concerned with the development of natural resources in Saint Lucia and these address only specific and partial aspects of broader issues. No single institution is currently addressing the complex and interdependent problems of natural resource development. Institutions have varying capabilities and competence and competing areas of interest. Existing institutional relationships are vertical with no horizontal linkages, limiting coordinated decision-making and action to the Cabinet level. Technical personnel are thinly dispersed throughout the Government resulting in the fragmentation of decision-making authority and resources, thereby reducing Government capacity to cope with pressing and complex problems of natural resource management and development. Institutional change is required to:

- Reduce fragmented decision making, a prerequisite to obtaining unified and consistent Government action to preserve and develop natural resources.
- Cope with the public sector technical problems involved in the management of natural resources, particularly land resources.
- Reshape the existing institutional system so as to ensure a unified decision-making structure aided by more efficient technical support.
- Catalyze changes in the existing legislation, which could occur along with the institutional changes.

#### Chapter Four: Dynamics of the Land Problem

Recent land distribution trends are indicative of notable changes in land subdivision and ownership patterns. Land acquired by private individuals and the Government from large estate owners accounted for a modification of ownership status of almost one quarter of the lands held in large holdings in 1973/74. Nearly 25 percent of all available good agricultural lands has been transferred from private to government ownership. A further 3400 acres have been transferred from agricultural to industrial, tourist or urban use.

Subdivision accounts for 45 percent of all land transfers. Few cases of consolidation occur, probably

because of lack of tenure definition and credit alternatives to enable such a transaction. Government intervention accounts for one-third of total agricultural subdivision.

## Chapter Five: Alternative Approaches to Land Transformation

Recommendations made by the Land Reform Commission addressing tenure problems include modification of existing laws, introduction of new legislation and execution of a cadastral survey of all land properties on the island. These activities are only part of a wider programme to create conditions for small farmers to make a meaningful contribution to the country's agricultural development. If small farmers are to play a successful role in agricultural development, better man/land relationships will have to be fostered and this can be accomplished through programs which will ensure that this group of farmers receives technological inputs of appropriate scales to satisfy its needs for production and maintenance of infrastructure.

Alternatives considered for removal of the land-related constraints to agricultural development include both indirect and direct intervention by the Government. Their main implications for the case of Saint Lucia are reviewed in this chapter as a basis for decision making.

Indirect interventions consist primarily of taxation and regulation:

- Progressive land tax to induce land owners either to put land into production or sell and to increase government revenue to finance land redistribution activities.
- Financing of land purchase so as to provide credit to individuals willing to consolidate small holdings to purchase land.
- Loan Guarantee to facilitate land acquisition by small farmers for agricultural purposes, enlarge farms and establish a base for expanded operations.
- Regulation of sales and leases to add flexibility to the land market and prevent price increases.
- Regulation of subdivision to prevent excessive subdivision and conversion to nonagricultural use.

Limited direct interventions involve intervention in the land distribution structure to solve resource problems, community conflicts over land or to take advantage of acquisition opportunities:

- Reconsolidation of holdings to solve localized problems of land scarcity within small farming areas.
- Redistribution of unused estate lands to give farmers access to these lands for individual or joint operation.

Comprehensive direct interventions aimed at nationwide impact on the land distribution structure;

- Establishment of a land bank to acquire properties and resell them to small farmers thereby speeding up the redistribution process.
- Elimination of large estates to do away with holding sizes determined to be excessively large by relevant economic criteria.

## Chapter Six: Short-Term Strategy for Land Redistribution

The short-term land redistribution strategy recommended to the Government was designed to fulfill the Government's goal of improving agricultural productive capacity and to guarantee access to sufficient amounts of land for surplus agricultural production by full-time farmers. The aim of the strategy was the gradual transformation of the land distribution structure by provision of incentives to encourage positive aspects of existing trends of land ownership distribution. A short-term approach is adopted by this strategy with direct and indirect interventions aimed at the national and/or local level.

National-level interventions include land taxation, the use of financial instruments to give small farmers access to land, regulation of land development to prevent inefficient use of resources and excessive subdivision of agricultural land. Local-level interventions include consolidation of small holdings to reduce land scarcity as a constraint to small farmers, redistribution of land which is unused or underutilized and expansion of the rural frontier by bringing marginal lands into production through the use of innovative technology. Cadastral survey and land adjudication are the activities that trigger the process of land transformation the strategy is aiming to guide and speed up.

#### Chapter Seven: Guidelines for Legal and Institutional Change in Matters Related to Agricultural Land Development

Changes in Saint Lucia's legal and institutional structures are required for natural resources management, land registration and agricultural land redistribution. These changes should: 1) develop a unified decision-making capability in matters related to natural resources management; 2) complete coverage of issues of conservation and land utilization; 3) introduce long-term planning capabilities by means of proper utilization of technical manpower; and 4) differentiate between institutional responsibilities for policy decisions and routine implementation.

Legislation required for natural resource management includes watershed protection, marine ecosystem protection and protection of areas of natural and historical interest. Regulatory powers should be given to Government enabling it to intervene in private sector activities involving water resources, agricultural land use, utilization of beaches and areas of natural beauty, fisheries exploitation and harbour utilization. To implement the proposed short-term strategy, legislation will have to be passed on land taxation, financial instruments, land development regulation and control of excessive subdivision. Additionally, the existing Land Acquisition Ordinance must be revised to enable expropriation by Government and to allow for more accurate land valuation.

Relatively complex institutional changes are required to effectively manage resources and satisfy conservation and regulation goals. It is recommended that a Natural Resources Authority be created and its major responsibility be long-term decision making and implementation surveillance. Formation of a Technical Secretariat is also recommended to provide the Authority with advice on long-term planning and policy making. The creation of the Secretariat will obviate the need for establishing a ministry to execute these tasks and will consolidate technical capabilities and identify deficiencies in the manpower supply. Linkages of the Authority and Secretariat to existing institutions are outlined in Chapter 7, as are recommendations for improvement of the current institutional structure.

#### Chapter Eight: Pilot Project on Land Registration: Morne Panache

The Pilot Project on Land Registration is designed to initiate a land titling programme and research practical problems involved in land distribution. The expected benefits are operations experience;

understanding of internal farm organization of hillside farming on a variety of soil types; development of farm models and management recommendations compatible with sound economic criteria and conservation requirements; understanding of land distribution needs of small farmers and the best way of implementing specific projects.

The main components of the Pilot Project are; 1) survey and land adjudication; 2) research on redistribution needs; 3) reconsolidation of holdings; 4) land redistribution; 5) expansion of the rural frontier.

The Morne Panache farming community and adjacent lands to the east (1 300 acres total) were chosen as being representative of 47 percent of the settlements identified in the settlement typology (Chapter 1).

Land tenure and distribution in the area are difficult to ascertain precisely because of lack of data. The 1980 Farmers Survey showed 152 holdings comprising 694 acres of the total of 1300. Nearly 80 percent are in the 1.0-9.9 acre size category with less than 8 percent below one acre. Renting and sharecropping of small areas are common, various types of tenure are identifiable and disputes over property boundaries or land ownership are not uncommon.

Bananas are the predominant crop grown but represent a low proportion of land use (28 percent) because of the presence of large vacant areas. Much of the land is marginal, but the cultivable areas are intensively cultivated by smallholders. Only 10.9 percent of the land is classified as highly productive.

Cadastral survey operations will be carried out in four stages: 1) index map preparation; 2) field compilation; 3) survey and adjudication (order, appointment of officers, claims and demarcation); and 4) registration. Upon completion of the survey the adjudication record will be completed and notice of its completion will be given with a ninety day response period allowed for grievances. The initial registration process will then proceed and claims will be filed with the proposed Registry to be established in Castries. As outlined in the Land Act of 1981, the Registry will include information on land characteristics (with reference numbers to registration blocks and parcel identification maps), a full description of proprietor and imposed restrictions and a statement of encumbrances (mortgages, leases, charges).

Research on land redistribution needs will focus on evaluation of the general land registration experience, evaluation of problems related to land shortage, reconsolidation by exchange and purchase, and expansion of the agricultural frontier. Specialized studies in agricultural economics, anthropology and agronomy will be carried out to define procedures to ensure an appropriate and sustained use of land. This will involve analysis of farming systems and of the relationship of farm size to land tenure patterns.

The time frame for implementation of the cadastral survey is approximately four months, excluding the preparatory community survey and community work. The Land Reform Management Unit of the Ministry of Agriculture will be responsible for implementation of the Land Registration Programme. Full involvement of the Department of Lands and Surveys is contemplated for the preparation of the cadastral survey and associated maps. The Registrar of Lands will perform registration activities and serve as the institutional core of the New Registry.





# Introduction

The sound utilization of scarce natural resources in Saint Lucia is a precondition for equitable development. The scarcity of natural resources presents a long-term constraint on the evolution of a diversified economy in a country of small territorial size heavily reliant on land and water resources and areas of scenic beauty to sustain agriculture and forestry, industry, tourism and urban development. Knowledge of resource availability must be combined with that regarding the interaction and linkages of resources to components of the natural and man-made environment. Such knowledge is mandatory to reduce risks of damaging small and fragile island environments vulnerable to adverse impacts of human activity. Agriculture is of increasing social importance in Saint Lucia and is an activity with a high degree of interaction with the natural environment. Consequently, it is essential that sound land use patterns and agricultural practices be established and, in many areas, soil conservation measures for sustained intensive farming be undertaken.

## Economic History

Saint Lucia has been unable to reach high levels of development and a diversified economic structure because of politico-economic circumstances. The uncertainties of the early periods of colonization brought about by the wars between France and England prevented the island from joining the sugar cane bonanza of the seventeenth and eighteenth centuries. In fact, sugar cane did not supersede the early export crops of tobacco, cotton and ginger until a century after it became the mainstay of Barbados, Antigua and other colonies. After emancipation shortages of labour and protectionist colonial practices discouraged efficiency and prevented the industry from surviving the introduction of beetroot sugar in the European markets.

The collapse of the major export crop did not lead directly to its replacement in Saint Lucia. Alternative sources of employment for the population and the presence of a large community of small farmers concentrating on subsistence crops prevented the economic system from collapsing with the fall of the main export crop. In times of declining agricultural activity the population and economic livelihood were supported by port activities at Castries (the chief coaling station in the West Indies), employment generated by the construction of the United States army and navy bases at Vieux Fort and Gros Islet and the reconstruction of Castries after its destruction by a fire in 1948.

When these sources of employment disappeared in the 1950s, Saint Lucia turned increasingly to agriculture as a source of income, in particular to the banana industry, which grew very rapidly at that time. Banana exports began in the 1920s, declined in the 1930s because of Panama disease and ceased during the Second World War when there were no ships to carry the fruit. After the war a new start was made with disease-resistant bananas. The industry had its major expansion when the sugar industry collapsed in the early 1960s, releasing the large, fertile valleys for banana cultivation. In 1965, bananas formed nearly 90 percent of the country's total exports, making Saint Lucia the first Caribbean economy dependent on the monocultivation of bananas.

## Development of the Agricultural Sector

Despite significant expansions of the manufacturing and tourism sectors, agriculture remains the most important economic sector in Saint Lucia. In 1978 the sector accounted for 27 percent of the Gross Domestic Product at market prices and for 50 percent of total exports, employing about 40 percent of the country's labour force. Recently, production has dropped, affecting both exports and foodstuffs. The major reasons for the decline are the antiquated land tenure system, the skewed distribution of land resources, the poorly organised marketing systems for domestic agriculture, the lack of adequate credit facilities, and the inadequately developed agricultural services.

In defining a solution to land tenure problems, well planned, long-term actions are required to replace the existing inefficient system of registration of rights to the land with a modern system of title registration and a cadastre, in addition to other legislative changes to protect tenants and to avoid excessive subdivision of lands. A set of more complex and long-term actions will be required to modify the highly concentrated pattern of land ownership that the country inherited and that is preventing the development of a more diversified, efficient and egalitarian agriculture. These actions need to be planned and implemented within the broad framework of other developmental actions, and consideration must be given to the pressing need to protect the environment and preserve renewable natural resources.

## Objectives of the Report

Environmental management, the rational utilisation of the environment for egalitarian socioeconomic development, has been used as the general framework for defining planning actions aimed at removing land-related constraints to agricultural development. As a government activity, environmental management should reconcile short-term demands for the utilisation of natural resources with long-term conservation needs. This process inevitably introduces changes in the socioeconomic structure that ultimately defines natural resource utilisation in a country.

Within this general framework, the information from studies summarized in this report was collected with the following objectives in mind:

- a) To make a preliminary prospectus of natural resource availability (particularly land and water) and of the conservation measures required for their rational utilisation in the development of agriculture.
- b) To analyze information concerning the constraints affecting agricultural development in Saint Lucia. To study the role of the existing land tenure and the skewed distribution of land resources in the development of agriculture in the different types of rural settlements in the country.
- c) To identify alternative approaches to solving land distribution problems in order to devise a policy on land redistribution and identify a pilot project on land registration to initiate the solution of the problems of land tenure.

## Organization of the Report

The first three chapters of this report provide an overview of existing conditions in Saint Lucia related to basic characteristics of rural settlements (Chapter 1); land tenure distribution and patterns and the constraints to agricultural development they present (Chapter 2); and the effectiveness of legal mechanisms and the technical capacity and interaction of institutions (Chapter 3).

An analysis of constraints on and opportunities for land management, based upon observations of resettlement projects or activities of estate lands, appears in Chapter 4. The following three chapters are devoted to the presentation of alternative approaches to solving problems of land transformation (Chapter 5); definition of a short-term strategy for land redistribution (Chapter 6); and, recommendations for legal and institutional change (Chapter 7). Chapter 8 is an outline of a pilot project in Morne Panache and includes an implementation process for land transformation.

The extensive analyses of land and water resources which served as references in several sections of the main report are included as Annex A - Land Resources and Annex B - Water Resources. Annex C - Environmental Prospective, is a basis for those parts of the report in which recommendations are made concerning the rational utilization of natural resources as an integral part of agricultural development. Other annexes include, Annex D - Population and Land Distribution: Basic Information; Annex E - Characteristics of Landholding Patterns in Saint Lucia; Basic Information; and Annex F - List of technical reports prepared by OAS staff, Government of Saint Lucia, technicians and consultants. The recommendations found in the latter were the basis for the report which follows.





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# Chapter 1. Basic characteristics of rural settlement

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[1.1. General background](#)

[1.2. The distribution of population and land](#)

[1.3. Human settlements in rural Saint Lucia](#)

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## 1.1. General background

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[1.1.1. Population and economy](#)

[1.1.2. Inherited characteristics of the rural sector](#)

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### 1.1.1. Population and economy

In 1980 Saint Lucia had 118 961 inhabitants, over 12 000 more than in 1970. The population increased at an average rate of 1.59 percent annually between 1970 and 1980, representing a decline from the previous 1.91 percent average yearly growth experienced between 1960 and 1970. Table 1-1 shows population growth from 1843 to 1980.

Saint Lucia is fundamentally a village society, with farm families living in urban centres and walking to their land daily. A large part of the rural population is within daily commuting distance of Castries or Vieux Fort, the two major centers of urban employment. Rural women market their food crops in the urban centers. In turn, urban families have rural family land which provides them with part of their food requirements.

As in most small ex-colonial countries, the Saint Lucian economy has been traditionally tied to export agriculture and dependent on external supplies and markets. Sugar cane production was the predominant activity until the mid-1950's, with export bananas becoming the new monoculture from the late 1950's to the present. Recently attempts have been made to diversify the economy, with emphasis on tourism and industry. The country's independence in 1979 gave impetus to a desire for diversification of agriculture and the economy as a whole.

Despite a tourism boom during the 1970's, agriculture continues to be the major productive sector. Industrial activity is rudimentary and narrowly based. In 1978 agriculture provided 60 percent of all exports and re-exports, roughly 80 percent of which consisted of bananas. According to the 1970

population census, agriculture employed 40 percent of the labour force. While this percentage may be smaller today, many urban jobs are still directly or indirectly linked to agriculture.

### 1.1.2. Inherited characteristics of the rural sector

The transformation from sugar cane to banana production allowed more smallholders to produce the major crop but preserved the essential structure of dependency. The preferential access of Windward Islands bananas to the United Kingdom market and the monopolistic role of Geest Industries as a large producer and sole purchaser and distributor of the crop generates a situation of high vulnerability for Saint Lucia's major agricultural product. Stability of demand is based on preferential treatment, and distribution is dependent on one large multinational with various commercial interests.

**TABLE 1-1. POPULATION GROWTH, 1843-1980**

Census year	Total population (000)	Population growth (000)	Average annual growth (%)
1843	20.7	-	-
1851	24.2	3.5	1.88
1861	26.7	2.5	1.33
1871	31.6	4.9	1.83
1881	38.6	7.0	2.15
1891	42.2	3.6	0.93
1901	49.9	7.7	1.82
1911	48.6	-1.3	0.26
1921	51.5	2.9	0.60
1946	70.1	18.6	1.44
1960	86.1	16.0	1.52
1970	101.5	15.4	1.91
1980	118.9	17.4	1.59

Source: Shurcliff, Alice W., and John F. Wellemayer, Economic Development in the Eastern Caribbean Island, St. Lucia, Series No. 4 ISER University of West Indies March, 1967. Population Census 1970 and 1980.

Recent attempts at diversification of agricultural production have had little success. Bananas provide a relatively attractive monthly income that few other crops can match. Attempts to expand other sectors, such as tourism, have aggravated the negative trade balance. The lack of internal investment capital has greatly restricted government options for diversification in all sectors.

The legal system inherited from the colonial powers has greatly affected the tenure pattern of the rural sector. The succession and land laws in Saint Lucia are based on the French system. Under the existing succession laws, all heirs participate in the property rights of the deceased, and this often results in progressive fragmentation of landholdings. Deeds to land are vague and often landholders do not possess documents, inviting abuse by powerful landholders and protected litigation in the courts. Under these conditions, many farmers are unwilling to invest in the land they work.

Large landholders have traditionally been the favoured producer group, deriving their power from the original distribution of land in large tracts. The productive alluvial valleys and surrounding lands are owned by this group, forcing small farmers to locate on the more remote hillsides. The estate owner is typically a part-time farmer, dividing his energies between rural and urban businesses. Their nonfarm activities range from commerce and industry to tourism and trade. They may include investments outside of Saint Lucia so as to reduce the risks of unexpected political decisions. These entrepreneurs obviously do not limit their instruments to the rural sector, and will transfer resources to other activities, depending upon the prospects of each of them. The observed tendency today of subdividing the large estate so as to free capital for other activities reflects a rationale of diversification on the part of the entrepreneur. This colonial legacy and its more recent manifestations have resulted in a backward rural sector in Saint Lucia, still at the cutlass stage on small holdings and well below the theoretical potential on the large valley estates.

## 1.2. The distribution of population and land

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### [1.2.1. Population distribution](#)

### [1.2.2. The distribution of agricultural land](#)

### [1.2.3. Spatial differentiation of population and land distribution](#)

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### 1.2.1. Population distribution

Despite major drops in mortality and sustained high birth rates, population growth has been slow because of emigration. Population increase has differential effects on rural and urban areas; even between villages differences in demographic dynamics can be found.

The tradition of population clustering in coastal villages has changed. The 1980 Population Census reveals that the coastal towns and villages of Vieux Fort, Laborie, Canaries, Choiseul, Arise la Raye, and Dennery all experienced population decline during the past decade.<sup>1</sup> This is most likely a response to an improved road network throughout the island, the availability of regular inland transportation and the existence of opportunities in other parts of the island.

<sup>1</sup> Government of Saint Lucia, "Population Census, 1980," Preliminary Counts, Castries 1981, (mimeo).

As Table 1-2 indicates, the island's 10 quarters show variable population increase, with six growing at a rate below the national average and four above that rate. This contrasts with the period 1960 to 1970, when, with a higher growth rate for the country as a whole, only the Quarters of Anse la Raye and Canaries recorded overall declines in population. The percentage of the population living in the Quarter of Castries declined between 1970 and 1980. This Quarter grew at an annual rate of only 0.57 percent, an increase significantly below the national average. Gros Islet (overspill of Castries) and Vieux Fort both experienced a growth rate that indicates that new construction, tourism, and industrial expansion have attracted people to these areas. The Quarters of Gros Islet, Vieux Fort, and Micoud are all gaining in population relative to the rest of the island but only in Micoud this growth is agriculturally based. The rural sections of Laborie, Dennery, Anse La Raye and Canaries show modest increase in population

which, in the absence of further corroborative data, suggest some measure of stability or limited growth in the agricultural economy of these areas. Map 1-1 shows population distribution by quarter and Map 1-2 the increase or decrease in rural population, by quarter.

## 1.2.2. The distribution of agricultural land

The land distribution pattern revealed in the 1973/74 Agricultural Census is characterized by the concentration of land resources in few holdings and by the existence of a large number of extremely small holdings.<sup>2</sup> Nine holdings of 500 acres and over (0.2 percent of total holdings) control 26 902 acres (37.4 percent of total land in holdings). At the other extreme, 4730 holdings of less than 1 acre each (45.3 percent of the total) control only 1 733 acres (2.4 percent of the land in holdings). In broad terms, large holdings (50 acres and over), representing 1.2 percent of the total number of holdings, control 42 034 acres, or 58.5 percent of the total land in holdings. Medium-size holdings (between 10 to 50 acres) are not important either in terms of their number (674 holdings, only 6.5 percent of the total number of holdings) or in terms of the land they control (12 695 acres, 17.6 percent of the total land in holdings).<sup>3</sup> Small holdings (0.1 acre to 10 acres) are the most important group in terms of numbers, as there were 9 640 holdings or 92.4 percent of the total number of holdings in 1973/74 (10 436), but they control only 17 272 acres or 24.0 percent of the total land in holdings (72 001 acres). (See Annex E, Tables E-1 and E-2.)

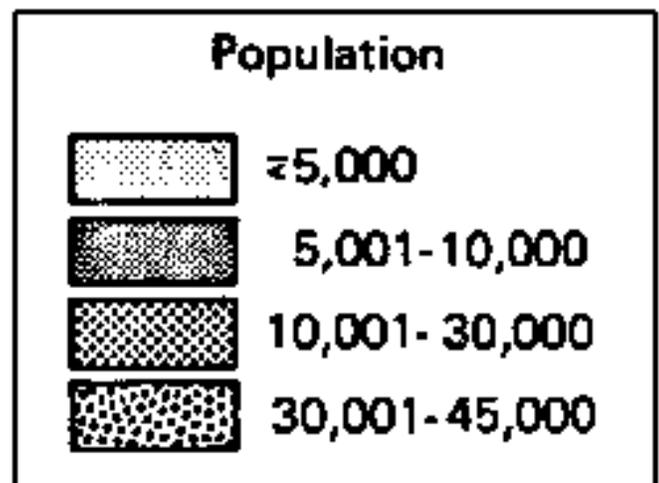
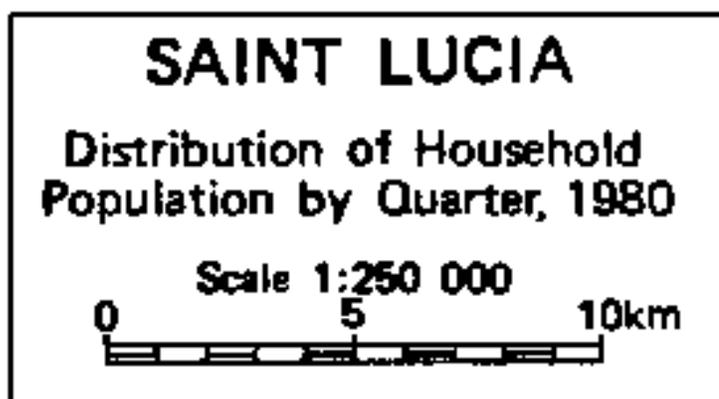
<sup>2</sup> Government of Saint Lucia, "Agricultural Census 1973/74," Ministry of Agriculture, Castries 1975.

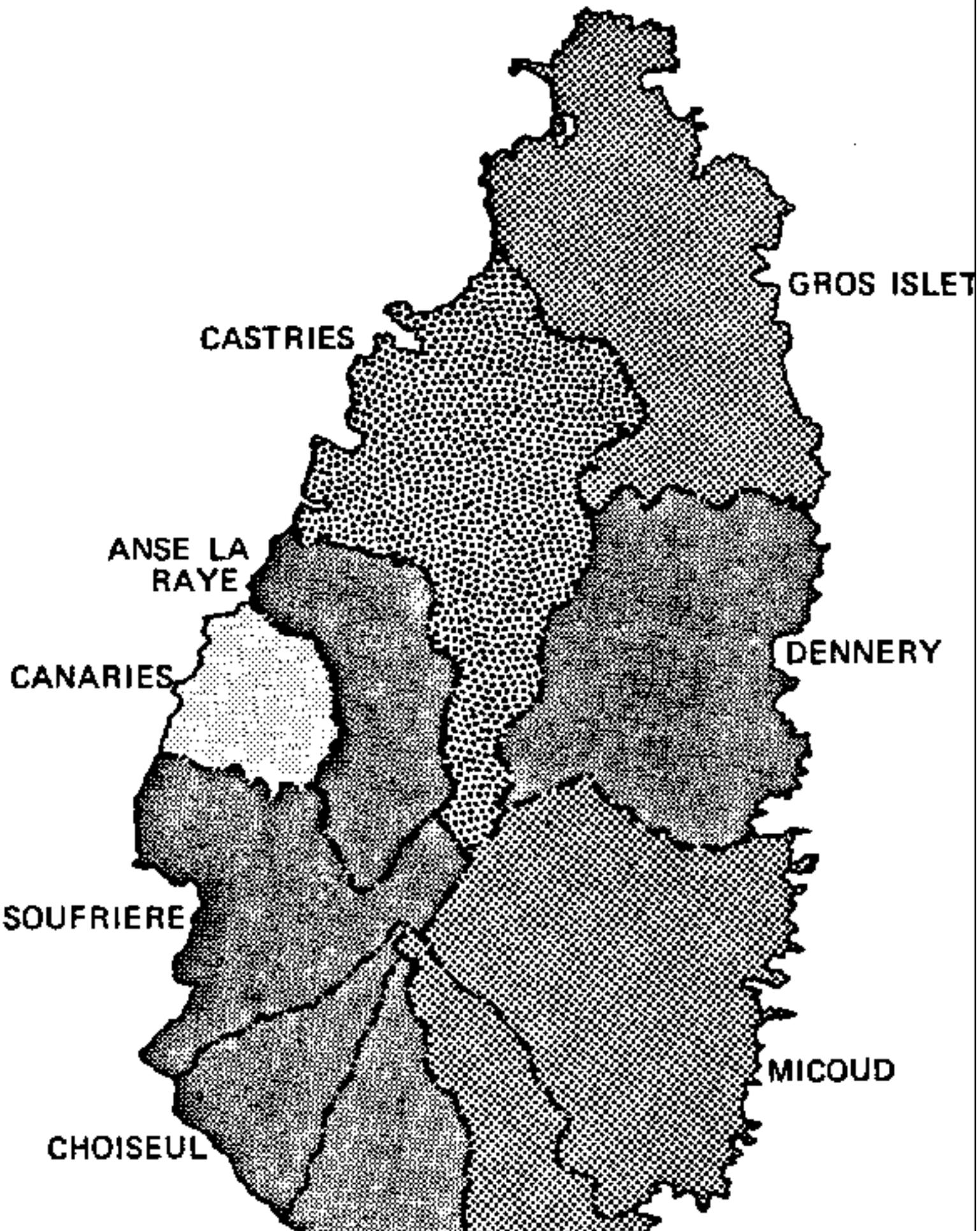
<sup>3</sup> As of 1982 the contribution of large holdings to the concentration of ownership has changed significantly due to subdivision through sales to individuals and transfer to Government of some large estates (Chapter 4). An accurate presentation can only be provided through a new agricultural census.

### TABLE 1-2. DISTRIBUTION OF HOUSEHOLD POPULATION IN URBAN AND RURAL AREAS, 1960, 1970, 1980

Source: Technical Supplement to the Draft Advisory Nation Physical Development Plan for Saint Lucia, UNDP: 1975

Map 1-1. Saint Lucia - Distribution of Household Population by Quarter, 1980



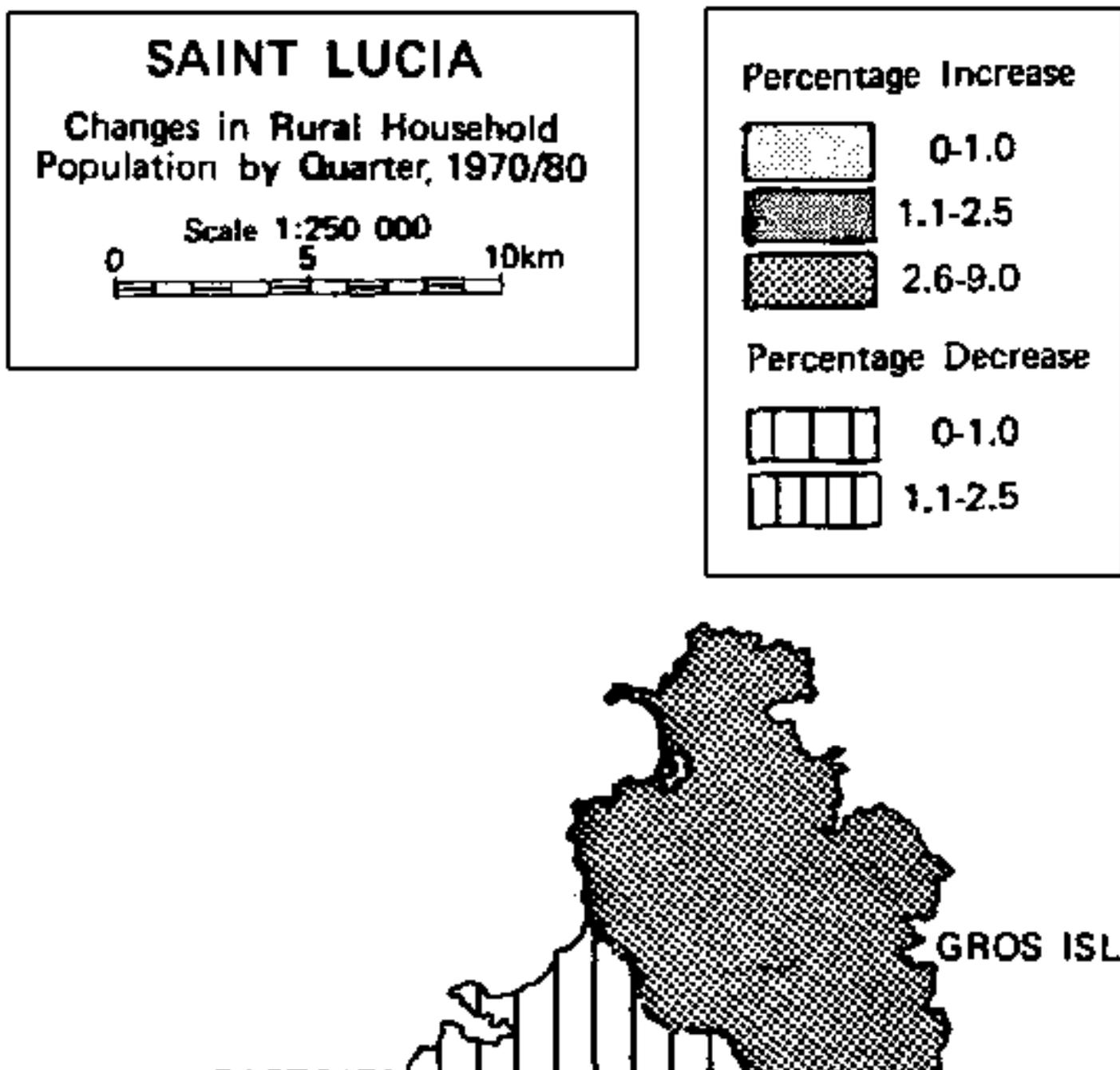


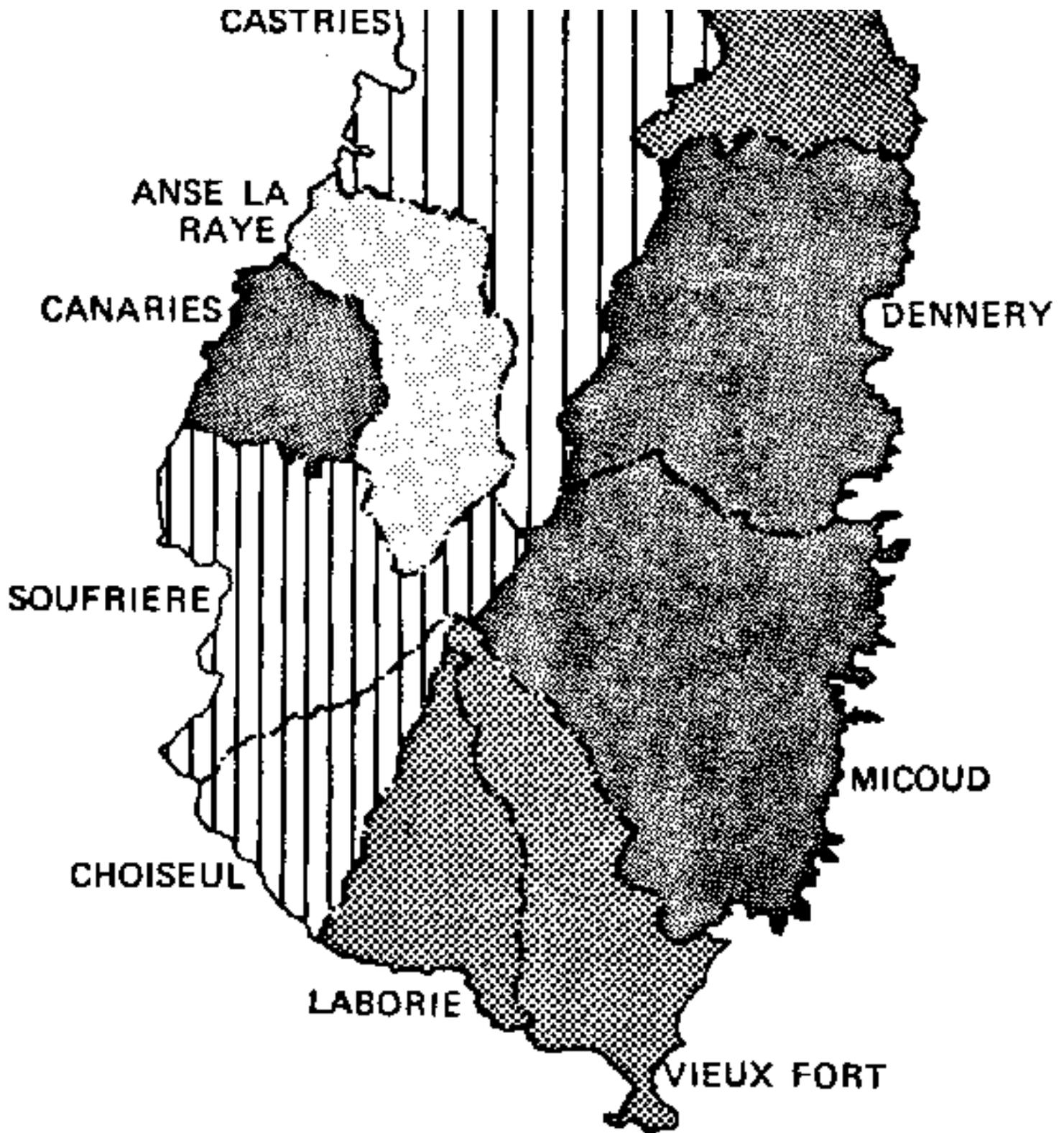


**Note: Quarter boundaries from Census 1980**

Source: Table 1-2. Distribution of Population in Urban and Rural Areas, 1960, 1970, 1980

**Map 1-2. Saint Lucia - Distribution in Household Population by Quarter, 1970/80**





**Note: Increase or decrease based upon average annual rate of growth**

Source: Table 1-2, Distribution of Household Population in Urban and Rural Areas, 1960, 1970, 1980

Concentration of ownership is only significant within the group of large holdings, particularly in the category of 500 acres and over, where nine holders had more than one estate in 1974. The largest amount of land held by one owner is 2760 acres in eight holdings, owned by one company. The smallest is 500

acres in two holdings. Holders of more than one property controlled 12 378 acres or 17.2 percent of total land in holdings in 1973/74. In 1974, foreign ownership of land in Saint Lucia affected 30 estates, a total of 23 889 acres (26.9 percent of the total land in holdings).<sup>4</sup> Of this total, 83.7 percent was in holdings of over 500 acres (36.4 percent of total holdings in this category in the hands of foreigners) whereas the larger number of holdings was in the 100 to 500 acres size group, controlling only 15.1 percent of the land in the hands of foreigners.

<sup>4</sup> United Nations Food and Agriculture Organization, Land Tenure in Saint Lucia; Findings and Recommendations, Rome, 1975.

### **1.2.3. Spatial differentiation of population and land distribution**

By analysing available information, it is possible to identify subnational differences in population structure and their relationship to the distribution of land resources which are important in characterizing the structure of human settlement on the island.<sup>5</sup>

<sup>5</sup> Any attempt to analyse the structure of the Saint Lucian population in spatial terms on the basis of existing information is beset by difficulties. The spatial units for which data have been compiled by different departments of Government, and for particular purposes, do not always correspond with each other.

Census data for 1970 are available by groups of enumeration districts in each quarter of the island, though the quarters themselves are defined differently for the Census than they are for purposes of administration.

Data for the Agricultural Census of 1973/74, on the other hand, are available only by quarters. It is therefore not possible to show variations in patterns between subregions below the level of the quarter for the data.

The ratio of land to farm population for each quarter suggests that pressure on farmland is relatively more acute in the Quarters of Choiseul, Castries and Canaries than in Micoud and Gros Islet (Table 1-3). The arid conditions of the Choiseul area and its overworked and eroded soils further compound man/land pressure in that region. The distribution of farm population is shown in Map 1-3.

It is useful to compare the gross ratios presented in Table 1-3 with the percentage of farm holdings of less than one acre for each quarter of the island (Table 1-4). For the island as a whole 43.2 percent of holdings are below one acre (Map 1-4 shows the percentage of such holdings by quarter). The quarters which have an even greater percentage than the national average of holdings of this minimal size are Castries, Anse La Raye, Canaries, Choiseul and Gros Islet. Tables 1-3 and 1-4 suggest the same conclusions about quarters that have acute pressure on available land resources. Both Anse La Raye and Gros Islet have a high percentage of holdings below one acre and higher than average ratio of land per person. This suggests a more inequitable distribution of farmland in these two quarters than elsewhere, although these quarters combined have only 16.5 percent of the holdings of less than one acre nationally and 14.2 percent of the total farm population. A further indication of differences in resource limitations between one subregion of the island and the next may be gleaned by looking at the age structure of the population within each quarter (see Annex D, Table D-1).<sup>6</sup> The percentage of the population in the 15-44 age group is higher in the villages and towns than in the more rural areas. In some districts, notably Choiseul, the contrast is striking. The presence of lower-than-average percentages in the critical segment of the working population suggests a depletion due to emigration. The areas most affected by out-migration of the productive labour force include the villages of Anse La Raye and Dennery. The rural areas of Canaries, Vieux Fort and Gros

Islet, on the other hand, attract people from other parts of the island hopeful of finding jobs in tourism, industry and commerce. The working population (15-44) of Micoud shows a pattern very close to the national average in both the rural and urban sectors. This indicates the relative lack of population pressure on the available resources in this region relative to other parts of the island.

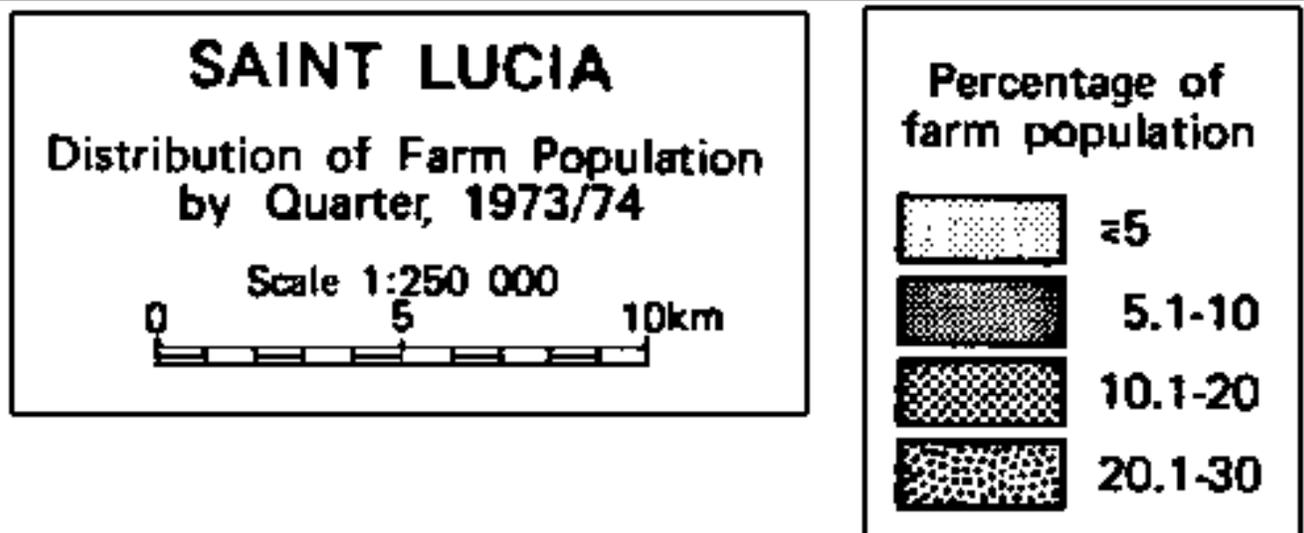
<sup>6</sup> In the tabulations in Annex D, the main village and its environs in each quarter is indicated by the number 1 in each case except for Castries where the respective numbers are 1-4. The other numbers listed for each quarter indicate rural areas.

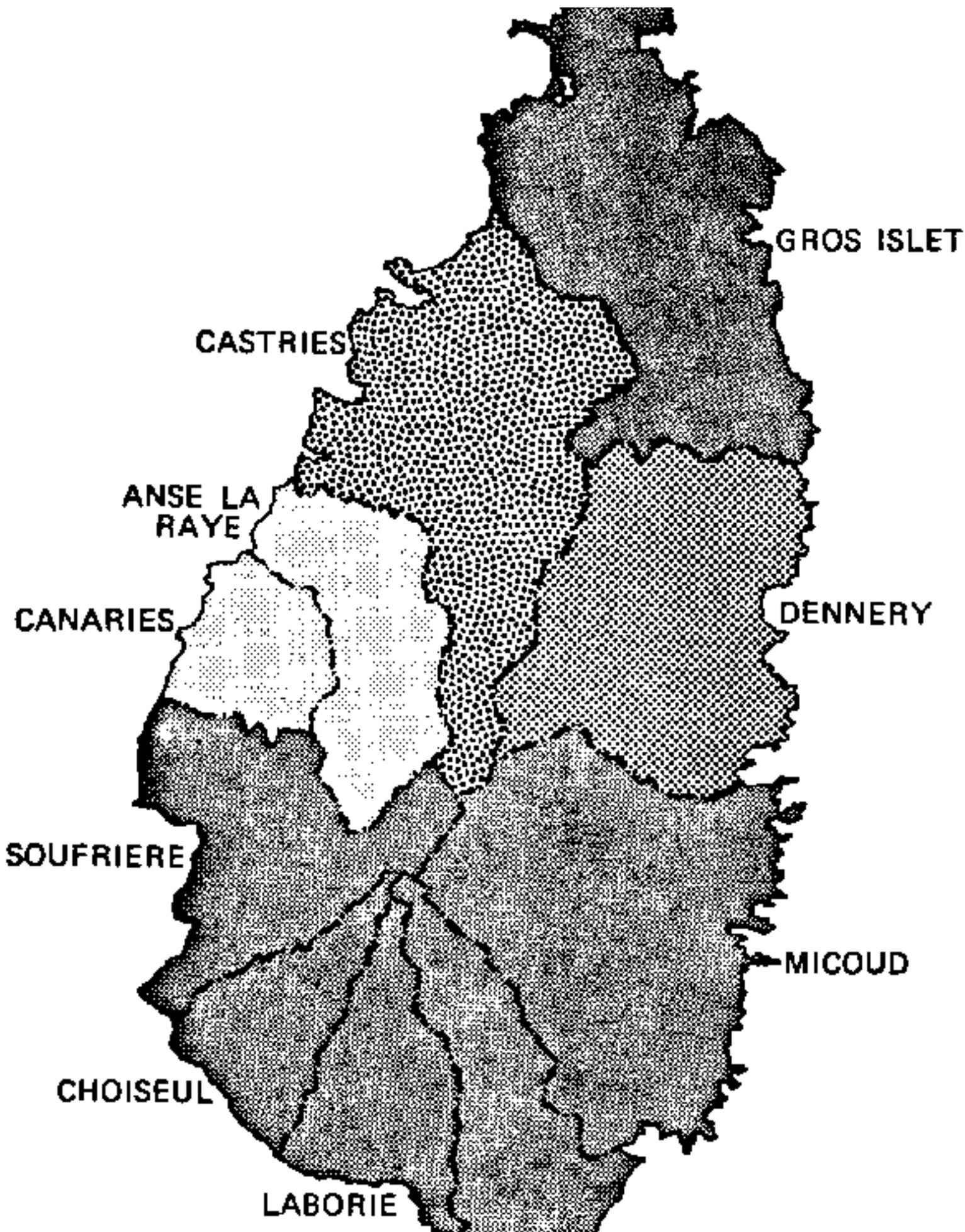
**TABLE 1-3. RATIO OF LAND TO FARM POPULATION BY QUARTER, 1973/74**

Quarter	Farm Population	Percentage of total farm population	Total acreage in farms	Percentage of total acreage in farms	Ratio (acres per person)
Castries	12 548	24.0	10 659	14.8	0.85
Anse La Raye	2 566	4.9	5 796	8.0	2.26
Canaries	2 374	4.5	2 248	3.1	0.94
Soufriere	4 522	8.6	6 953	9.7	1.54
Choiseul	4 584	8.8	2 016	2.8	0.45
Laborie	3 886	7.4	5 832	8.1	1.50
Vieux Fort	4 324	8.3	4 692	6.5	1.08
Micoud	3 670	7.0	11 301	15.7	3.08
Dennery	8 935	17.2	10 552	14.7	1.18
Gros Islet	4 874	9.3	11 952	16.6	2.45
TOTAL	52 283	100.0	72 001	100.0	

Source: Government of Saint Lucia, Ministry of Agriculture, Agricultural Census 1973/74.

**Map 1-3. Saint Lucia - Distribution of Farm Population by Quarter, 1973/74**







Source: Table 1-3. Ratio of Land to Farm Population by Quarter, 1973/74

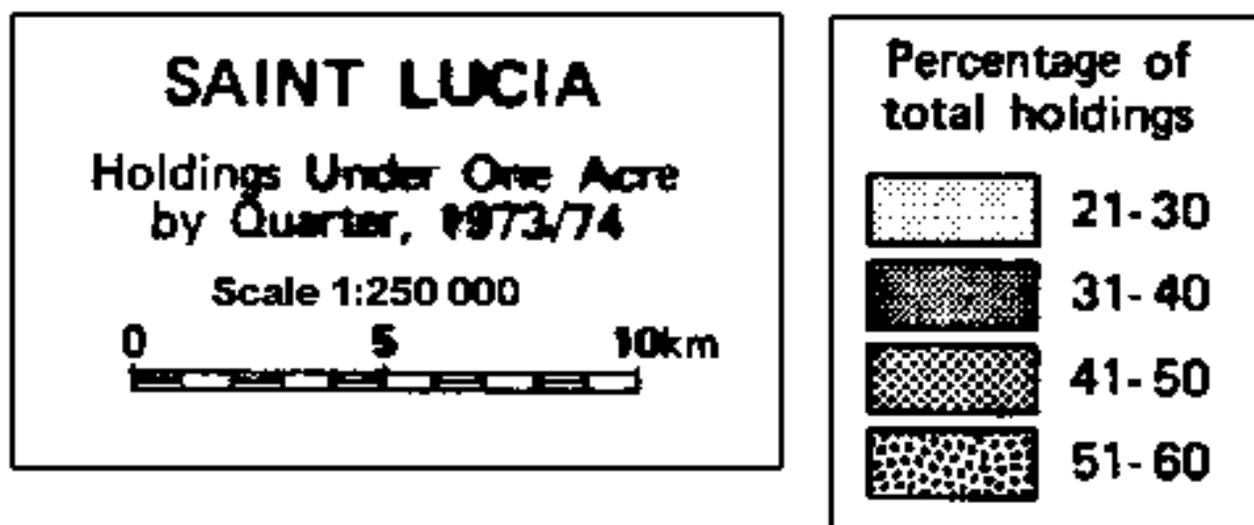
**TABLE 1-4. HOLDINGS UNDER ONE ACRE BY QUARTER, 1973/74**

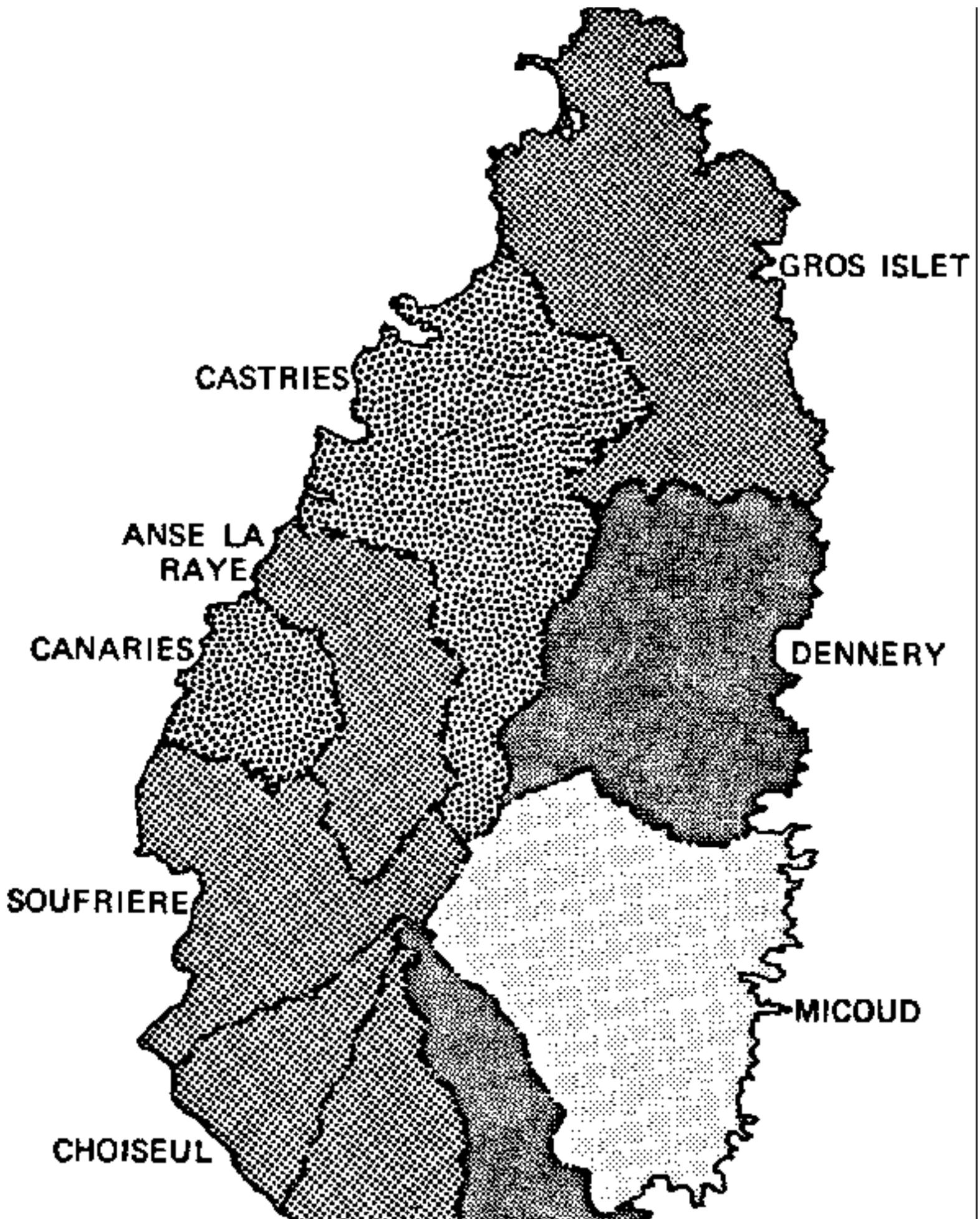
Quarter	Holdings below 1 acre (No.)	Total holdings (No.)	% holdings below 1 acre	Holdings below 1 acre as % of national total
Castries	1 318	2 399	54.9	21.9
Anse La Raye	288	618	46.6	5.7
Canaries	189	363	52.0	3.3
Soufriere	416	999	41.6	9.1
Choiseul	469	1 004	46.7	9.2
Laborie	323	787	41.0	7.2
Vieux Fort	346	915	37.8	8.4
Micoud	222	1 086	20.4	9.9
Dennerly	610	1 586	38.4	14.5
Gros Islet	549	1 181	46.4	10.8
Total	4 730	10 938 *	43.2 *	100.0

\* Includes 502 "holdings without land." Consequently percentage changes from 45.3 to 43.2. See Annex E, Table E-1, for comparison.

Source: Government of Saint Lucia, Ministry of Agriculture, Agricultural Census 1973/74.

**Map 1-4. Saint Lucia - Holdings Under One Acre by Quarter, 1973/74**







Source: Table 1-4, Holdings Under One Acre by Quarter, 1973/74

An additional indicator of significant subregional differences is the proportion of the population engaged in farming, forestry and fishing in each quarter (see Table D.2). In every case except Anse La Raye, the population of the main village is less involved in agriculture than is the population of the hinterland. The variation in the degree of dependency on agriculture of different parts of the island is significant. In Micoud, the hinterlands of Laborie and Dennery, and parts of Choiseul and Canaries more than 70 percent of the population is engaged in either farming, forestry and/or fishing.

## 1.3. Human settlements in rural Saint Lucia

### [1.3.1. Criteria for the typification of human settlements](#)

### [1.3.2. Types of settlements](#)

### 1.3.1. Criteria for the typification of human settlements

A typification that distinguishes plantation and peasant settlements has been found useful in many parts of the Caribbean region. The quality of lands in farm holdings, differences in the crops produced and differences in methods of organization of production serve as the basis for the distinction between plantation and small-scale farming. Plantations rely on a large landless labour force which settles near, or comes seasonally to, the estates. Smallholders hold and cultivate land on their own account. These differences lead to significant variations in community organization and social structure between these main settlement types. This distinction, while useful in suggesting a broad framework for observation, must be carefully examined and modified when trying to specify precise differences between settlements in St. Lucia.

Some of the factors which allow identification of the plantation and smallholder distinction in Saint Lucia are as follows:

- a) Many Saint Lucian plantations adopted forms of crop sharing - metayage - in the decades immediately following emancipation in 1838, in order to maintain their productivity at minimal cost in the face of serious economic difficulties.<sup>7</sup> Many large estates still allocate plots, free of charge or at a minimal rent, to their workers for cultivation on their own account. The distinction between landless plantation workers and own-account farmers is not clear cut. Even those villages on which estates depend for their work force have much the same structure as other small farming communities.
- b) Although Saint Lucian estates are predominantly located in the fertile alluvial valleys, they

are not separated by great distance from the hillside regions occupied by the peasantry. There is enough regular commerce between villages to preclude the development of marked differences in social structure between villages close to the plantations and other rural communities.

c) Bananas for export are grown by both large estates and the peasantry, so that during the last two decades the interests of the two sectors have converged to a limited extent.

<sup>7</sup> Woodville, Marshall, "Metayage in the Sugar Industry of the British Windward Islands 1838-1965", *Jamaica Historical Review* 5 (1), 1965, pp. 28-55.

Other characteristics of saint Lucian society prevent rigid definition of a spatial classification of human settlements. The island has had an extremely unstable economic history which has forced people to become accustomed to seeking out opportunities in other parts of the island or overseas. Rural people moved from the countryside to work on construction of the United States bases at Vieux Fort and Gros Islet during World War II, on the reconstruction of Castries after the fire of 1948, and for spurts of employment offered at the port (refuelling ships with bunker coal, in earlier decades). Thousands of saint Lucians have migrated for varying periods of time to work overseas. The "opportunity structure" of most people, whether rural or urban, involves the continuous creation of multiple options for training and jobs, and there is a tendency for people to have several occupations simultaneously. A recent report on small farming points out that in order to reduce their risks farmers have adopted "a system of resource allocation, cropping patterns and cropping technologies that emphasize heterogeneity."<sup>8</sup> Farmers in all parts of the island tend to grow a combination of cash crops and crops for domestic use.

<sup>8</sup> Vasantha Narendran, "Farming Systems in St. Lucia: An Anthropological Perspective," CARDI, Saint Lucia, 1981.

### 1.3.2. Types of settlements

It must be emphasized that the typification presented in Table 1-5 is not comprehensive; certain important distinguishing features have been omitted because they do not seem to be central to the specific study.<sup>9</sup> It will be noted that most rural communities are characteristic of either type B or C. Types B and C are within the same continuum, and it is often difficult to determine whether a particular settlements conforms more closely to one type or the other.

<sup>9</sup> A new classification of settlements was made in 1983. The methodology used and results of this work will appear in a settlement report on recent Project activities.

**TABLE 1-5. TYPES OF HUMAN SETTLEMENTS**

Type	Characteristics	Settlements

<p>A-1: Urban, or urban function related, as defined by functional and economic relationships.</p>	<p>Less than 50% of population engaged in agriculture, forestry and fishing, and/or concentration of tourism, industry, commerce, and construction, and/or served with greatest frequency by independently owned transport vehicles allowing residents to commute to work in urban areas.</p>	<p>Castries, Vieux Fort, Marisule, Augier, Reduit, Black Bay, Bois D'Orange, Gros Islet, Dennery (village), Soufriere (town), Choiseul (village), Laborie (village). Settlements which show signs of increasing dependency on urban jobs, e.g., Bexon area, Babonneau area,<sup>1</sup> Ti Rocher (Castries).<sup>1</sup></p>
<p>A-2: Related to urban area by location but have no urban functions.</p>	<p>Heavy reliance on non-agricultural sources of income (e.g.: craftwork in the Choiseul Quarter, remittances in Anse La Raye and Canaries Quarters).</p>	<p>Reunion, Cafetere, Monchy, Desrameaux, La Borne, Theodorine, Anse La Verdure.</p>
<p>B: Rural, agricultural functions supported by good natural resource base.</p>	<p>Concentration of small farmers producing crops that enjoy the most reliable market system (bananas, coconuts, fresh vegetables) and/or good rainfall, soils not seriously eroded and/or high percentages of 1-5 and 5-10 acre holdings.</p>	<p>Babonneau,<sup>1</sup> La Gare, Balata, Marquis, Paix Bouche, Marc, Fond Cannie, Chassin, Forestiere, Trois Piton, Fond Petit, Ravine Poisson, Guesneau, Odsan, Boguis, Deglos, Becage, Barre de L'Isle, Ti Rocher (Castries),<sup>1</sup> La Ressource, Mon Repos, woodlands, Au Leon, Belle Vue, Morne Panache, Banse, Canelles, Grande Ravine, Vige, Desruisseau, La Rue, La Caye, Annus, Micoud, Giraud, Saint Joseph, Ti Rocher, Saltibus, Blanchard, Millet, La Croix, Maingot, Grace, De Many, Latille, Ti Riviere, L'Eau Mineur, Moreaux, Degard, Durocher, Mahaut, La Cour Vine, Galba, Lombard, Seleau,<sup>2</sup> Raillon, Choco Mel,<sup>2</sup> Londonderry, Praslin, Patience, Mamiku, Derniere Riviere.</p>

C-1: Predominantly small holdings (under 1 acre).	Holdings generally smaller than type B with a greater percentage under 1 acre and/or greater land constraint than type B because of mountainous terrain which restricts settlement expansion or because nearby lands are controlled by well-cultivated medium and large estates.	Roseau, Soucis, Saint Philip, Crown Lands, Migni, Garrand, Colombette, Debbarah, Sarot, Fond Assau, Durandean, Dupui, Hill 20, <sup>2</sup> Pois Dous, <sup>2</sup> La Haut, Talvern, Eating, Dauphin, Belle Fond, La Pointe, Malgretoute, Jac Mel, Grand Riviere, Fond Saint Jacques.
C-2: Predominantly small holdings (under 1 acre)	Lower rainfall, than in type C-1 or poorer soils and/or heavier rate of emigration (especially the 15-44 age group) than occurs in areas characterized in type C-1.	Morne Sion, Delcer, Ravenau, Fiette, Victoria, La Fargue, Industry, Debreul, Esperance, La Pointe (Choiseul), La Riche.
D: Former sugarcane growing areas.	Areas that did not go into intensive cultivation of replacement cash staples.	Morne Jacques, Mal Mason, Masacre, Sarot, Au Tabor, Robot, Belvedere, Gertrine, Ravine Duval, Savanne, Bouton Chateau Belair, Esperance (Canaries).

<sup>1</sup> Settlements that have characteristics of more than one type.

<sup>2</sup> Not traceable on the 1: 25 000 scale. Directorate of Overseas Survey Map.

Source: Carnegie, C., "The Rural Population of Saint Lucia: A Preliminary Analysis," OAS Technical Report, Castries, Saint Lucia, September 1981 (mimeo). Directorate of Overseas Survey: 1: 25 000 scale map and Government of Saint Lucia, Ministry of Agriculture: 1980 Farmer Survey.

Table 1-6 helps to clarify the distinction between types B and C. For example, in comparison with Ti Rocher (Micoud), Fond Saint Jacques has a high concentration of holdings below one acre and a low percentage of holdings between one and ten acres.

**TABLE 1-6. SIZE OF HOLDINGS: TI ROCHER (MICOUD) AND FOND SAINT JACQUES, 1980**

Acres	0-1	1-5	5-10	10-50	50+	Total No. of holdings
Ti Rocher	9.3%	53.1%	26%	11.7%	0.7%	128
Fond St. Jac.	58.3%	31.0%	6.4%	3.7%	0.4%	216

Source: Government of Saint Lucia, Ministry of Agriculture, 1980 Farmer Survey.

Finally, squatting on private estates or on Crown Lands has been a persistent problem since emancipation, and it is likely that several communities that are now well established were originally formed in this way. Their ownership and other patterns gradually came to conform to those of other rural communities. Villages on the periphery of or within large estates may have been formed originally by squatters but are

now indistinguishable from other rural communities. It also appears that squatting is haphazard, involving isolated cases or very small groups of people rather than clear zones of settlement. Even among these groups there might be a great deal of shifting from one season to the next or involvement into and out of agriculture as personal circumstances determine.

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# Chapter 2. Land tenure and distribution as constraints on agricultural development

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[2.1. Land tenure](#)

[2.2. Land distribution](#)

[2.3. Land use and technology](#)

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Land tenure and distribution are key factors to understanding the structure of production and power in Saint Lucia's rural sector. The following analysis is an attempt to characterize man/land relations and indicates the extent to which these relationships represent major constraints on agricultural development. Many of the data used are drawn from the 1973/74 Agricultural Census. While this information is somewhat dated and has certain deficiencies, it remains the best available at the national level. It has been supplemented with recent survey data and field observations.

## 2.1. Land tenure

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[2.1.1. Land ownership and rental](#)

[2.1.2. Ownership and operation of the agricultural holdings](#)

[2.1.3. Family lands](#)

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### 2.1.1. Land ownership and rental

Various forms of land tenure influence the stability of the rural sector. If large numbers of farmers have only temporary access to land (through short-term sharecropping agreements, for example), social problems are likely to be severe. The 1973/74 Agricultural Census indicates that 70.6 percent of all holdings were "owned or held in ownerlike possession." No less than 92.6 percent of the total farm area was held in this way, suggesting that the sector was reasonably stable in this respect. This classification apparently includes family land, an issue discussed at greater length below.

The next most prominent tenure category was that of renter, which represented 18.3 percent of total holdings yet controlled only 2.8 percent of the island's farmland, averaging 1.0 acre per rental unit. While not a major problem nationally, these small producers may present one in specific localities. In the census quarter of Castries, Vieux Fort, and Dennery they constitute 24.4 percent, 27.8 percent, and 43.9 percent,

respectively, of all holdings.

## 2.1.2. Ownership and operation of the agricultural holdings

Another dimension of land tenure, the relation between ownership and operation of the holding, can be evaluated indirectly from census data. This relation is important when considering any "land to the tiller" programme or when examining questions of absentee ownership.

One indicator of the gap between owners and those who work the land is the legal form of landholding. While 98.4 percent of all holdings were owned by individuals (civil persons), 26.5 percent of the land was held by nineteen corporations. Another indicator of this gap is the incidence of management by third persons (farm administrators). A total of 57 holdings of 50 acres or larger were so managed in 1973/74 representing 39.5 percent of total farmland in Saint Lucia.

A certain disparity of land tenure emerges from this analysis. While the majority of farmers own the land they work, which suggests a high degree of tenure stability, localized problems of small rental holdings and squatting exist. On the other hand, a small number of large owners control a disproportionate part of the national territory, but do not work the land directly.

## 2.1.3. Family lands

Family land is inherited land held in common by the heirs. This important type of land tenure in Saint Lucia requires separate analysis. The concept of family land originates from the laws of intestate succession (death in the absence of a will), which provide that property be divided in equal shares among the surviving spouse and all legitimate children.<sup>1</sup>

<sup>1</sup> In the absence of a spouse and legitimate children, succession devolves to ascending, descending or collateral relatives. Illegitimate children succeed only in the absence of legal issue.

While each heir has the legal right to demarcate and subdivide his inheritance, few such subdivisions take place. On small holdings the process is frequently more expensive than the value of the land. On large holdings, where the size of the inheritance might justify the cost, land is frequently maintained intact through will provisions or by agreement of the heirs.

In the absence of official statistics on the extent of family land, estimates range all the way from 10 percent to 64 percent of total farmland.<sup>2</sup> Because landholdings tend to be small, the number of producers will be proportionately larger than the area.

<sup>2</sup> United Nations Food and Agriculture Organization, *op.cit.*, pp. 20-29. FAO reports that questions on family land were included in the 1973/74 Agricultural Census, although nothing has been published and nothing referring to this question was found in the original census forms.

A recent survey of 245 rural holdings of 15 acres or fewer revealed that 104 of the parcels (42.4 percent) consist of family land.<sup>3</sup> Analyses of four Catchment Area Surveys show the area of family land to vary from 1.9 percent to 70.5 percent of the region surveyed. The situation appears to be of little significance in some areas, especially where larger farms predominate, but can represent the major form of landholding in areas where small farms are numerous.

<sup>3</sup> University of the West Indies and Mid-West Consortium for International Activities (U.W.I. - MUCIA), "The Economic Role of Women in Small Scale Agriculture: The Eastern Caribbean," Saint Lucia, 1981 (mimeo).

The family land system has been condemned by many land tenure specialists who have visited Saint Lucia. Foreman declared it to be "the greatest single factor responsible for the unsatisfactory state of the island economy."<sup>4</sup> The disadvantages are:

- a) Co-owners of family land seldom have a deed or other legal evidence of their right to the land.
- b) Lack of legal documents impedes the sale of land and makes it extremely difficult to obtain credit.
- c) Investment is discouraged by the conventional right of all co-owners to harvest permanent crops grown on the land, whether they participate in their cultivation or not.
- d) Since not all heirs are interested in actively farming the land, some areas are left unused or underutilized.
- e) Over generations the increasing number of co-owners of a holding may reduce each individual claim to an area too small to farm.

<sup>4</sup> Foreman, R.A., "Land Settlement Scheme for Saint Lucia," British Government Colonial Office, Castries, 1958, p. 15.

There can be no doubt that the informality of the registration procedure and lack of cadastral information are primary in a combination of factors that slow the transformation of present agriculture as a commercial subsector. The advantages of the family land system are that family land has served as a mechanism to avoid excessive fragmentation implicit in succession laws; that a significant proportion of the population has been guaranteed access to land, whether on a full-time basis or as a supplementary income source; that garden plots are often grown by estate and urban workers helping subsidize wages from large farmers and urban employers; and that for those who do not work the land themselves family land serves as a type of social security and place of future residence.

The problem associated with the "family land" tradition of multiple small plots farmed by one family is in fact a product of the succession laws. Fragmentation can become severe over generations. Census data, while probably understating the problem, suggest that only 11.7 percent of all holdings are composed of two or more parcels and fewer than half of one percent contain three or more.

Any major changes in the family land tradition, as proposed by Foreman and others, will inevitably have social and economic consequences. According to statistics presented in the 1975 FAO report, 43 percent of the holders of family land felt that this arrangement in no way prevented them from making proper use of the land and only 29 percent stated that they would like to abolish this form of tenure in favour of individual property rights.<sup>5</sup> The local farm population must obviously be consulted and involved in the process of deciding on any proposed change to avoid social and economic disruption.

<sup>5</sup> *Op. cit.*, pp. 29-30.

## 2.2. Land distribution

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[2.2.1. Holding size categories](#)

[2.2.2. Fragmentation and centralization](#)

[2.2.3. Characterizing the land distribution problem](#)

[2.2.4. The landless population](#)

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### 2.2.1. Holding size categories

The skewed nature of land distribution in Saint Lucia is readily visible and in many respects reflects the plantation/peasant system established by the colonial powers. While the change in monoculture (from sugar to bananas) has increased participation in cash crop production, no fundamental change in the land distribution pattern has resulted.

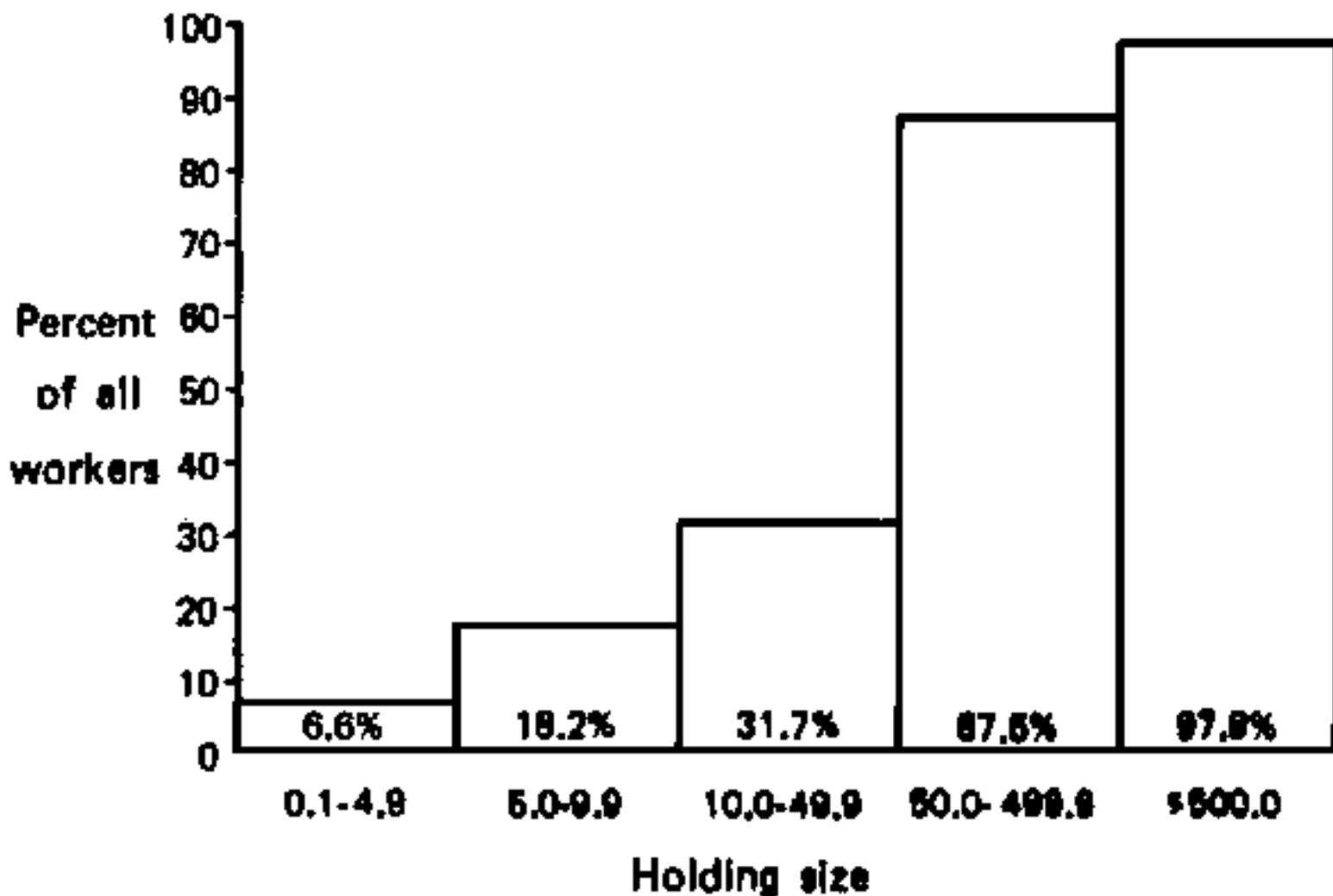
Tables E-1 through E-5, Annex E, characterize land holding patterns on the island. Many of the data are drawn from the 1973/74 Agricultural Census, but more recent information is used where available. The choice of holding size categories used in the analysis is based on initial observations of the function that land has for the various types of holders. Holdings in the 0.1 - 0.9 acre category average only 0.4 acres each (tables E-1 and E-2), which suggests that these plots have only a supplementary function as an income source. Farms in the 1.0 - 4.9 acre category average only 2.2 acres, which indicates that most of these producers still have considerably less land than 4 to 5 acres of good agricultural land considered necessary to fully employ the farm family using existing technology.<sup>6</sup> Both of these categories can be considered subfamily holdings by this criterion, representing the level where the greatest land need will be found.

<sup>6</sup> See Zadek, S., "Appraisal Report on Roseau Small Holder Resettlement Scheme," Government of Saint Lucia, Ministry of Finance, Central Planning Unit, Castries, 1980 (mimeo).

The adequacy of operator family labour in farming is used as a major criterion for determining the remaining size categories. The degree of dependency on wage labour, as given in the Census, helps separate family and commercial holdings (Graph 2-1).<sup>7</sup>

<sup>7</sup> Calculated as the percentage of paid workers in the total labour force during the week prior to the Census (1973/74) within each holding size.

#### **GRAPH 2-1. Paid Workers as a Percentage of All Workers by Holding Size (Acres)**



Source: Agricultural Census 1973/74

While some wage labour is recorded in the 0.1 - 4.9 acre category (assumed to be smaller than that necessary to fully employ the farm family), this is likely to be provided from earnings of family labour on larger farms, a variable not measured by the Census.

In the 5.0 - 9.9 acre category family labour provides over 80 percent of total labour requirements and only occasional outside workers are necessary. The 10.0 - 49.9 acre category can still be considered an essentially "family farm" situation, although purchased labour has increased to 31.7 percent of the total.

The situation changes radically for holdings over 50 acres. Census data show purchased labour as representing 74.4 percent of total requirements in the 50.0 - 99.9 acre category and 87.5 percent in the 50.0 - 499.9 acre category. These holdings can be defined as "commercial" with respect to labour use. The 500.0 acre category represents a qualitative rather than a quantitative distinction from other large farms because it is composed of the nineteen largest estates on the island. Labour on these farms is almost entirely purchased (97.9 percent).

### 2.2.2. Fragmentation and centralization

Tables E-1 and E-2 of Annex E show that the smallest holding category represents 45.3 percent of all farmers, but contains only 2.4 percent of the area of farmed land.<sup>8</sup> The 8,558 holdings in the 0.1 - 4.9 acre

group (the two "subfamily" categories) represent 82.0 percent of all holdings yet control only 14.2 percent of total farmland. The 122 holdings with more than 50 acres represent only 1.2 percent of all farms but control 58.4 percent of the land. The largest nineteen holdings (+500 acres) alone contain 37.4 percent of the total area. This shows the inequality of land distribution to be severe, especially when land quality is considered.<sup>9</sup>

<sup>8</sup> This percentage is a calculation of total holdings which includes 502 "Holdings Without Land". Actual percentage is 43.2 percent, as shown elsewhere in this report.

<sup>9</sup> In the quarter of Dennery it was found that up to 87 percent of the lands in classes I, II, and III were in holdings of over 500 acres and that large farms (over 50 acres) accounted for almost all the good lands available in the quarter.

Comparison by census quarter (Table E-1) shows an extreme concentration of micro-holdings (0.1 - 0.9 acres) in Castries (58.1 percent), Canaries (55.1 percent) and Gros Islet (52.8 percent). Where the subfamily categories (0.1 - 4.9 acres) in the quarters of Vieux Fort and Choiseul are considered jointly, they represent the most critical situation, with over 90 percent of all holdings falling within the 0.1 - 4.9 range. In only three of the quarters does the percentage fall below 80 percent. These figures indicate that inequality of land distribution in Saint Lucia is widespread.

The concentration of land ownership in large holdings (over 50 acres) is most severe in Gros Islet, Vieux Fort, and Anse La Raye, where it exceeded 70 percent of total farmland (Table C-2). Large estates (500.0 acres) occupy half of the land in Anse La Raye and Vieux Fort and 68.4 percent in Gros Islet. The area occupied by large holdings (500.0 acres) as a percentage of total area, by quarter, is shown in Map 2-1.

### **2.2.3. Characterizing the land distribution problem**

An attempt to rank the census quarters in terms of the severity of land fragmentation concentration is presented in Table 2-1.

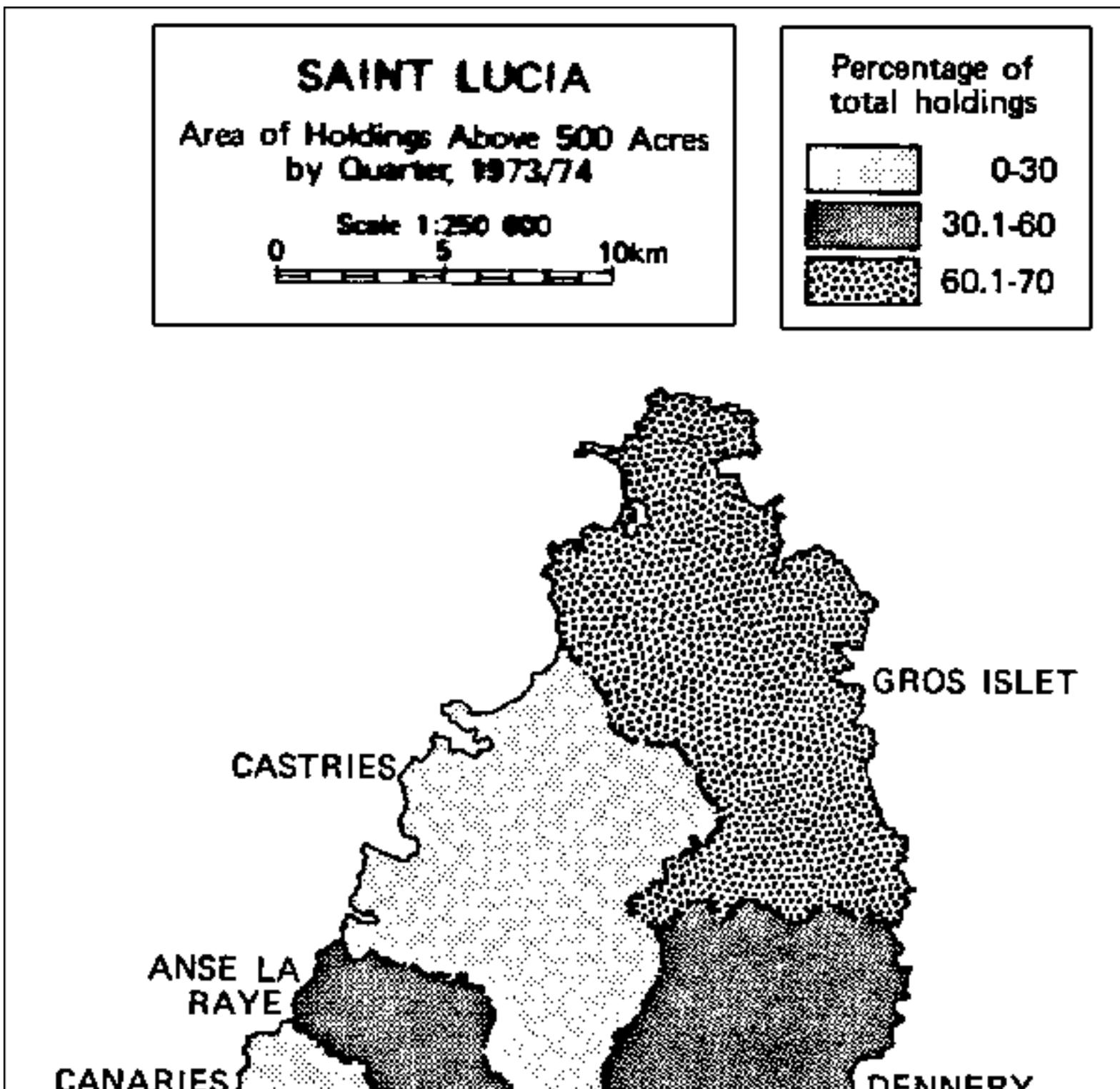
The quarters are ranked by the percentage that each of the four land distribution situations represents of the total number of holdings (in the case of fragmentation) or area (in the case of concentration). For example, the Quarter of Castries had the largest percentage of holdings in the 0.1 - 0.9 acre size and was among the quarters with the smallest percentage of area included in the 50 acre category.

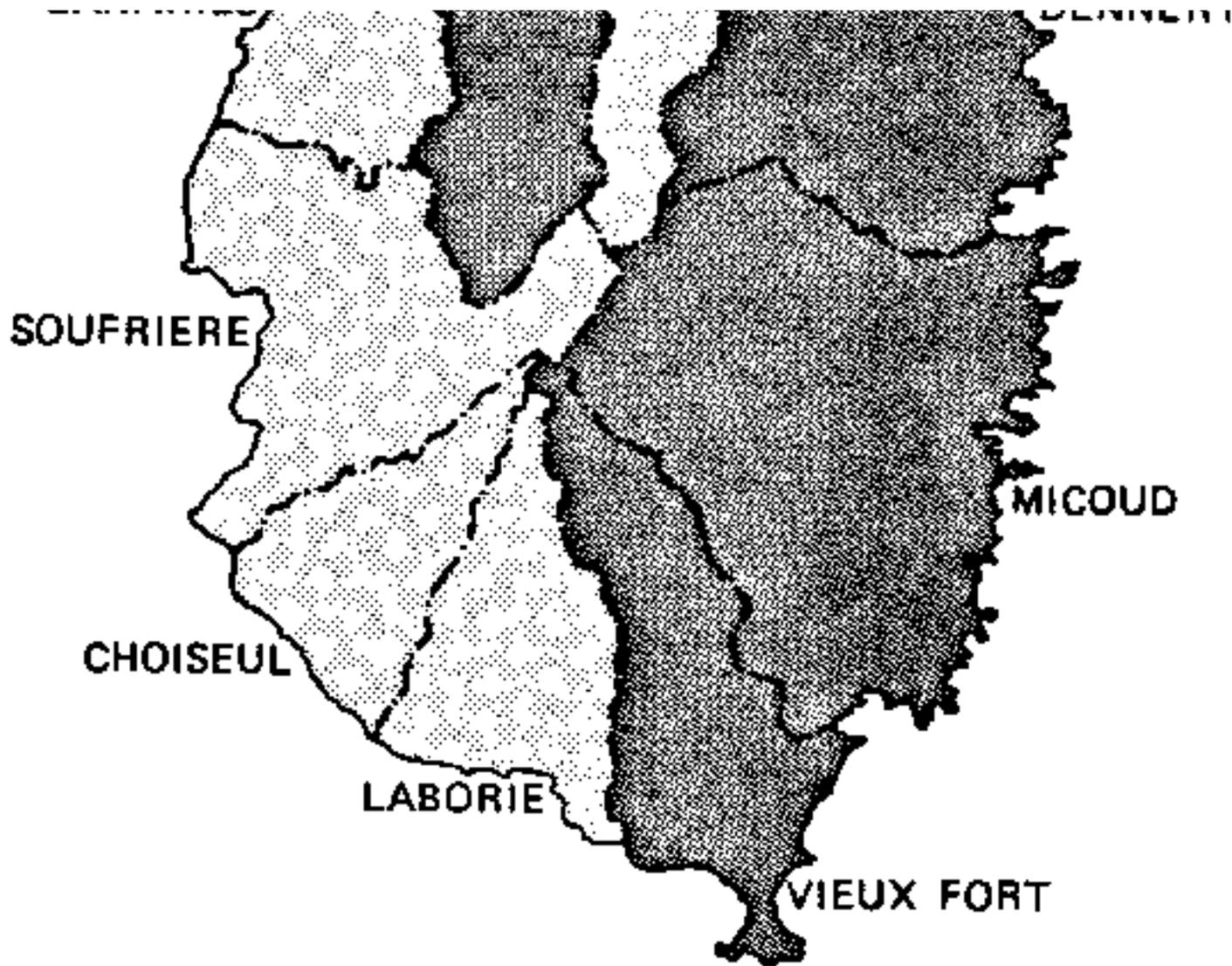
The "inequality index" is calculated by allocating weights for each quarter according to its rank (e.g., the index for Castries is  $10 + 7 + 2 + 5 = 24$ ), as shown in Table 2-2. The assumption is that each of the four situations is equally constraining and permits summation in a single index. Differences in the productive potential of the quarters were not considered. From the inequality index, quarters can be categorized into relative "degrees of severity" regarding the land distribution problem. Map 2-2 shows the distribution of the quarters according to three classes of severity.

To better qualify the severity of unequal land distribution, the problem can also be examined in terms of the function of land for the holder. The Census provides national data on the occupation of the landholder, permitting identification of those for whom agriculture is the primary occupation, those who work primarily as agricultural labourers on the land of others, and those who depend largely on non-farm employment. Wage labour in agriculture is found primarily (although not exclusively) on estates. Non-farm work includes fishing as well as urban jobs. These data are presented in Annex E, Table E-3.

Fewer than half of all landholders are full-time farmers. One of every three has a non-agricultural occupation and one out of six is an agricultural employee. The function of land as a supplemental income source is most pronounced in the smallest and the largest size categories. Only one-fourth of all holders in the 0.1 - 0.9 size category are self-employed farmers. Half of them have non-agricultural jobs, another one-fourth are rural wage workers. Over one-third of all holders included in the 1.0 - 4.9 acre category (most likely those with smaller plots) also depend on other occupations for their principal source of livelihood. Many of these part-time farmers probably work family land and grow subsistence crops in their spare time.

**Map 2-1. Saint Lucia - Area of Holdings Above 500 Acres by Quarter, 1973/74**





**Note: Canaries and Choiseul have no holdings larger than 500 acres**

Source: Table E-2, Area of Holdings by Quarter and Size Category, 1973/74

**TABLE 2-1. LAND FRAGMENTATION/CONCENTRATION RANKING BY QUARTERS, 1973/74**

Rank	Fragmentation <sup>a/</sup>		Concentration <sup>b/</sup>	
	0.1-0.9	0.1-4.9	50.0	500.0
10	Castries	Vieux Fort	Gros Islet	Gros Islet
9	Canaries	Choiseul	Vieux Fort	Anse La Raye
8	Gros Islet	Gros Islet	Anse La Raye	Vieux Fort
7	Choiseul	Castries	Canaries	Micoud
6	Anse La Raye	Canaries	Micoud	Dennery
5	Vieux Fort	Soufriere	Soufriere	Castries
4	Soufriere	Anse La Raye	Dennery	Soufriere
3	Laborie	Laborie	Laborie	Laborie

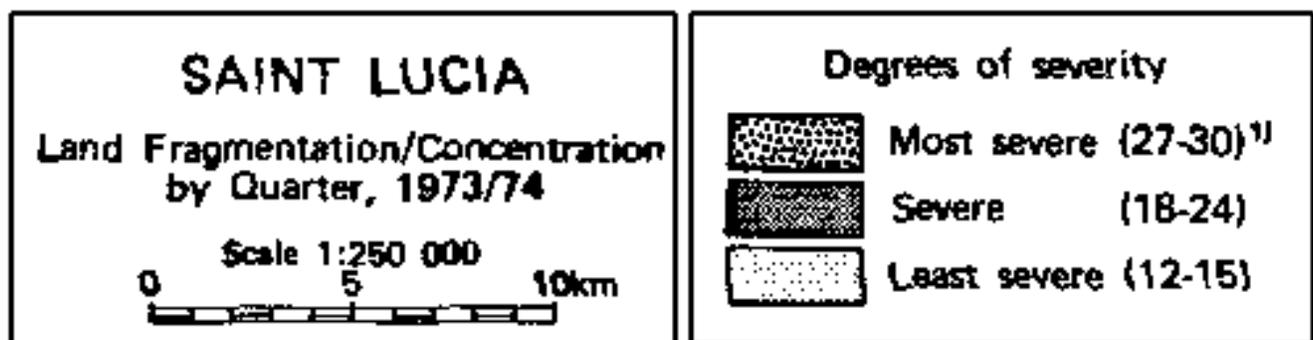
2	Dennerly	Dennerly	Castries	Canaries
1	Micoud	Micoud	Choiseul	Choiseul

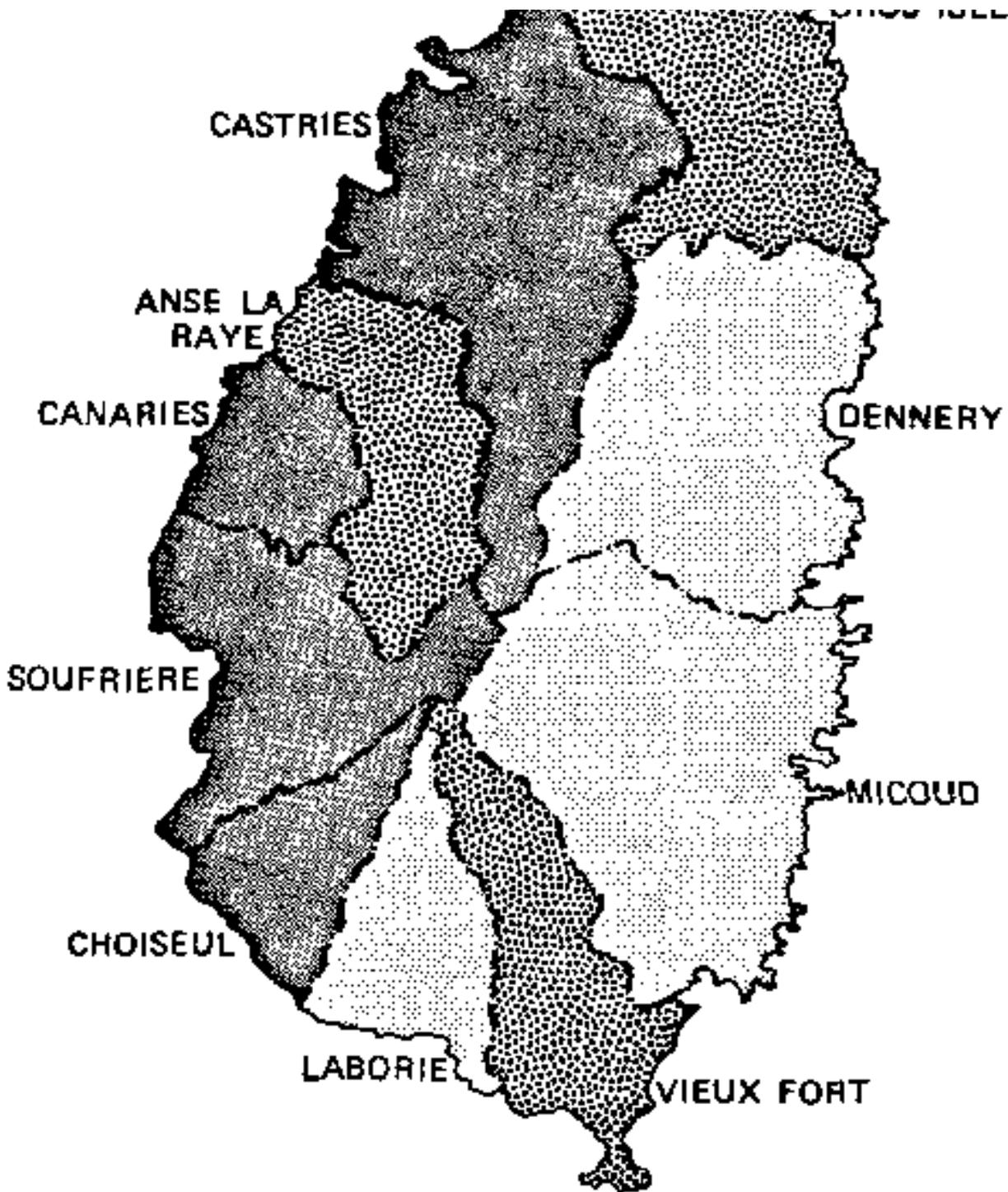
- a. Quarters ranked by numbers of small holdings as a percentage of total number of holdings.
- b. Quarters ranked by area of large holdings as a percentage of total area; 10 is the highest ranking (amount), 1 the lowest. Source: Annex E, Tables E-1 and E-2.

**TABLE 2-2. LAND FRAGMENTATION/CONCENTRATION; ACTUAL RANKING, 1973/74**

	Fragmentation		Concentration		Inequality Index
	0.1 - 0.9	0.1 - 4.9	50.0	500.0	
Gros Islet	8	8	10	10	36
Vieux Fort	5	10	9	8	32
Anse La Raye	6	4	8	9	27
Castries	10	7	2	5	24
Canaries	9	6	7	2	24
Soufriere	4	5	5	4	18
Choiseul	7	9	1	1	18
Micoud	1	1	6	7	15
Dennerly	2	2	4	6	14
Laborie	3	3	3	3	12

Source: Table 2-1.

**Map 2-2. Saint Lucia - Land Fragmentation/Concentration**



**Note:** <sup>1)</sup> Intervals of the inequality index are the basis for classifying quarters into 'degrees of severity' defined as the highest to lowest combination of land fragmentation/concentration. Intervals are taken from Table 2-2

Source: Table 2-2, Land Fragmentation/Concentration Actual Ranking, 1973/74

These findings indicate that land serves a social function for the small holder which differs significantly from that of the commercial farmer. Not only is emphasis placed on food crops, but the part-time small holder may, in some instances, be unable to work more land even if it were available.

The fact that fewer than half of the largest holders are self-employed in agriculture may be explained by

their multiple roles as landlords and businessmen. Their principal occupation may change over time, depending on where the most profit can be obtained. Currently, however, agriculture appears unable to compete with commerce and urban land speculation.

## 2.2.4. The landless population

There are numerous reports of the existence of a sizable landless population in Saint Lucia, although no precise data are available to quantify this assertion or to analyze its spatial distribution. When carrying out its hearings the Land Reform Commission received testimony on the question of squatting that indicated the existence of a large group of landless peasants. The Forest Supervisor reported the presence of squatters in the forest reserve and spoke of penalties and other efforts to alleviate the problem they posed. Errand, Louvet, and Jalousie states also reported intrusions from squatters in the past few years. Other estates, while claiming no problem with squatters, did comment on the prevalence of praedial larceny from their holdings. Several of the large estates submitted written statements to the Commission reporting that they allocate portions of land to their workers for planting gardens.<sup>10</sup> This has been a long tradition of Saint Lucian estates that apparently continues to be widespread. The practice perhaps mitigates or disguises the problem of landlessness.

<sup>10</sup> Saint Lucia Land Reform Commission, "Public Hearings 1979/80 Transcription," Castries, 1980 (mimeo); and "Written Memoranda Submitted to the Commission, 1979-1980" (unpublished).

Squatting is not assigned a specific tenure category in the Agricultural Census, nor is there any indication that it is included in the "other types of tenure" category. This may be attributed to the illegality of squatting and the reluctance of the squatter to provide the census enumerator with information.

"Landless" in the Saint Lucian context encompasses a variety of different relationships of people to land in the rural sector. There are people who rent land on a seasonal, yearly or long-term basis, squatters on privately owned or Crown lands, and people who operate holdings too small to provide an adequate income for their families without other forms of employment. These conditions can impose considerable insecurity of tenure on agricultural producers which restricts their productive potential. These effects might vary in severity from one farmer to the next or between one part of the island and another. Furthermore, land possession itself does not ensure the disappearance of unfavourable conditions. The difficulty of securing registered title to freehold property, the lack of price supports and adequate marketing arrangements for produce, the difficulty in securing agricultural loans, and several other conditions tend to constrain the farming community regardless of the form of tenure.

While renting and squatting indicate landlessness, not all renters and squatters are necessarily landless. In the Caribbean Research Development Institute (CARDI) sample of 31 Saint Lucian farmers, at least 5 of the 21 for whom information is complete show different forms of tenure on different farm plots in their holdings. A lease or rental may be combined with more secure tenure on freehold or family land.<sup>11</sup> These forms of tenure have become part of the small farming system over time. In some instances they may represent a temporary phase in the farmer's working career, supporting him until he gains access to family land or takes up another occupation. In other instances, rental and leasehold may be used by the small farmer as a device for spreading risk.

<sup>11</sup> Vasantha Narendran, *op. cit.*

The implicit assumption that when given access to land the landless will become long-term agricultural

producers must also be carefully evaluated, particularly in connection with the age structure of this landless population. The existing information indicates that not all the rural population is equally willing to engage in full-time farming. Over the years, a pattern has developed in which young people below age 35 are under-represented in the local agricultural sector, but gradually take their place in agriculture during their middle years.<sup>12</sup>

<sup>12</sup> Carnegie, C., *op. cit.*, p. 33.

## 2.3. Land use and technology

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[2.3.1. Uses of agricultural land](#)

[2.3.2. Intensity of land use](#)

[2.3.3. Land use and family land](#)

[2.3.4. Land utilization](#)

[2.3.5. The function of production](#)

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Various aspects of farming practices have been identified as constraints on land development and as justification for promoting a reformulation of the structure of the rural sector. Large farms are accused of underutilizing the land at their disposal. While land is used more intensely on small farms, its utilization is seen as technologically backward, resulting in a relatively low level of efficiency. The following analysis characterizes land use and technology in Saint Lucia's rural sector and suggests areas of constraints on production.

### 2.3.1. Uses of agricultural land

Land use by holding size is presented in Table 2-3. This analysis is based solely on 1973/74 Census data since the 1980 Farmer Register provides information only on the area of crops damaged by Hurricane Alien and not on total land use. The proportion of land in permanent crops (bananas, tree crops) is high for all size categories, averaging 39.6 percent. It is lowest for the smallest and largest holder categories and highest for the 5.0 - 9.9 acre size category. This activity is characterized by its permanence, providing land cover and protection against erosion year-round.

The production of other crops, primarily food provisions, shows a marked decrease as farm size increases. The smallest size category has (0.1 - 0.9 acres) over half of its area devoted to this activity, while on the largest farms (500 acres) 7 percent of the area is planted with annual crops. This suggests an essentially subsistence and non-commercial nature for these crops. They also provide the least protection against resource degradation because of their limited canopy and the seasonal nature of production. The second largest major-use class, in terms of area, is forest land, which increases with average farm size. Because there is little exploitation of forest on farmlands in Saint Lucia, this category can be considered unused land, as can the "other land" category in Table 2-3.

## 2.3.2. Intensity of land use

A summary of the three major land use categories, expressed as a percentage of total area, is useful for comparing the intensity of use by holding size. Table 2-4 shows percentages of land by size category. Cropland includes both permanent and annual (other) crops. Unused land is composed of forest and other land from Table 2.3. The intensity of land use is seen to be in inverse proportion to holding size, e.g., pressure on land in the smallest size category (0.1 - 0.9 acres) appears excessive, considering that most lands in this category are hillside farms requiring careful conservation measures. In the three smallest size categories (10 acres) over 80 percent of total area is used for crops. Cropland intensity drops to just over 40 percent on the largest farms (500 acres), lending support to the contention that the large holder uses his land less intensively than he might. Pasture area is much smaller on large holdings than might be expected and is probably even less today given the observed reduction in cattle production on large units during the 1970s.

### TABLE 2-3. LAND USE BY HOLDING SIZE, 1973/74

Source: Ministry of Agriculture and Lands, Agricultural Statistics: Census Data, 1973/74, Castries 1975.

### **TABLE 2-4. MAJOR LAND USE BY HOLDING SIZE, 1973/1974**

<b>HOLDER SIZE (acres)</b>	<b>AREA</b>	<b>TOTAL AREA (%)</b>	<b>CROPLAND (%)</b>	<b>GRASSLAND (%)</b>	<b>UNUSED (%)</b>
0.1 - 0.9	1 733	100.00	93.8	3.2	3.0
1.0 - 4.9	8 471	100.00	80.4	11.0	8.6
5.0 - 9.9	7 059	100.00	81.1	7.1	11.8
10.0 - 49.9	12 704	100.00	64.7	7.7	27.6
50.0 - 499.9	15 132	100.00	53.5	14.6	31.9
500.0	26 902	100.00	41.6	9.9	48.5
<b>TOTAL</b>	<b>72 001</b>	<b>100.00</b>	<b>57.9</b>	<b>10.2</b>	<b>31.9</b>

Source: Table 2-3.

The implicit assumption that "unused" land on large holdings can in fact be farmed profitably would be contested by many owners involved. Most unused land consists of hillside forest or scrub. The rich alluvial valleys found on many large estates are generally being cultivated with permanent crops. Observation suggests, however, that were this unused land found on medium sized and small holdings, much of it would be under cultivation. Recent land sales by large estates, releasing unused land for agricultural purposes, tend to confirm this observation. The reasons for this difference in land use between holding sizes must be identified to determine how a "profitable" activity is defined by each holder type.<sup>13</sup>

<sup>13</sup> For the large holder, the profitability calculation includes provision for a return on invested capital. The peasant farmer, on the other hand, will probably undertake production on land as long as he earns at least a wage equivalent for his labour even though little or nothing is left as returns on capital.

### 2.3.3. Land use and family land

Analysis is required to ascertain the frequency of non-use of plots within small holder communities, information not apparent in the census data. The methodology of census enumeration explains why this situation is not documented: all holdings where no economic activity had occurred during the preceding twelve months were simply ignored for census purposes.

The proportion of family land claimed by holders who were actually farming in the survey of three catchment areas varied from 20.4 percent to 34.6 percent, which indicates that a major part of family land in these regions was not being worked (Table 2-5). While this limited information cannot be extrapolated to the nation as a whole, it does suggest that considerable unused land exists at both ends of the farm size spectrum, though for quite different reasons.

**TABLE 2-5. FAMILY LANDS IN THREE SELECTED AREAS, 1972**

	<b>Total family land (acres)</b>	<b>Portion claimed (acres)</b>	<b>%</b>
Chopin	103	21	20.4
Micoud	318	110	34.6
Vige	687	189	27.5
<b>TOTAL</b>	<b>1 108</b>	<b>320</b>	<b>28.9</b>

Source: Government of Saint Lucia, Ministry of Agriculture, Socioeconomic Survey of Three Catchment Areas, 1972.

Because no documentation of vacant lands exists, analysis of why land is vacant is tenuous at best. The explanation would partially appear in the family land arrangement, in which some co-owners live far from the land (perhaps even outside the country) and are not interested in working it. There are probably other limitations, e.g., physical, restricting the use of family lands for agriculture.

### 2.3.4. Land utilization

While it is not always easy to document the existence of unused land in the rural sector, the question of under- and overutilisation of land is even more difficult, but nevertheless important. The data above suggest that many small holdings are being utilised beyond what can be considered a rational degree of intensity, given the steep topography and the need for permanent vegetation cover over considerable areas of these farms. Both producer education and alternative employment will be necessary to reduce this pressure on the ecosystem.

Underutilization of particularly productive and ecologically stable soils such as the alluvial valleys is an important problem as well, especially from the point of view of national product and income. There are indications that these valleys are undercapitalized and underutilised today, which suggests that private profit calculation is not necessarily compatible with the national interest.<sup>14</sup>

<sup>14</sup> This is the case with two large estates now controlled by the Government, Dennery Factory and Roseau Estates, where large investments in field development are required to make the properties productive.

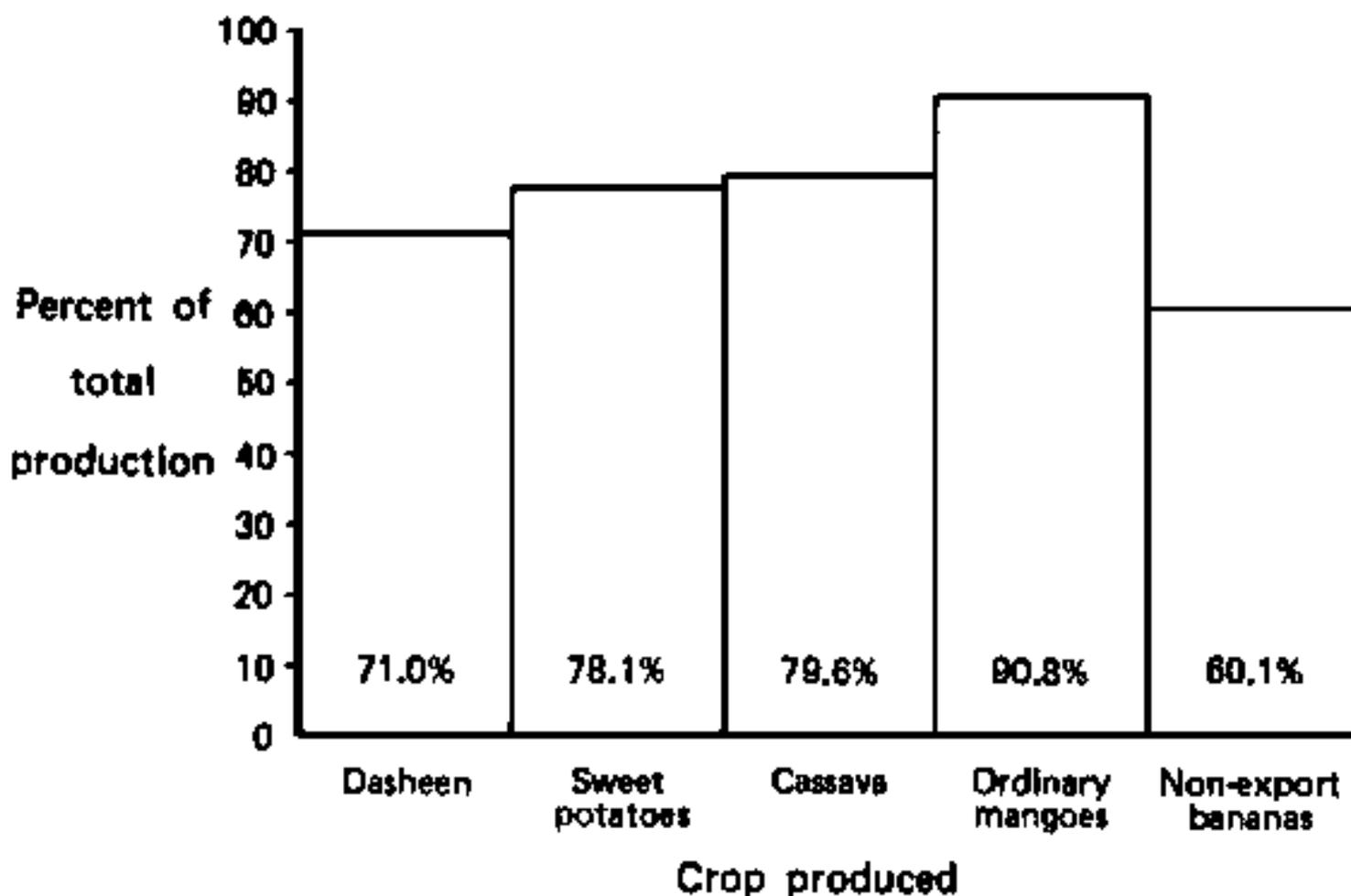
### 2.3.5. The function of production

In the absence of value or income data, crops grown by different holding sizes can be taken as a measure of the importance of its cultivation to the producer. For the two smallest holding sizes (0.1 - 4.9 acres), food crops are the most frequently grown and represent the activities in which the smallholder makes the greatest contribution to national production (see Graph 2-2).

As holding size increases, participation in food production decreases in favour of export and commercial crops. In the largest size category (500 acres), production is specialized in a small number of high-income crops (bananas, coconuts and limes).

Banana production for export is found on farms of all sizes, although only one-third of the holdings in the 0.1 - 4.9 acre categories produced any. This compares with over 60 percent of the holdings in the 5.0 - 9.9 and 10.0 - 49.9 size categories. The widespread distribution of this major cash crop among holding sizes can be explained by its relatively high income potential and the absence of significant economies of scale in production, given the existing level of technology. The lower participation of the smallest holdings may be due to their difficulty in gaining membership in the Banana Growers Association.

**GRAPH 2.2. Contribution to National Food Production Made by Small Holders (0.1 - 4.9 acres)**



Source: Government of Saint Lucia, Ministry of Agriculture. Agricultural Statistics, Census Data, 1973/74



District		Household population						Population Growth <sub>1</sub>			
		1960	% of total	1970	% of total	1980	% of total	1960-70	%	1970-80	%
CASTRIES	URBAN	19 334	60.80	22 991	56.84	25 558	59.76	+3 657	+1.89	+2 567	+1.12
	RURAL	12 465	39.20	17 460	43.16	17 212	40.24	+4 995	+4.01	- 248	-0.14
	TOTAL	31 799	37.30	40 451	40.53	42 770	36.94	+8 652	+2.72	+2 319	+0.57
ANSE LA RAYE	URBAN	2 049	41.46	1 815	38.06	1 755	35.05	- 234	-1.14	- 60	-0.33
	RURAL	2 893	58.34	2 954	61.94	3 252	64.95	+ 61	+0.21	+ 298	+0.01
	TOTAL	4 942	5.80	4 769	4.78	5 007	4.32	- 173	-0.35	+ 238	0.50
CANARIES	URBAN	1 676	77.70	1 221	62.93	1 204	58.02	- 455	-2.72	- 17	-0.14
	RURAL	481	22.30	718	37.07	871	41.98	+ 237	+4.93	+ 153	+2.14
	TOTAL	2 157	2.53	1 939	1.94	2 075	1.79	+ 218	-1.01	+ 136	0.70
SOUFRIERE	URBAN	2 631	36.68	3 069	42.33	4 065	54.52	+ 438	+1.68	+ 996	+3.25
	RURAL	4 541	63.32	4 181	57.67	3 390	45.48	- 360	-0.79	- 791	-1.89
	TOTAL	7 172	8.41	7 250	7.26	7 455	6.43	+ 78	+0.11	+ 205	0.28
CHOISEUL	URBAN	513	8.66	2 116	6.71	2 051	32.13	+1 603	-31.25	- 65	-0.33
	RURAL	5 409	91.34	5 753	93.29	4 331	67.87	+ 344	+0.64	-1 422	-2.47
	TOTAL	5 922	6.95	7 869	6.18	6 382	5.51	+1 947	+3.29	-1 487	-1.89
LABORIE	URBAN	1 591	31.45	1 786	29.30	1 107	15.94	+ 195	+1.23	- 679	-3.8
	RURAL	3 468	68.55	4 227	70.70	5 837	84.06	+ 759	+2.19	+1 610	+3.8
	TOTAL	5 059	3.94	6 013	6.02	6 944	5.99	+ 954	+1.89	+ 931	1.55
VIEUX FORT	URBAN	3 120	45.40	3 794	46.79	2 684	25.14	+ 674	+2.16	-1 110	-2.93
	RURAL	3 753	54.60	4 314	53.21	7 991	74.86	+ 561	+1.50	+3 677	+8.52
	TOTAL	6 873	8.06	8 108	8.12	10 675	9.21	+1 235	+1.80	+2 567	+3.17
MICOUD	URBAN	2 039	25.06	2 430	23.95	3 064	24.98	+ 391	+1.92	+ 634	+2.61
	RURAL	6 096	74.94	7 715	76.05	9 290	75.02	+1 619	+2.66	+1 485	+1.93
	TOTAL	8 135	9.54	10 145	10.16	12 264	10.59	+2 010	+2.47	+2 119	+2.09
DENNERY	URBAN	2 228	28.63	2 629	29.70	2 492	25.81	+ 401	+1.81	- 137	-0.52
	RURAL	5 554	71.37	6 222	70.30	7 162	74.19	+ 668	+1.21	+ 940	+1.51
	TOTAL	7 782	9.13	8 851	8.87	9 654	8.33	+1 069	+1.37	+ 803	0.91
GROS ISLET	URBAN	1 013	18.74	1 256	20.55	1 900	18.39	+ 243	+2.41	+ 644	+5.13
	RURAL	4 392	81.26	4 857	79.45	8 429	81.61	+ 465	+1.06	+3 572	+7.35
	TOTAL	5 405	6.34	6 113	6.12	10 329	8.92	+ 708	+1.31	4 216	+6.90
GRAND TOTAL		85 246	100.00	101 508	100.00	113 555	100.00	16 262	1.91	12 047	1.19

Note: Various population estimates have been made for 1978-80, e.g., in a Ministry of Agriculture report, "Hurricane Allen, Agriculture Rehabilitation and Development" an estimate of 123 000 is provided, while in the 1978 World Bank Atlas an estimate of 112 000 is given.

1. Annual average.



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# Chapter 3. Legal and institutional framework for natural resources conservation and development

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[3.1. Legal background of land development control and regulation](#)

[3.2. Legal background of natural resources conservation and development](#)

[3.3. Institutional structures for natural resources conservation and development](#)

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This chapter provides an analysis of the current legal and institutional framework for natural resource conservation and development, with emphasis on land resources and their critical importance to agricultural development. Specific proposals to deal with the problems detected are provided in Chapter 7.

## 3.1. Legal background of land development control and regulation

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[3.1.1. Land ownership and registration](#)

[3.1.2. Land use control and regulation](#)

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Land control legislation was introduced by the French Government when the laws of the Coutume de Paris were accepted as the basis for French colonial law in Saint Lucia. Additions to the law were made throughout the 18th century.<sup>1</sup> Initially the legislation addressed inheritance, land registration, and the demarcation of Crown Lands. Additions to this body of law concern taxation, some aspects of natural resource conservation, and urban land use control. The existing legal structure has grown through new legislation or by amendments to existing laws. A recent study evaluating the legal structure which addresses natural resource issues indicates that it can be considered incomplete in its coverage of issues and often insufficient in regard to current development needs.<sup>2</sup>

<sup>1</sup> "Arret en Règlement du Conseil Supérieur portant que la Coutume de Paris et les Ordonnances du Roi Seront suivies en cette Ile" (5 November 1681), St. Lucia Revised Ordinances; A.M. Lewis, Vol. I - VII; Castries: Voice Publishing Company, 1957.

For instance the "Ordre du Roi au sujet des cirquante pas du bord de mer" (6 août 1704)

Saint Lucia Revised Ordinances, op.cit., Vol. VI, Appendix 11; p. 35

<sup>2</sup> Rojas, E., "Institutional and Legal Aspects of Agricultural Land Development Planning and Implementation in Saint Lucia," OAS Technical Report, Castries, November 1981.

### **3.1.1. Land ownership and registration**

The Saint Lucia Civil Code allows freeholding of lands by individuals or companies.<sup>3</sup> Aliens are required to obtain a license from the Cabinet to buy, lease or hold a mortgage on land in Saint Lucia.<sup>4</sup> Enforcement of this law allowed nearly 30 percent of the agricultural lands to be acquired by foreigners during the 1960s and 1970s.<sup>5</sup>

<sup>3</sup> "The Civil Code", Revised Ordinance, op. cit., Vol. IV, Cpt. 242.

<sup>4</sup> The Aliens Act, 10/1973 (Landholding Regulation).

<sup>5</sup> FAO, op. cit., p. 10.

FAO estimated that in 1973 the Government owned 26 798 acres of land, of which 16 385 acres were state forest (10 165 acres of protected forest and 6 220 acres of forest reserves); 6 395 acres were agricultural holdings; 2518 acres corresponded to the Queen's Chain and approximately 1 500 acres to public roads and buildings.<sup>6</sup> In the same year, 70 777 acres were privately owned, of which 63 577 acres were in agricultural holdings, 5 900 acres were non-urban land not in agricultural holdings and 1 300 acres were urban land. At that time, 54 745 acres had uncertain ownership and tenure status (e.g., ungranted Crown Lands, unregistered Government Lands, etc).

<sup>6</sup> Ibid, p. 16.

Legislation currently allows government to acquire lands, including agricultural land, compulsorily when necessary. The acquisition process may generate implementation difficulties in complex acquisition programs involving multiple owners because of the complicated statutory rules of assessment of compensation in the Land Acquisition Ordinance (section 19); these rules require determination of a free market price. The well-known distortions that occur in land markets coupled with the traditional low dynamism of the agricultural land market do not ensure that a fair value may be obtained through this procedure. These rules may need to be changed to allow for valuation procedures capable of accounting for the value of the land, capital and other productive factors.<sup>7</sup>

<sup>7</sup> See, for example, Matthew, C., and J. Girard, "Report on the Valuation of Fond Estate", Ministry of Agriculture and Lands, June, 1973 (unpublished).

The acquisition of land by private individuals tends to be unduly complicated by the existing system of registration of rights. The introduction of a title registration system will facilitate the process, and the introduction of "a trust for sale" will help solve multiple ownership problems created by existing inheritance laws.<sup>8</sup>

<sup>8</sup> Both are proposals made by the Saint Lucia Land Reform Commission in its "Interim Report" published in June 1980 (mimeo), and accepted by Government. Legislation in this connection has already been drafted and is being circulated for corrections.

The deficiencies of the existing system of ownership registration, a bottleneck for all land transactions

(the Registration of Deeds), affects agriculture by making it difficult for farmers with no clear title to obtain credit.<sup>9</sup> The land market in Saint Lucia is very inactive, particularly for small holdings, where the difficulties created by the registration system are greater.<sup>10</sup>

<sup>9</sup> The Mode of Registering Deeds Ordinance, Saint Lucia Ordinances, 1945. op. cit., (8/1961).

<sup>10</sup> Rickman, R., Saint Lucian Land Market A Brief Survey, Technical Report, Ministry of Agriculture, Castries, December 1981 (mimeo).

The lack of a cadastral survey makes the taxation system incomplete. Lands taxes are used as a source of income for the Government (currently supplying less than 0.04 percent of the government's recurrent revenue);<sup>11</sup> an annual flat rate tax per acre is assessed according to property size (no tax for properties of less than 10 acres, 25 cents per acre for properties between 10-50 acres 50 cents for those of 50-100 acres, 75 cents for 100-500 acres and EC\$1 per acre for properties of 500 acres and over).<sup>12</sup> A cadastral survey would fill an information gap which, in effect, is preventing land control and the utilization of taxes as a development tool to gradually reduce land ownership concentration and land underutilization.

<sup>11</sup> Land and House Tax Ordinance (11/1952), Amended by Ordinance 19/1965; 16/1966.

<sup>12</sup> Ministry of Finance, Inland Revenue Department.

### **3.1.2. Land use control and regulation**

Legislation concerning land use regulation has evolved over time and concentrates on the control of urban land, the building situation and construction. Only minor pieces of legislation have been enacted for natural resource protection or management.

The Town and Country Planning Ordinance first established development control by creating a Central Housing and Planning Authority with powers to prepare or adopt schemes containing development proposals and to enforce compliance with these schemes.<sup>13</sup>

<sup>13</sup> Town and Country Planning Ordinance, (10/1945), Saint Lucia Ordinances ... 1945, op. cit., pp. 7 and ff.

In 1971, the Central Housing and Planning Authority was dissolved by the enactment of the Land Development (Interim Control) Act, 1971, which established the Development Control Authority.<sup>14</sup> This act was passed as a temporary measure while full planning legislation was put before the House of Assembly. To date, no new legislation has been passed and the 1971 Act remains the only urban planning legislation effective in Saint Lucia. Urban land development is also subject to the following enactments:

- a) The Public Works and Roads Ordinance (1969) with regard to siting and access for any development proposals.
- b) The Industrial and Commercial Buildings Act (1973).
- c) The Public Health Act (1975) for sanitation, sewage treatment and other public health measures.

<sup>14</sup> Saint Lucia, Land Development (Interim Control) Act 1971, No. 8 of 1971. The Development Control Authority is a board of seven members including the Technical Officer in charge of Housing, Public Works, and Health Services, with the Chief Technical Officer in charge of Town and Country Planning Development acting as Executive Secretary.

Although the development controls powers given to the Authority are ample in scope, they are restricted in where they can be applied: Section 9 and the First Schedule of the Act state that buildings and other works intended solely for agricultural purposes will be considered as permitted, hence not requiring permission from the Authority to be developed.<sup>15</sup> Therefore, the development control powers of the Authority are confined to urban areas. Implementation of land use proposals and building regulations prepared by the Authority depends on the process of granting a planning permit for development. Two main problems have been encountered in implementing these proposals. First, not all developers apply for permission. Furthermore, the Authority lacks sufficient staff to prosecute all cases of illegal development, and the fines set by the 1971 Act are low, offering little disincentive to evasion, and second, decisions on major development proposals are made by the Cabinet (re: Hess Transhipment Terminal, Hotels, etc.), discouraging the Authority in the fulfillment of its tasks...

<sup>15</sup> Section 9 also states that although no permission is required for buildings, or land use for agricultural purposes, such development shall be subject to any conditions and restrictions imposed by regulations made by the Cabinet with reference to the provisions of the Act. In fact, no regulations have been issued by the Cabinet.

The powers of the Authority were further reduced by the creation of the National Development Corporation.<sup>16</sup> According to the legislation, this statutory body has powers to act as Development Control Authority within designated development areas. Special areas need to be designated by the Governor General and approved by the House of Assembly. Development areas have been designated in various sections of the Gros Islet - Castries urban corridor, Vieux Fort and Dennery giving NDC control over substantial sections of these urban areas. Currently, there are two development control authorities in Saint Lucia with powers to regulate development in nine urban areas.

<sup>16</sup> The National Development Corporation Act (9/1971), sections 15 and 17.

## **3.2. Legal background of natural resources conservation and development**

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[3.2.1. Forest protection](#)

[3.2.2. Beach protection](#)

[3.2.3. Wildlife protection and areas of natural and historic interest](#)

[3.2.4. Natural resources use](#)

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### 3.2.1. Forest protection

The only legislation with a bearing on the control and regulation of rural land use is the Forest, Soil and Water Conservation Ordinance enacted in 1945. This Ordinance covers only a narrow aspect of natural resource conservation. The Ordinance delegates to the Chief Forest Officer the duties of managing all lands Crown Lands (Section 3), overseeing the timber industry and timber dealers in the country and preventing the unlawful removal of timber from Crown Lands (Sections 6 and 18). Provisions was made in the Ordinance for the establishment of forest reserves (Sections 19 and 20) and/or the declaration of protected forests on private lands, allowing the Chief Forest Officer to regulate its utilization "in order to protect covered areas of importance for protection against storms, prevention of soil erosion, the maintenance of water supplies in springs, rivers and reservoirs and the preservation of health."<sup>17</sup>

<sup>17</sup> The Forest, Soil and Water Conservation Ordinance (6/1945).

The declaration of preserved and protected forests and their corresponding rules and provisions are the only aspects of the Ordinance dealing with the regulation of land use in rural areas. They address only the forestry-related aspects of soil and water conservation, without considering the agricultural land use aspects of environmental management.

### 3.2.2. Beach protection

The beaches are the only other natural resource partially protected by legislation in Saint Lucia. The Beach Protection Ordinance (21/1963) is very limited in scope, preventing digging and removal of sand, stones, shingle or gravel from the seashore. The Ordinance permits the Government to undertake such operations and authorises the Minister of Communications and Works to grant licenses to private citizens or companies to carry out any activities prohibited by the Ordinance. The definition of seashore given in the Ordinance is fairly broad (including the bed and shore of the sea, every channel, creek, bay or estuary and every river as far as the tide flows), and the Government owns all lands covered by the Ordinance (the Queen's Chain), but no legal provision exists in this legislation for the integrated protection of the delicate coastal ecosystems on which much of the tourism industry is based. These ecosystems are being permanently damaged by pollution and overexploitation.

### 3.2.3. Wildlife protection and areas of natural and historic interest

Two pieces of legislation important for the protection of the environment and the scenic beauty of Saint Lucia are the Wildlife Protection Act (9/1980) and the Saint Lucia National Trust Act (No. 16, 1975).<sup>18</sup> The former was enacted specifically to protect various species of wildlife that are either unique to Saint Lucia or of ecological importance, and the latter to legally sanction an institution capable of preserving buildings and areas of architectural, historical or natural interest. While only the Wildlife Protection Act is regulatory in character, the National Trust is important regarding actions required for protecting natural resources.

<sup>18</sup> The Saint Lucia National Trust Act, No. 16 of 1975.

### 3.2.4. Natural resources use

Other than the Forest Soil and Water Conservation Ordinance (6/1945), there is no legislation ruling on issues of land use and development in rural areas or on other natural resources use. Misuse of land, water, mangrove, swamps and other natural resources has proceeded unchecked in Saint Lucia for years.

Their lack of water resource use legislation is particularly conspicuous. A scarcity of water is becoming evident, but no regulatory measures have been implemented. To use water resources properly, legislation addressing ownership and exploitation rights, the resolution of disputes and watershed protection must be passed. Some infrastructure may be necessary to increase water availability in certain watersheds.<sup>19</sup>

<sup>19</sup> Oelsner, J., Saint Lucia, Water Resources; OAS Technical Report, Saint Lucia, May 1981 (mimeo).

## 3.3. Institutional structures for natural resources conservation and development

[3.3.1. Institutional development and coverage of issues of natural resources development](#)

[3.3.2. Institutional coordination on natural resources conservation and development](#)

[3.3.3. Manpower resources for natural resources conservation and development](#)

[3.3.4. Recent trends in institutional development](#)

### 3.3.1. Institutional development and coverage of issues of natural resources development

Currently there are eighteen different institutions concerned with natural resource development in Saint Lucia. Table 3-1 shows that no single institution is capable of dealing integrally with the complex and interdependent problems of natural resource development in the country. Each institution addresses specific or partial aspects of the issues. This is also reflected in the legislative coverage of the relevant problems. Table 3-2 shows the institutional and legal coverage of the main issues related to land development in Saint Lucia, distinguishing between partial and integral coverage and indicating where coverage actually exists, has been proposed, or does not exist at all. Most of the issues have not been addressed by institutional or legislative measures. There have been very few proposals related to land tenure and forestry aimed to improve the existing situation (see sections 3.1 and 3.2). In areas where legal and institutional coverage of an issue do exist, it is noticeably partial (for example, the Beach Protection Ordinance concerns only sand mining), not covering all the dimensions of the problem.

### 3.3.2. Institutional coordination on natural resources conservation and development

There are multiple relationships between the different institutions listed in Table 3-1, and these relationships (legal and financial dependency; different degrees of mutual control and regulation;

complementary or conflicting spheres of influence; involvement of the same individuals in the management of different institutions, etc.) determine the possible degree of coordination in action and the levels of internal conflict within the system. A simplified analysis of these relationships shows the main features of the problem. Chart 3-1 illustrates the system of institutions concerned with natural resources. Only the basic relationships of legal and financial dependency are shown to illustrate certain structural characteristics of the system today. At least four inferences can be drawn from Chart 3-1.

First, relationships of direct dependency in the institutions of the Central Government are strictly vertical, without horizontal interdependence. When this type of structure is coupled with the specific area of concern of each institution, highly uncoordinated actions are to be expected from Government. The only possible level of coordinated decision making is the Cabinet level, a level that cannot cope with the specific technical aspects involved in coherent governmental action on natural resource (land development) management. Technical coordination is left in the hands of interagency coordination committees that at best have advisory powers. Under these circumstances, effective coordination is rarely achieved.

**TABLE 3-1. INSTITUTIONS CONCERNED WITH NATURAL RESOURCES DEVELOPMENT IN SAINT LUCIA, 1981**

Type	Controlling Agency	Institution	Laws, ordinances and regulations affecting the institution	Involvement in land development
Central Government	Cabinet	Cabinet	The Aliens (landholding regulation) Act: 10/1973	Granting aliens landholding licenses
	Ministry of Agriculture	Lands Department	The Crown Lands Ordinance. 7/1945 (amended by Ordinance, 19/1960) and Regulations	Control and Registry of Crown Lands
			The Surveyors and Boundary Settlement Ordinance, 47/1961 (amended by Act 16/1972)	
			The Colony Survey Ordinance, 47/1953	

	Forestry Division	The Forest, Soil and Water Conservation Ordinance, 6/1945	Protection of Central Forest Reserve
		The Forest, Soil and Water Conservation (Crown Land forest produce) Rules	Control of protected forest
		The Wildlife Protection Act, 1980	Conservation of wildlife and areas of natural interest
Ministry of Agriculture	Extension Division		Advise farmers on landuse, agricultural practices, markets, etc.
		Engineering Division	Centralization of hydrological and hydrometeorological information
	Office of the Chief Agricultural Officer		Planning and development of irrigation projects
			Promotion of soil conservation
Ministry of Finance, Development and Planning	Central Planning Unit, Environmental Planning Section	Town and Country Planning Ordinance, 10/1945	Landuse control in urban areas
		Land Development (Interim Control) Act, 8/1971	Building Control

		The Industrial and Commercial Building Act, 1983	
	Inland Revenue	Land and House Tax Ordinance, 11/1952 (amended by Ordinances, 41/1965; 16/1966 and Act 20/1970 and 19/1977)	Definition of tax Collection of land taxes
Ministry of Agriculture	Agricultural Bank	The Agricultural Bank Ordinance, 19/1965 (amended by Acts 18/1970 and 27/1970)	Credit for agricultural development
Ministry of Youth, Community Development, Social Affairs and Sports	Saint Lucia Central Water Authority		Development and distribution of water for domestic, industrial uses Sewage development and control
Ministry of Communications and Works	Works Division	The Public Works and Roads Ordinance, 1969	Planning, execution and maintenance of major infrastructure
		The Beach Protection Ordinance, 21/1963	Control of sand mining
Judiciary System	Registrar	The Civil Code	Registration of land transactions and inheritances
		The Mode of Registration of Deeds Ordinance, 8/1961	
		The Wills (Formal Validity) Ordinance, 57/1965	

			The Administration of Small Successions Ordinance	
	Cabinet	National Development Corporation	National Development Corporation Act, 1971	Land development for urban, tourism or industrial purposes
				Development control authority within development area
				Control of Government land linked to development projects
	Cabinet	Housing and Urban Development Corporation	Housing and Urban Development Corporation Act, 1971 (Slum clearance and Housing Ordinance)	Planning and development of land for residential and other community purposes
Statutory		Saint Lucia National Trust	The Saint Lucia National Trust Act, 16/1975	Preservation of buildings and objects of historic and architectural interest and areas of natural or scenic importance
	Ministry of Agriculture	Commodity Associations	The Commercial Code of Saint Lucia	Marketing of agricultural commodities
			Banana Ordinance, 1934 Saint Lucia	Land use advice
			Banana Growers Association Ordinance, 35/1953	Credit
Coconut Growers Association Ordinance				

			Agricultural Association Ordinance	
Private		Private Banks	The Commercial Code of Saint Lucia	Credit for land acquisition and development
		Research Institutions		Improvement of cultivation practices, landuse, farm management technology and productivity

Source: Rojas, E. "Institutional and Legal Aspects of Agricultural Land Development, Planning and Implementation in Saint Lucia", *op. cit.*

**TABLE 3-2. INSTITUTIONAL AND LEGAL COVERAGE OF THE MAIN ISSUES OF LAND DEVELOPMENT**

Main issues in land development	Legal coverage		Institutional coverage	
	Partial	Integral	Partial	Integral
Natural resources conservation				
Soil erosion				
Water catchment protection	E	P	E	
Deforestation	E	P	E	P
Water utilization				
Degradation of coastal ecosystems				
Protection of areas of natural interest			E	
Land tenure				
Unsecured tenure systems		P		
Family lands		P		
Inefficient registration systems				P
Land ownership				
Concentration of ownership				
Scarcity of land in small holdings				
Land utilization				
Overcultivation of lands				
Underutilization in large holdings				
Monocultivation			E	
Urban invasion of agricultural lands	E	P	E	

E = Existing

P = Proposed

Source: Rojas, E., "Institutional and Legal Aspects of Agricultural Land Development: Planning and Implementation in Saint Lucia," *op. cit.*

### **CHART 3-1. Institutions Concerned With Natural Resources Development**

Second, there are four institutional levels of Government involved in land development decision making. Given the fact that areas of competence are fairly specialized (ignoring conspicuous cases of duplication) and that implementation depends heavily on political commitment, sharp differences among institutions in their position in the decision making hierarchy prevents joint action when necessary. Institutions more strategically located in the hierarchy monopolize the resources allocated to the solution of a specific problem, to the detriment of other institutions. When these differences in position do not reflect the political and technical priorities of the solution to the problems that the institutions are addressing, distortions in the priorities for resource allocation can be expected.

Third, duplication of responsibility and effort (see Table 3-1) occurs in the structure of relations among institutions. Statutory bodies with ample capability for action in land development (e.g., The National Development Corporation) are often created to bypass decision making bottlenecks of the Central Government's bureaucracy. The flexible technical structure of this type of institution coupled with the more direct linkage between decision making and execution inherent in its structure makes coordination with agencies of the Central Government unlikely, especially when there is no financial or political dependence.

Fourth, fragmentation of decision making results from both the structure of relations (Chart 3-1) and the institutions' partial involvement in natural resources development (Table 3-2). Deficiencies in governmental actions are the result not only of a deficient legal and institutional structure, but of erroneous conceptualization of the problem. Institutions tend to develop their own perceptions, and definitions of concepts and solutions to problems in their specific area of interest. These conceptual definitions are often in conflict with those of other institutions directly or indirectly addressing the same problems. When the conceptual frame of reference is divergent, no coordination or complementary action can be expected from government agencies.

### **3.3.3. Manpower resources for natural resources conservation and development**

The institutions of the Central Government whose manpower have expertise in resources management are the following:

- a. The Land Department, Forestry Division, and the Agricultural Services including the Extension Division, Engineering Division, the Statistical Unit and other operational units, of the Ministry of Agriculture;
- b. The Economic Section, Environmental Planning Section and Building Design Section of the Central Planning Unit of the Ministry of Finance; and
- c. The Works Division of the Ministry of Communications and Works.

A total of 198 government posts, 4.6 percent of total Government personnel, are involved. These posts are separated into three broad groups in Table 3-3: managerial posts (involving top-level decision making within the civil service), technical posts (requiring a university degree or high level of training) and assistant posts (requiring specialized training). The data shown in the table represent the posts considered in the budget estimates, not necessarily actual manpower in different institutions. Lack of resources to meet the expenditures considered in the estimates, or lack of qualified personnel, prevents institutions from filling all positions.

Interpretation of Table 3-3 requires the consideration of factors that undermine the manpower capacity of the Government to deal with land development problems. Note that in the institutions evaluated, less than 20 percent of the manpower is of technical level, the level capable of undertaking complex tasks of planning and control. The overemphasis at the assistant level can be explained by the chronic scarcity of resources and trained manpower, but this cannot be endorsed as desirable in the long term.

Four institutions for which information was available were evaluated to determine how many positions considered in the estimates were filled; Table 3-4 shows that almost 30 percent of the positions are not filled (in one institution, 50 percent). Although this information cannot be extrapolated to the whole civil service of Saint Lucia, first-hand information indicated that the situation in other departments is not better but probably worse.

Managerial positions are always filled, out of necessity, with vacant positions found only at the technical and assistant levels. The total absence of manpower at the technical level (i.e., Forestry Division) or chronic shortage, has been partially alleviated by foreign technical assistance, mainly British, brought to the country to fill the more important gaps (i.e., the agrarian economist in the Ministry of Agriculture, economic planners at CPU, etc.) until positions can be occupied by Saint Lucians.

There are qualified and complementary staff capable of dealing with natural resource and land development issues in all the previously mentioned institutions. Rationalization of the use of these manpower resources is essential if meaningful action is to be expected from Government in the short term. This rationalization necessarily involves a reshaping of the relationships that currently exist between the institutions that employ these manpower resources.

### **TABLE 3-3. MANPOWER AVAILABILITY IN CENTRAL GOVERNMENT INSTITUTIONS CONCERNED WITH LAND DEVELOPMENT, 1981-82**

Source: Government of Saint Lucia, 1981-82 Estimates, Government Printing Office, Castries: 1981.

### **TABLE 3-4. MANPOWER AVAILABILITY IN FOUR SELECTED INSTITUTIONS: COMPARISON OF BUDGET ESTIMATE POSTS AND ACTUAL PERSONNEL, 1981**

	Agricultural Services		Forestry Division		Environmental Planning		Land Department	
	Posts	Actual	Posts	Actual	Posts	Actual	Posts	Actual
Managerial	4	4	1	1	1	1	2	2
Technical	13	10	1	-	4	1	6	4
Assistant	76	57	22	12	9	5	21	16

Total	93	71	24	13	14	7	29	22
Actual as % of budget estimate posts		76%		54%		50%		76%

Sources:

- a. National Budget.
- b. Ministry of Agriculture, Programme of Activities 1981, Castries: January, 1981 (mimeo), pp. 159-164.
- c. Personal Communication with the Government Town Planner.
- d. Personal Communication with the Superintendent of Lands and Surveys.

### 3.3.4. Recent trends in institutional development

Since the institution building effort of the early seventies - creation of the National Development Corporation, the Housing and Urban Development Corporation, the Town and Country Planning Department, which is now the Environmental Planning Section of CPU, the Development Control Authority, the Saint Lucia National Trust, etc. - no major changes have been introduced in the institutional structure of the Saint Lucia Government. Awareness of the need for change has encouraged proposals for institutional development, which will nevertheless reproduce the problems of the existing institutional structure. For example, the Environmental Planning Section of CPU has been studying a new Land Development and Building Act that attempts to solve some of the drawbacks of the existing Land Development (Interim Control) Act of 1971.<sup>20</sup> In doing so, it reshapes the composition of the Development Control Authority and unifies the urban development control powers currently split between the Authority and the National Development Corporation. Although the draft introduces many improvements in the existing situation for the control of urban development, it fails to consider the intimate relationship that exists between different aspects of land development. The provisions of the act are applicable to urban areas without reference to rural land use and coastal ecosystems that are affected by development. The draft follows the existing trend towards fragmented decision making by reinforcing the Authority's power only within urban areas.

<sup>20</sup> Ministry of Finance, Central Planning Unit, Environmental Planning and Building Control Section, "Land Development Control Act" (draft bill, unpublished).

The problem of fragmented decision making is further aggravated by other proposals like the draft of the Forest, Watershed and Soil Conservation Act which has been promoted for a number of years by the Forestry Division of the Ministry of Agriculture. The creation of a Forest, Watershed and Conservation Authority as the senior decision making body for these subjects is proposed in the draft.<sup>21</sup> The act gives the Authority the power to protect forest and important watersheds and to carry out necessary works. Both the definition of the Authority's responsibilities and its powers of intervention are confined to these topics without considering that forest invasion and damage to the watershed and soil originated in existing agricultural practices and the overall macro-economy of agriculture and land distribution.

<sup>21</sup> Ministry of Agriculture, Forestry Division, "Forest, Watershed and Soil Conservation

Act" (draft bill, unpublished).

Other actions undertaken by the Ministry of Agriculture provide a third example. To implement the recommendations made by the Saint Lucia Land Reform Commission in its interim report, the Ministry of Agriculture has set up a new section, the Land Reform Management Unit, which is responsible for implementation of these proposals in collaboration with the Lands Department. The Lands Department is concerned with problems of land registration and distribution, aspects directly related to the sphere of influence of the Forest, Watershed and Conservation Authority.

The above is illustrative of the persistent tendency within the public sector to view problems in isolation and of the institutions' attempt to separately find legal, administrative and financial solutions. Modification of this negative trend is imperative to bring about a unified view of the natural resources conservation development efforts. Certainly such a change will imply unification of decision making capacity and rationalization in the use of available manpower at the technical level to parallel the required changes in the legal structure.



SIZE CATEGORY (ACRES)	TOTAL AREA		PERMANENT CROPS <sup>A/</sup>		OTHER CROPS		GRASSLAND <sup>B/</sup>		FOREST		OTHER LAND	
	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
0.1 - 0.9	1 733	100	541	31.2	1 084	62.6	56	3.2	18	1.0	34	2.0
1.0 - 4.9	8 471	100	3 725	44.0	3 090	36.5	930	11.0	466	5.5	260	3.1
5.0 - 9.9	7 059	100	3 630	51.4	2 096	29.7	496	7.0	603	8.5	234	3.3
10.0 - 49.9	12 704	100	5 322	41.9	2 891	22.8	975	7.7	2 495	19.6	1 021	8.0
50.0 - 499.9	15 132	100	5 999	39.6	2 108	13.9	2 214	14.6	4 280	28.3	531	3.5
500.0	26 902	100	9 319	34.6	1 877	7.0	2 675	9.9	11 140	41.4	1 891	7.0
TOTAL	72 001	100	28 536	39.6	13 146	18.3	7 346	10.2	19 002	26.4	3 971	5.5

- a. Includes citrus, bananas, plantains, coconuts, cocoa, coffee, nutmeg, mangoes, avocados and breadfruit.  
b. includes both cultivated and uncultivated pasture.



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# Chapter 4. Dynamics of the land problem

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[4.1. Recent land development trends](#)

[4.2. Specific land development projects](#)

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## 4.1. Recent land development trends

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[4.1.1. The dynamics of land distribution](#)

[4.1.2. Proposals and actions concerning land tenure](#)

[4.1.3. General proposals for land redistribution](#)

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The land question in Saint Lucia has been a topic of study and debate for over a quarter of a century. Initially, attention was placed upon the negative effects of the land tenure systems which are remnants of a mixed French and British colonial heritage. More recently preoccupation with the overall problem of agricultural development and its socioeconomic consequences in an independent nation has focused attention on other land-related constraints to agricultural development. Land distribution, use, and utilization are now being discussed with land tenure when debating agricultural development.

In Chapter 2, the most relevant aspects of the land problem in Saint Lucia were discussed on the basis of existing information. Although somewhat dated, the information available permits the identification of structural constraints on agricultural development: natural resource management and scarcity of cultivable land; the traditional land distribution structure; unclear definition of ownership and tenure; a sizable cohort of landless farmers and/or squatters; and lack of an effective land registration system. The discussion that follows concentrates on Saint Lucia's land problem with emphasis on recent trends in land distribution, proposals and actions concerning land tenure and general proposals for change in man/land relationships. Section 4.2 includes a review of several land transformation projects that have been proposed and reached varying levels of implementation. The relevant considerations will focus on existing institutional capacities for project implementation and costs and benefits of the various proposed projects.

### 4.1.1. The dynamics of land distribution

The land distribution pattern outlined in Section 2.2 of Chapter 2, has changed over the years as a result of private sector activities and Government interventions. By 1980, land sales by estate owners combined with Government acquisition of estates and settlement projects resulted in a modification of the

ownership status of almost a quarter of the lands held in large holdings in 1973/74. Over the last seven years at least 17 percent (close to 7 000 acres) of the 42 000 acres that in 1973/74 were in holdings greater than 50 acres has been subdivided into smaller holdings. Six percent has come into direct Government control and one percent has just changed hands without being subdivided.<sup>1</sup> This represents a rapid shift in land ownership caused primarily by the desire of large landholders to move out of agriculture and the willingness of Government and some committed individuals to become involved in agricultural production. The government has accounted for the subdivided 1 549 acres and acquired ownership of other 2 700 acres; private individuals have acquired over 1 200 acres recently subdivided in medium size farms, for agricultural purposes. Over 3 400 acres have been transferred from agricultural to urban uses as a result of subdivision which accounts for close to 45 percent of the transferred lands, a substantial loss to agriculture in a country so short of productive land.

<sup>1</sup> Estimates based on the analysis of data from the 1973/74 Agricultural Census, Tax Paying List 1974-1980 from the Inland Revenue, Deeds of Sale registered between 1974-1980 in the Registrar, and information given by Government official and private agriculturists.

This pattern of change of land distribution has occurred fairly smoothly despite its ad hoc nature and the losses to agriculture. The impetus of demand for land has been development of tourism and industry combined with urban development. The pattern is likely to continue, but at a slower rate because most existing urban development areas have infilling capacity and almost all the land designated by the Government in its physical plans for urban development has already been affected by this process. In any case, the subdivision of agricultural land for urban purposes is likely to continue on an informal basis to supply housing lots for the urban poor in the villages within commuting distance of Castries.

Private subdivision of land for agricultural purposes, 22 per cent of total subdivided land, is a trend that has gained momentum despite the scarcity of capital and credit for land purchases and the generalized lack of secure and clear title for land.

Direct Government intervention accounted for almost one-third of total agricultural land subdivided during the period 1976-1981. This confirms the importance of Government intervention in the land market even in circumstances where its actions are fairly ad hoc. During the period considered no explicit policy concerning land distribution was defined by the Government. Nevertheless, during the last six years the control of nearly 4 600 acres of the best agricultural lands, nearly 25 percent of all good lands available, has been transferred from the private sector to Government either as a loan (Roseau Estate) for a resettlement project or by direct purchase (Dennery Farmco, Section 4.2.2).

A survey of Saint Lucian land market operations focusing on sales of holdings greater than one acre reveals that over the past five years average land values followed a recognisable pattern, with small sales more profitable per acre than large ones.<sup>2</sup> This trend is more visible if the largely urban quarters of Gros Islet and Castries are included, along with the 1.00-1.99 acre size range in Soufriere. Included in these are sales for holiday home sites of over EC\$70 000 per acre without dwelling. Even in the predominantly rural quarters the value of small plots, probably for combined house and gardening use, is still twice that of the 2.00-4.99 acre size group. The 2.00-4.99 acre group consistently shows lower rates than the 5.00-9.99 acre group as does the 10.00-49.99 acre group in agricultural areas. This may be explained by the theory that those with money to buy agricultural land are not interested in farms under five acres while those interested in smaller lots for non-housing purposes suffer from an absolute constraint of capital availability and poor credit-worthiness.

<sup>2</sup> Rickman, R., "Saint Lucian Land Market, A Brief Survey," *op. cit.*

Table 4-1 provides a summary of registered land transactions for the entire island. The average value of large estate sales is extremely low compared to other size classes. Although it is true that large estates occupy most of the best agricultural land in Saint Lucia, they also include substantial amounts of poor uncultivated and uncultivable land. Most of the ten registered sales appear to be of such low value land. Unregistered sales, both private transfers and to Government range from EC\$2 000 to EC\$5 000 per acre for better land (1 EC\$ = US\$0.37); with little distinction between subdivision sizes. In at least one case, small plots were sold at a substantial reduction to estate workers unable to raise sufficient money to buy larger blocks which the estate preferred to sell.

**TABLE 4-1. SUMMARY OF LAND TRANSACTIONS, 1976-1981 (all values inflated to 1981)**

Size group (acres)	Whole island		Whole island less Castries, Gros Islet and 1.00 - 1.99 acres for Soufriere	
	Total Acreage	Acreage price per acre (EC\$) <sup>a</sup>	Total Acreage	Average price per acre (EC\$)
1.00 - 1.99	159	17 153	53	4 749
2.00 - 4.99	625	5 355	362	2 294
5.00 - 9.99	652	6 221	404	2 945
10.00 - 49.99	1 195	3 964	765	2 781
more than 50.00	1 890	553	1 610	497
TOTAL	4 521		3 194	

a. 1 EC\$ = US\$0.37.

Source: Ministry of Agriculture, Department of Lands and Surveys, Compilation of Land Transactions.

Concessional purchases are also obvious when raw data of lands and survey compilation is inspected. During one year, the value per acre for one size group within a quarter can range from tens to thousands of dollars. Although this may be explained in part by variable intrinsic value, it also suggests two other explanations which are to some extent supported by the evidence available. First, many sales are to close relatives (subdivision of family land) and former employees. Secondly, many people have little idea of the potential market value of the land they are either purchasing or selling.

The 1973/1974 Census indicates that agricultural holdings consisted of 72 000 acres. Assuming that land sold in lots of one acre and over was agricultural land initially, registered land transactions from 1976 to 1981 accounted for more than 6 percent of the land in holdings. If unregistered purchases of large estates by both Government and private individuals are also included, the total area in transactions increases by at least 8 000 acres to 12 500 acres or over 17 percent of the land in holdings. The immediate reaction to this estimate might be that, despite the archaic system of registration of deeds, the land market is active. However, the scale of such activity is greatly affected by the sales of large estates, the ownership of which is rarely in dispute. The predominance of purchasers such as Government and professional people who have resources to check on the legitimacy of the vendor's ownership also reduces problems of verification.

A qualitative inspection of the registered transactions shows that many of the small land sales are subdivisions of other properties. Few show evidence of consolidation of holdings, which may be due to a lack of desire or money for reconsolidation. A contributing factor may be reluctance to buy land for which no clear ownership exists, a frequent occurrence for small parcels.

### 4.1.2. Proposals and actions concerning land tenure

The first and only national land survey in Saint Lucia was conducted by the French Government in the eighteenth century and is still used as the reference point of land surveying on the island.<sup>3</sup> The legal document for proof of ownership, the land deed, frequently omits precise information on the total size and the geographical boundaries of the property. A large number of farmers have no documentation whatsoever for the land they work.

<sup>3</sup> Lafort de Latour "Description Générale et Particulière de l'Île de St. Lucia," Paris, 1774.

Individual land surveys exist and have been undertaken predominantly for larger holdings and land that has increased in value because of tourism or urban expansion. While these surveys supplement land documentation, they do not provide an adequate base for resolution of future boundary disputes. Survey tends to be so expensive that few smallholders can afford it. Consequently, information on small holdings would be required as part of a data base used for boundary dispute resolution.

Even for the few landowners with a deed and land survey, the principle of "caveat emptor" defines the basic legal attitude regarding definition of land ownership rights. Deeds are filed under the name of the purchaser rather than parcel number making the task of establishing clear title to the land practically impossible. Various specialists studying the land tenure question in Saint Lucia have, over the years, suggested a national land survey and compulsory registration as solution to this problem.<sup>4</sup> Such a project would require expansion and modernization of the present Lands and Survey Department, the formation of a special Land Court, and a reshaping of the Registry. Before 1981, no action had been taken in this respect. Resistance to act may be based less upon cost considerations than upon the complexity of the issue. Besides the technical problems of producing a cadastre in the complex topographical setting of rural Saint Lucia, there are numerous questions that land registration raises but does not solve.

<sup>4</sup> Foreman, R.A., *op. cit.*; Mathurin, Emerson D.C., "An Unfavourable System of Land Tenure: The Case of Saint Lucia," Agricultural Superintendent, Saint Lucia, ca. 1966 (unpublished); FAO, *op. cit.*; Allsenbrook, G, "Saint Lucia, A Study on Possible Conversion from the Civil Code of the Laws of Succession and Land Tenure," CIDA, Castries, 1978 (mimeo); Lawrence, J.C.D., "Land Tenure in Saint Lucia", BDD, ODA, Saint Lucia: 1979 (mimeo); Saint Lucia Land Reform Commission, "Interim Report," Saint Lucia: June 1980 (mimeo).

Disputes over land ownership have been muted in the past because of the cumbersome and expensive legal system. Land survey and registration will bring disputes into the open, with both political and social repercussions. Multiple and competitive claimants of ownership over a single plot of land may end up assigning certain farmers less land than they are currently occupying or may demonstrate that actual occupants of the land are not rightful claimants. Solution to the problems of these new types of landless farmers will certainly put a burden on the Government. If remedies are not directed at the land registration and survey process, implementation of the whole Land Titling Programme may be

jeopardized.

A land survey may imply dividing land into minuscule plots far below what might be considered minimum size to guarantee family subsistence. This is likely to be the case for family land, since the survey and registration process will have to respect all claims to these lands, however remote. The present succession laws will perpetuate this problem over time. Reconsolidation of small holdings will need to be encouraged in areas where extreme subdivision is likely to occur in order to prevent the land from being left uncultivated. Credit for land purchases is normally a major constraint on this process; it is usually made available only after the implementation of the land titling programme. As an alternative solution, determination of what constitutes "minimum size of holding" (Section 7.2.3) and changes in the succession laws to limit the number of heirs and otherwise modify land inheritance have been suggested, but political and technical considerations have delayed any decision in this area.<sup>5</sup>

<sup>5</sup> Foreman, R.A., *op. cit.*, and FAO, *op. cit.*

Another problem that land survey and registration will help to identify, but will not solve, is that of unused and underutilized land. In the case of Crown Lands appropriate use can easily be determined by the Government. A national land use plan and a variety of instruments ranging from a more effective land tax based on present use to expropriation powers in case of non-adherence may be necessary.

A final question relates to the change in the social function of land that survey and registration will most surely expose. Smallholders in Saint Lucia consider land a guarantee for family subsistence, and therefore land do not see it as an exchangeable commodity. Once clear title is established, land becomes a capital good and necessary exchanges and sales will be permitted that can lead to more efficient use of the land. Establishment of clear title may also initiate a process of land concentration, even within smallholder communities, denying access to land to more and more families. While this has been an historical tendency in most capitalist nations and a prerequisite for efficient use of scarce land resources, the difficulty of providing alternative employment for displaced families in Saint Lucia may require short-term Government intervention in the land market to ameliorate the undesirable social effects of this phenomenon.

The foregoing observations in no way reduce the need for a comprehensive land survey and registration programme in Saint Lucia. They do suggest however, that prior experience should be acquired in one or more relatively small test areas before the programme is launched on a national scale.

### **4.1.3. General proposals for land redistribution**

#### **i. Land redistribution**

The need to promote a more equitable distribution of land in Saint Lucia has deep historical roots dating from the original French land system of quarters. Foreman cites an 1897 British Royal Commission which recommended that the Government "... exert itself in the direction of facilitating the settlement of the labouring population on the land... as small peasant proprietors."<sup>6</sup>

<sup>6</sup> Foreman, R.A., *op. cit.*

During the 1970s, debate on the need to redistribute land reached a climax with growing calls for reforms that in 1979 led to the establishment of a Land Reform Commission (LRC). Extensive hearings have taken place and the final report of the commission was being awaited at the time of this study. While it is

too early to evaluate the final report or Government action on it, it is becoming increasingly clear that land redistribution is difficult politically and no more than a partial solution to a much more complex problem.

Chapter 2 of this report has clearly documented the inequality of land distribution in Saint Lucia, but land shortage is only one of a number of serious constraints faced by the smallholder. To minimize these, the institutional and technological changes suggested in Section 2.3, Chapter 2, are necessary to guarantee that the new smallholder is not condemned to a marginal existence on his own plot of land.

The concept of "land hunger" itself has to be qualified in the Saint Lucian case. For many smallholders land is a secondary source of income only supplementing cash wages. Distribution of land to these and other landless workers may remove them from the wage labour force with the consequent impact on export agriculture. Further redistribution of land in family-sized plots is a one-generation solution at best if no clear rules preventing uneconomical subdivisions are enforced.

## ii. Technological solutions

The tendency to recommend technological solutions for the problem of underdevelopment in the rural sector springs from the impressive gains in productivity that can be realized from intensive application of modern inputs and capital expenditures. It is frequently assumed that technology is neutral, offering all producers the same opportunities. In actual fact, technological packages are frequently developed for specific types of farmers; emphasis on pure stand banana production research is a case in point. While the results are useful for the large farmer, only recently has research focused on the rationality of intercropping on small farms and on adapting existing technology and institutions to the smallholder's needs.

The need for irrigation has received much attention during the last few years, but again the technology proposed is designed with the large farmer in mind. While this heavy investment may be justified from a national point of view, little attention has been paid to the need for investment on small hillside farms upstream from the irrigation system and the implicit relationship that exists between the two farming systems.

Despite the lack of specific technological packages for the small farmer, it can be argued that technology is not the major limiting factor in the development of Saint Lucia's rural sector. Major investments in this field, without solving fundamental institutional problems in the area of land tenure, will benefit a restricted group of landholders at best.

## 4.2. Specific land development projects

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[4.2.1. Roseau smallholder resettlement scheme](#)

[4.2.2. Dennery Farmco](#)

[4.2.3. Private redistribution of land: Marquis estate](#)

[4.2.4. Integrated rural development: Fond Assor](#)

[4.2.5. Evaluation of proposals for change](#)

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In addition to the general proposals for change outlined previously, several types of projects have been proposed as partial solutions to the land problem. Four different types have been identified for analysis.<sup>7</sup>

a) Government resettlement projects. Several resettlement projects have been proposed. The Roseau Small Holder Resettlement Scheme, originally proposed in 1975 and at present in the initial stages of implementation, will be discussed here.

b) Government-owned farm. In the early 1950's the Government intervened in the sugar estates but returned them to private ownership. A more recent case of Government purchase of a large estate for production purposes, the Dennery Landco/Farmco Organization, hereafter referred to as Dennery Farmco, will be used to illustrate the problems and potentials of Government as large landowner.

c) Private land redistribution. The inability to farm land adequately and the fear of expropriation has led many large landowners to sell all or part of their estates. The Marquis Estate has been chosen to exemplify the case of the landowner who chose to sell land to his workers on a preferential basis.

d) Integrated rural development. The proposed Fond Assor Project is examined as an example of revitalization of a smallholder farm community. While it never passed the planning stage, this project illustrates the possibilities of working directly with peasant families who already have access to land. The analysis will identify the potential and difficulties that each project presents for basic changes in the rural sector with the objective of using this experience in future project identification.

<sup>7</sup> See Strachan, Lloyd, "Land Reformulation in Saint Lucia: Evaluation of the Need for Change ... of Existing Proposal to Bring It About", OAS Technical Report, Castries, July 1981.

## 4.2.1. Roseau smallholder resettlement scheme

### i. Project description

As early as 1975 Geest Industries (W.I.) Limited offered to dispose of 1 932 acres of the 5 880 acres it held in two large estates - Cul de Sac and Roseau. An integrated rural development study was undertaken, and it concluded that the Roseau lands offered the best potential for such activities and recommended that the Government acquire 330 acres in the upper part of this valley.

In 1976, the Commonwealth Development Corporation (CDC), a British state organization specializing in overseas investments, was invited to discuss a potential land development project with Geest. The CDC was subsequently asked by the Saint Lucian Government to prepare a feasibility study, which recommended the acquisition of 1 800 acres of the Roseau estate for a smallholder project.<sup>8</sup>

<sup>8</sup> Commonwealth Development Corporation, "Roseau Small Holder Project," Castries, April 1978 (mimeo).

The original plan suggested that 400 smallholders receive 2.5 acres of valley land (for pure stand bananas) and 2.5 acres of hillside, for fruit and vegetables. The split-holding proposal was later discarded and the number of participants reduced to 175 farming 1 344 of the 1 800 acre area.<sup>9</sup> There are now 115

valley farms of 5 acres each for pure stand banana production and 60 hillside farms with 12 acres apiece for banana and fruit production.

<sup>9</sup> Zadek, S., *op. cit.*

Capital for the project will be provided by Geest (EC\$2 million), the Saint Lucian Government (EC\$372 000), the European Development Fund (EC\$6 million), the CDC (EC\$7.7 million), and other loan sources. The project will be administered by Saint Lucia Model Farms Limited (SLMF), with share capital of EC\$30 000 equally divided among the National Development Corporation, the CDC and Geest. The land will be operated as an estate until it is turned over to the smallholder. The SLMF will redevelop valley lands (levelling, drainage, roads, irrigation), provide access to and necessary terracing on hillside farms and, with the help of the new farmer, plant the banana and fruit trees before turning the land over to the smallholder. SLMF will also provide and maintain the basic infrastructure (boxing plants, transport, cableways, etc.) necessary to guarantee efficient marketing. Finally, SLMF will be responsible for technical orientation of the new farmer.

The smallholder will gain access to land under a lease agreement of ten years, duration on valley farms and fourteen years for hillside properties. At the end of this time payment for the land and other investments are presumed to be completed. Both valley and hillside farmers will assume a large debt, calculated at a minimum of EC\$54 000 (1979 prices). If the grants requested from the Saint Lucia Government and the European Development Fund do not materialize, the average farmer debt will reach EC\$85 000 (1979 prices) or EC\$104 000 in 1980.<sup>10</sup>

<sup>10</sup> *Ibid.*, pp. 10-13.

## ii. Degree of intervention

Geest appears to have taken the initiative in proposing the sale of its land. The Government was apparently invited to participate rather than guide the direction of change. Geest's decision was motivated by both economic and political considerations. The 1978 CDC report cites "six years decline (in production) due to drought" and "violent criticism and hostility by the opposition party" as major reasons for the sale of the land.

A Geest submission to the Land Reform Commission indicates that the company began selling land as early as 1973 and by 1979 had sold 1 456 acres of the Cul de Sac estate and 205 acres of the Roseau property.<sup>11</sup> The sale of the additional 1 800 acres for smallholder resettlement was within this general plan of asset liquidation. While political pressure may have been a factor in this decision, the fact that shipping and marketing bananas is much more profitable for Geest than producing them makes the divestiture a logical one from the company's point of view.

<sup>11</sup> Saint Lucia Land Reform Commission, "Written Memoranda Submitted to the Commission 1979-1980" (unpublished).

Intervention at the level of the small holding, on the other hand, is far reaching. The SLMF determines what initial investments are made and paid for by the new farmer and what the farmer will grow and how it will be grown. Failure to follow technical recommendations during the lease period can lead to suspension of the lease and removal of the family from the project.

## iii. Relation to government objectives

The project appears to meet several objectives proposed in the 1977-81 Sector Plan for Agriculture.<sup>12</sup> Emphasis on banana (valley) and mango (hillside) production will help maximize foreign exchange earnings. The proposed intensity of land use is a major improvement over that existing under Geest management. All 115 valley farms are still exclusively dependent on banana production, which indicates that the diversification proposed by the Government has not been extended to banana lands.

<sup>12</sup> Government of Saint Lucia, Ministry of Finance, Central Planning Unit, "Sector Plan for Agriculture, 1977-1981," Castries, 1977 (mimeo).

#### iv. Cost and financing

The major investment items of the project, in order of priority, are field development, smallholder housing, land, and infrastructure. It is surprising that such massive field development investment (EC\$7 million) is required for what had been regarded as a productive estate. This cost is accounted for by irrigation equipment, levelling and drainage on valley farms and terracing on hillside units.

Valley farmers start paying principal and interest from year one, since banana production is assumed to be near its peak when the producer takes over. Hillside farmers are given a five year moratorium on principal payments because of the slower maturing rate of the fruit trees.

It has been assumed that EC\$6.4 million of a total cost of EC\$18.1 million (35.4 per cent) will be in the form of grants from the Saint Lucia Government and the European Development Fund. The remainder will be in the form of soft loans at 6 percent interest. A decrease in the grant component or increase in the level of interest charged will automatically increase the farmer's debt load.

#### v. Gestation period

The repayment period was assumed to be 20 years in the most recent project appraisal report. Present information suggests that this period has been collapsed to 10 years for the valley farms and 14 years for hillside units. This will increase annual lease costs substantially, thereby reducing the farmers net income.

#### vi. Implementation difficulties

In the original proposal, the turnover of land was to be gradual, beginning in 1979 and ending in 1983. Work on infrastructure has begun but no settlement has as yet taken place. This would appear attributable to:

- inability of the promoting agency to arrange all necessary financing
- lack of concordance on the necessary legal instruments (lease, deed of sale)
- lack of decision concerning smallholder selection criteria

The original smallholder selection proposal called for requiring that a EC\$2 500 down payment and giving ex-Geest workers on the Roseau Estate preference. Both of these provisions have since been dropped, with selection open to all qualified Saint Lucians without any down payment.

Several first and second generation problems are evident in the project as now planned, e.g., if former Geest workers are not selected as settlers a serious social problem may emerge in the region. A survey in the Roseau Resettlement Scheme found 26.5 percent of the population over 14 years of age

unemployed.<sup>13</sup> It also revealed that squatting in housing and on land was a common occurrence on Geest land, a reality ignored by project documents.

<sup>13</sup> Government of Saint Lucia, Ministry of Finance, Central Planning Unit, "Roseau Resettlement Scheme, Phase 11: A Sociological Analysis of the Social Aspects," Castries, n.d. (mimeo).

Another problem is the highly specialized nature of production, especially on the valley farms where bananas are the only crop to be grown. This makes the valley farmer highly vulnerable to price changes, insect and disease problems, natural disasters, and fluctuations in the availability of irrigation water. Recognition that the available water is insufficient has already led to a reduction in the projected area of irrigated banana lands, leaving more than half of the new valley farmers without this valuable input.

The critical moment for the project will occur at the lease period's end, when SLMF turns all management and common services over to the smallholders. No adequate provision for fostering a strong cooperative organization or promoting increased participation of the smallholders in SLMF decision making appears to have been made.

Land sales and subdivision through inheritance will accelerate at the end of the lease period. This will lead to the fragmentation of plots and their possible transfer from high income cash crops to lower risk food crops, thus reducing the income generating capacity of the valley. Any subsequent attempt to reconsolidate plots will be slow and expensive.

#### vii. Impact on land and income equality

Despite the above observations, the Roseau Resettlement Scheme has much to offer regarding its original purpose of returning land to Saint Lucian farmers. While 175 instead of 400 will acquire land, income projections suggest that participants will be able to improve their standards of living over time and to generate large volumes of production and foreign exchange earnings for the nation. The smallholders will also produce some local foodstuffs (particularly fruit) and demand for local labour will be created, since the holdings are somewhat larger than most families can farm alone. The stated objective of using this project as "a pilot for future resettlement schemes" is questionable, given the massive volumes of capital (and smallholder debt) that are involved.

## 4.2.2. Dennery Farmco

### i. Project description

Dennery Farmco is an agricultural enterprise of 2 772 acres situated in the Mabouya Valley. Approximately 1 500 acres are considered appropriate for cultivation; the remaining 1 272 acres consist of roads, ravines, steep hillsides and infertile land.

In May 1978 the original owners, the Barnard family, agreed to sell the land and buildings belonging to their two companies, Dennery Factory Company Ltd. and Bosquet D'Or Ltd., to the Saint Lucia Government. This property is held by the Government via a wholly - owned corporation, Landco Limited, a subsidiary of the National Development Corporation. The total cost of the land was EC\$3.6 million, part of which has yet to be paid off. The operating assets of the two companies were sold to another newly constituted company, Dennery Farmco Ltd. The shareholders of this company were originally intended to include the Caribbean Food Corporation, but the arrangement failed to materialize.

The EC\$2.0 million in shares are now owned 60 percent by Government, 20 per cent by the Barnard family and 20 percent by Booker Agriculture International (BAI), the last of which having also provided management services until early 1981. Farmco leases the land and associated fixed assets from Landco at a rent of EC\$270 000 per annum.

## ii. Degree of intervention

The extent of Government-initiated change in operations is minimal. The previous owners wished to dispose of the property for various reasons and the Government was a suitable buyer. As a result, social intervention has been minimal except for a possibly more benign approach to responsibility as a major employer and attempt to encourage a more productive attitude amongst the work force. In the future, this could lead to the replacement of temporary labour with permanent employees.

## iii. Relation to Government objectives

Government policies relevant to the Farmco operation are reflected to some degree by actual activities. Despite hurricane and flooding problems, yields of bananas are approaching the targets laid down by BAI in the revised plan of operations.<sup>14</sup> Although such a development is essential for project viability as well as for generating valuable foreign exchange, no activities have been initiated to produce food for local consumption. A significant diversification component was envisaged in the revised plan of operations, but capital shortage and the need to cut expenditure on experimentation have all but eliminated proposals for crop and livestock diversification.

<sup>14</sup> Booker Agriculture International Ltd., Dennery Farmco Ltd., Saint Lucia, Revised Operational Plan, July, 1980 - June, 1985; April, 1980.

The main resources of capital, management, and labour are being used to boost banana production. When banana production is stabilized, opportunities for spreading diversification may arise. Such enterprises are not without risk, and the ability of a large estate to take temporary losses caused by innovation is one advantage of the estate system over the smallholder.

Dennery Farmco has a small core of permanent management and administrative staff, but the field workers are all employed by the day. Of the 700 people on the company's books, only about 400 will actually work on an average day. The number employed has not fluctuated dramatically since the change of ownership, nor has the system of casual labour. It is suggested that real wages have risen through bonus payments for good work, which indicates the relevance of instituting a reward system where regular workers get priority when work is scarce. Such a system could be the first step towards creating a permanent work force. Benefits of the casual labour system are: 1) available work may be distributed to several individuals during periods of employment scarcity such as after Hurricane Alien thus providing income for many people, and 2) it provides a source of supplementary income for workers who have gardens (in either estate or private land) used for subsistence.

The value posed in providing land for subsistence farming suggests another Government objective: provision of land for landless agricultural workers. The Farmco model may appear totally incompatible with this aim because the land is held and worked as an estate. However, long term opportunities for worker involvement may exist. One way to provide these opportunities is to sell portions of an estate once land has been disencumbered. Another possibility would be to issue equity to workers once Farmco becomes profitable.

#### iv. Costs and financing

The cost of buying and rehabilitating a large estate such as Dennery is extremely high. Land costs of EC\$3.6 million and capital expenditures estimated at EC\$6.2 million over the first three years are required.<sup>15</sup> If working capital is taken into account, the total project cost is over EC\$24 million and a financing gap of EC\$3.9 million is envisaged over a ten-year period. Problems caused by neglect of infrastructure and crops before purchase have been compounded by Hurricane Alien and several flash floods.

<sup>15</sup> National Development Corporation, "Position Paper Dennery Farmco Ltd.", Castries, January 1981 (unpublished).

Since March 1981 the project has been reformulated to reduce costs considerably. The Caribbean Development Bank (CDB) is being approached for the additional loan finance required at preferential rates of interest. Substantial amounts have been saved by the cancellation of the BAI management contract and a cutback of diversification projects. As a result, an even greater reliance is placed on the financial success of 500 acres of irrigated and intensively cultivated bananas. Work on other areas of the estate will take second place, possibly hastening the decline in productivity as drains, roads, and other infrastructure deteriorate.

Government intervention at Dennery facilitated soft loan financing. A total of EC\$4.05 million has been allocated by CDB and further loans are being negotiated. A private owner is unlikely to obtain favorable terms or be willing to take on such a debt.

The run-down condition of the estate before purchase required a great deal of investment to ensure profitability and debt repayment. The Government often finds that intervention in estates which are neglected and underutilized requires massive financing. Unless the valuation of estates considers existing conditions and investment requirements, productive capacity cannot be gauged and prediction of debt repayment capability will be difficult.

#### v. Gestation period

The run-down nature of the estate is reflected in the length of the gestation period. According to the NCD, operations at Farmco will not break even until year nine, a very late point for what had been purchased as a going concern.

#### vi. Implementation difficulties

A preliminary assessment of first generation problems and results encountered at Farmco is now possible. The problems may be attributed to deficient infrastructure, the weather, a top-heavy management structure, and lack of working and investment capital. They have either been bypassed (lack of infrastructure led to concentration of operations in areas where it is adequate) or overcome (termination of BAI management contract and remotivation of the work force). The financing problems are under review at present. The satisfactory establishment of a productive banana operation is essential as a base from which to build.

There are several possible problems that a large Government-owned farm such as Farmco may encounter in the future. First, management may become unduly bureaucratic and unable to respond to changing circumstances, a frequent problem in Government enterprises. Second, it will be essential to maintain

investment even when prices and output result in low returns. The dangers of letting infrastructure deteriorate have been well demonstrated in the last few years. Finally, the labour force must receive sufficient motivation. Although increased wages may achieve this in the short run, other, more subtle mechanisms may be of greater social benefit in the long run. Such changes may include a regularization of the work force, provision of health insurance, etc. More fundamental changes would involve not only equitable distribution to workers once company operations become profitable, but also worker participation in production decisions and the sale of land not used by Farmco to landless workers.

#### vii. Impact on land and income equality

Farmco's success as an efficient producer of export crops will benefit the national economy. It is reasonable to assume that whatever surplus is generated will be reinvested in productive activities. The workers may receive a more equitable income than before if the Government respects their right to organize. No provision has been made (or appears likely) to redistribute the rich valley land to the workers, although the possibility of providing workers with less fertile hillside land still exists.

### 4.2.3. Private redistribution of land: Marquis estate

#### i. Project description

A number of large private estates have recently taken the initiative to subdivide and resell land without any direct Government participation. In some cases this has resulted in land being converted from agricultural use and to tourism, industry and housing.

The Marquis Estate, which occupies the northeastern coast of the fertile Marquis River Valley, is a prime example of private land subdivision for agricultural purposes. In 1980 the estate consisted of 2 550 acres, 930 of which were in crops (primarily coconuts and bananas), 550 in natural forest and 1 070 classified as scrub land. Roughly 400 acres had been terraced (200 acres of which were previously scrub land) and 80 acres of bananas were being grown under irrigation. As of March 1980 the estate employed approximately 200 persons.<sup>16</sup>

<sup>16</sup> Saint Lucia Land Reform Commission, "Written Memoranda...", *op. cit.*

Prior to 1980 about 150 acres had been sold, and during that year it was announced that the owner (Lord Waltston of Newton) planned to dispose of the Babonneau section of the estate, which consisted of 1 000 acres. The arable lands were to be "offered on easy payment terms to the estate workers."<sup>17</sup> According to information provided to the Land Reform Commission, the estate was to be divided into areas of 3 to 25 acres with former estate workers paying half the going price. The project appeared to offer redistribution of land to those who worked it at no public expense.

<sup>17</sup> *Ibid.*, p. 3.

By July 1981 a total of 608 acres of the Babonneau section of the estate had been sold. Of approximately 100 families working on the property, 19 were able to buy a total of 102 acres (an average of 5.4 acres per family). The remainder was sold to estate personnel and the general public in units that varied from 10 to 78 acres.

#### ii. Degree of intervention

Other than a consensus that the days of the large foreign landholder are numbered, there appears to have

been no official pressure prompting the sale of the land. The reasons given by the administrator were purely economic, suggesting that the sale was intended to free capital needed for development of the remaining estate lands.

### iii. Relation to Government objectives

The transfer of land from foreign to local ownership and the sale of land to estate workers are in keeping with popular sentiment in Saint Lucia today. To the extent that subdivision results in more intensive use of the land, the Government objective of increased production will have been furthered.

### iv. Cost and financing

Land was sold to the nineteen estate workers in three to seven acre plots at EC\$1 500 per acre, with payments spread over a maximum of five years at 10 per cent interest. A down payment was required, presumably with the intention of separating workers with the capacity to save and meet future land payments from those who could not. In most cases the workers continued their jobs on the estate, paying for the land with wages and/or produce. Other purchasers acquired funds for the total price through bank loans or other sources. The price was higher than that paid by workers and no area of less than ten acres was sold.

### v. Impact on land and income equality

This experience has proved disappointing in terms of making land available to the worker. Fewer than 20 percent of the 100 families working for the estate are actually qualified to buy land, although as many as 43 showed interest in doing so at some time.<sup>18</sup> The reasons for this could be:

- a) While the size of the down payment was flexible (EC\$600 to EC\$1 500), few working families had savings of this amount;
- b) The necessity to pay for the land in five years at 10 percent interest may have been seen as an unrealistically heavy debt load; and
- c) The purchase price, while apparently favourable, may have been seen as high relative to other potential purchases.<sup>19</sup>

<sup>18</sup> Information supplied by the administrator of Marquis Estate.

<sup>19</sup> The land sold to estate workers was not immediately accessible and only now is a road being opened. As a basis for land price comparison, the 1979 price to be charged hillside participants in the Roseau Resettlement Scheme was EC\$400 per acre.

Non-estate workers were discouraged from participating by the minimum ten-acre lot requirement and the necessity of raising the money for the total price within 90 days of purchase. The estate had little interest in becoming a land bank for outsiders and was unwilling to spend additional funds on the demarcation of small units.<sup>20</sup>

<sup>20</sup> Land survey and demarcation services alone are estimated at EC\$300 per acre on the Marquis Estate (1981).

Despite its shortcomings, this experience has resulted in the formation of several new small- and medium-sized holdings. This is likely to lead to more intensive land use with somewhat greater emphasis

on food production. While the results are disappointing with respect to the stated objective of the sale, the experience may prove useful in formulating future guidelines to ensure more effective Government and worker participation in land transfers.

#### **4.2.4. Integrated rural development: Fond Assor**

##### **i. Project description**

The Fond Assor Rural Development Project was conceived in the early 1970s to address the problems of smallholders. While it never passed the planning stage, the proposal offers an interesting contrast to the preceding three projects, all based on large estates. The project area chosen was part of the Monier/Fond Assor water catchment basin. This and three other basins had been studied early in the decade with the objective of developing a comprehensive resource conservation program in each. The project area was 750 acres, containing 90 rural properties (8.3 acres apiece) and 500 residents.<sup>21</sup>

<sup>21</sup> Government of Saint Lucia, Ministry of Agriculture, Lands, Fisheries and Co-operatives, Office of the Chief Agricultural Officer, Castries, filed in 1973 (unpublished): "A Proposal of Integrated Rural Development for Agriculture", "Catchment Development Project: Fond Assor"; "Proposals for a Cadastral Survey, Land Registration and the Improvement of the Land Tenure Situation in the Integrated Land Development Project - Fond Assor"; "Project Costs."

When it became evident that the existing land tenure pattern would not permit a successful conservation program, the concept of a "pilot land registration project" with demarcation and registration of all properties in the area was added to the original proposal. At a later date the project was elevated to a Catchment Area Integrated Rural Development Programme.

Finally, the project consisted of the following activities:

- land demarcation, adjudication and registration;
- land use zoning;
- soil and water conservation (waterways, terracing); and
- construction of feeder roads, power lines and a cableway.

A total of 475 acres, or 63.3 percent of the area, was scheduled for terracing at a cost of EC\$700 per acre (1974). Land use and cultural practices were to be carefully monitored, with farmers receiving inputs at subsidized rates.

The project was to be managed by a Land Development Authority empowered to administer Government land and acquire lands where no adequate solution could be reached regarding ownership or subdivision. The project would have been staffed by seven professionals, including three full-time extension officers at its peak period.

##### **ii. Relation to Government objectives**

Project objectives evolved over time and were initially limited to the testing of erosion control technology in a river basin setting and making a cost/benefit analysis of the results. The objective of creating secure land tenure in the area was added later. At the final integrated rural development stage the objective was the creation of "a new order of farmers, competent persons capable of bringing a satisfying

income to the operator and his family." While none of these objectives contradict overall Government policy for the rural sector, their evolution indicates an increasing complexity of the project which may have been responsible for its failure to be implemented.

### iii. Cost and financing

The costs during the first five years of the project were estimated at EC\$1.7 million (1974). Included in this were staff and office space, equipment, terracing, road-building and other capital inputs, cadastral survey and land registration, and subsidies on the purchase of inputs. The farmer was to pay the subsidized cost of the inputs and part of the costs of terrace construction. The remainder was to be financed by Government, directly and through soft loans from agencies such as the Caribbean Development Bank.

### iv. Gestation period

While the most intense period of project development was scheduled for the first five years, administration by the Land Development Authority was to continue for ten years. The internal economic rate of return, estimated at a modest 8 percent per year, was based on a 25-year period.

### v. Implementation difficulties

Since the project never reached fruition, the nature of the difficulties likely to have been encountered can only be surmised. The enforcement of land use zoning would have been difficult, although the generous grants and subsidies would have facilitated acceptance by many landowners. The heavy dependence upon Government financing that this implied may well have made the project impractical from both a financial and political standpoint.

### vi. Impact on land and income equality

The 90 landowners in the area stood a good chance of gaining significantly from the project, had it been implemented. However, one specialist considered the project an inadequate model for improving land tenure conditions in Saint Lucia as a whole because of its limited impact even as a learning experience for subsequent programs.

## **4.2.5. Evaluation of proposals for change**

The four projects examined above represent different approaches to the problem of land tenure and rural development. Their common elements, however, merit a comparative evaluation.

### i. Initial motivation

In all but the Fond Assor project the initial motivation appears to have been rooted in the private interest of large landowners in divesting themselves of all or part of their land. In both the Roseau and Dennery Farmco cases, Government was invited to participate after the decision to sell had been made. This in itself does not negate the importance of the projects but suggests that they were accommodated within Government programs rather than being chosen specifically for inclusion. The question of the Government's paying market prices for large estates that are clearly in a state of decapitalization requires broader discussion in Saint Lucia.

### ii. Principal objectives

The projects share common objectives, and within each the objectives overlap. Production maximization is a major objective in all but the Marquis Estate project, in which the primary objective is the sale of land. Fond Assor and part of the Roseau project emphasise resource conservation. The implicit assumption, that maximum production is compatible with individual and national welfare, is questionable.

The risk-averting nature of peasant production has not been scrutinized. At Roseau a large number of participants will be dependent exclusively on banana income. Dennery Farmco has systematically eliminated proposals for crop diversification, disregarding the significant history of such production on the estate.

The objective of improving land tenure is evident in the Roseau and Fond Assor cases. Both proposed creating clear title for smallholders, although at Roseau title is to be given only after a ten- to fourteen-year period. The Marquis project also provides for demarcation prior to land sale.

### iii. Proposed level of technology

Emphasis on production maximization implies heavy reliance on capital-intensive technology. While heavy capital investments may be justified in the rich alluvial valleys, the possibility of repaying a heavy debt for hillside farms must be seriously questioned. Even in the case of Roseau, the question of the ability of smallholders to maintain the heavy infrastructure planned for the project remains unanswered.

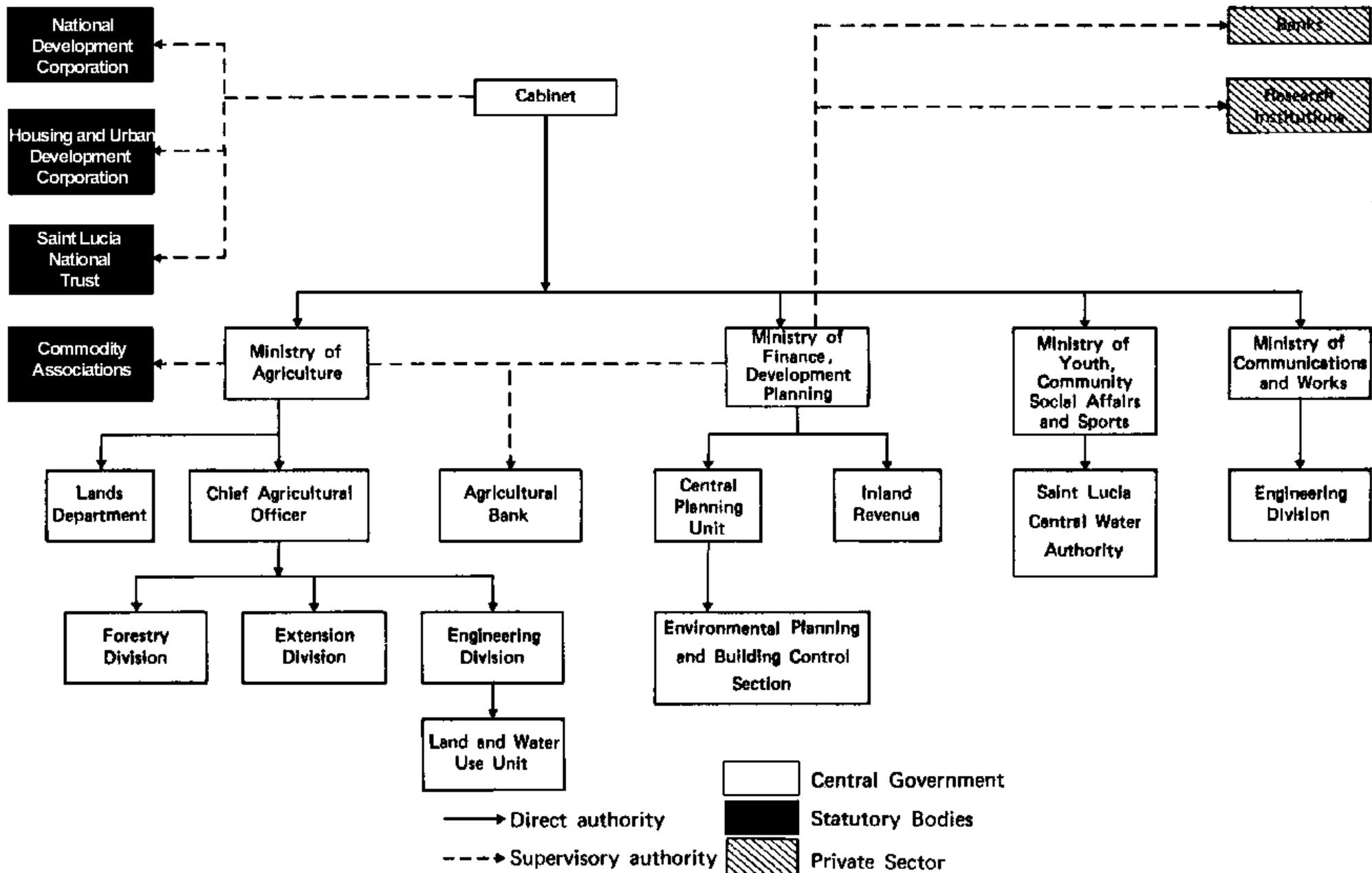
### iv. Worker/producer participation

All but Dennery Farmco are projects designed to serve participant needs, yet the future participants were not consulted at the decision making stages. Lack of effective participation in any project is likely to result in failure. The Dennery Farmco project was less pretentious in this respect since no worker participation was ever envisaged. This will become an increasing problem for management, however, as worker alienation leads to labour strikes.

### v. Applicability at the national level

None of the four projects studied serve as a model for land redistribution at the national level. All but the Marquis project are too expensive and technologically complex, with heavy dependence on outside financing. The Marquis project, on the other hand, addresses the needs of only a handful of worker/producers. The divergent patterns of development in the two major valley projects, Roseau and Dennery, suggest that no clear policy on future valley development exists, although this is of the highest priority for national economic planning.





Note: The judiciary system is involved through the Registrar's office. (See Table 3-1)

	Type of institution							
	Ministry of Agriculture				Ministry of Finance		Ministry of Communications and Works	
Personnel	Lands Department	Forestry Division	Agricultural Services	CPU Economic Section	CPU Environmental Planning Section	CPU Building Design Section	Works Division	Totals
<b>Total</b>	29	24	93	10	14	23	5	198
<b>Managerial</b>	2	1	4	1	1	1	1	11
<b>Technical</b>	6	1	13	5	4	3	-	37
<b>Assistant</b>	21	22	76	4	9	19	4	150
<b>%</b>	100	100	100	100	100	100	100	100
<b>Managerial</b>	6.9	4.1	4.3	10.0	7.1	4.3	20.0	5.5
<b>Technical</b>	20.7	4.1	13.9	50.0	28.6	13.1	-	18.7
<b>Assistant</b>	72.4	91.5	81.8	40.0	64.3	82.6	80.0	75.8




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# Chapter 5. Alternative approaches to land transformation

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[5.1. Alternative solutions to land tenure problems](#)

[5.2. Alternatives for land redistribution](#)

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## 5.1. Alternative solutions to land tenure problems

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[5.1.1. Multiple ownership and fragmentation](#)

[5.1.2. Insecure forms of tenure](#)

[5.1.3. Inefficient system for the registration of ownership](#)

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The search for solutions to land-related constraints on agricultural development in Saint Lucia included consideration of proposals regarding land tenure and the alternative approaches to land redistribution put into practice by many countries.<sup>1</sup>

<sup>1</sup> See for Example, Foreman, R.A., *op. cit.* "Land Settlement Scheme for Saint Lucia," Saint Lucia Government Printing Office, Castries 1958; Mathurin, Emerson D.C., *op. cit.*; FAO; *op. cit.*; Allsenbrook, G., "Saint Lucia; A Study on Possible Conversion from The Civil Code of The Laws Of Succession And Land Tenure," CIDA, Saint Lucia; 1978 (mimeo). Lawrence, J.C.D., "Land-Tenure in Saint Lucia," British Development Division, Saint Lucia, 1979 (mimeo); Saint Lucia Land Reform Commission, "Interim Report," Castries, June 1980 (mimeo).

Prior to making recommendations, the Saint Lucia Land Reform Commission made a detailed analysis of the alternative solutions proposed for land tenure problems. The analysis is presented in the Commission's Interim Report.<sup>2</sup> Only the main features of this analysis are reproduced here; they provide a general background for the solutions recommended in this report. The implementation of the Pilot Project outlined in Chapter 8 constitutes the first phase of putting these recommendations into practice.

<sup>2</sup> Saint Lucia Land Reform Commission, "Interim Report," *op. cit.*

As was discussed in Chapter 2, land tenure problems in Saint Lucia have been constraining agricultural development for many years. They can be summarized as:

- a) A high incidence of multiple ownership of lands due to the characteristics of the inheritance laws.

- b) Excessive fragmentation of the Land which occurs when subdivision takes place and leads to uneconomic sizes of holdings.
- c) Unsecure forms of tenure (sharecropping, squatting, informal rentals, etc.), which prevent appropriate development of lands.
- d) An inefficient system of registration of ownership (deeds registration), which makes dealings in land costly and uncertain.<sup>3</sup>

<sup>3</sup> Ibid.

The alternative solutions to land tenure problems discussed by the Land Reform Commission in its report are summarized in the following sections.

### **5.1.1. Multiple ownership and fragmentation**

The Commission considered impractical the FAO suggestion to amend succession laws to reduce the number of potential heirs to one farming unit.<sup>4</sup> Instead, the Commission decided to focus on the problems of multiple ownership (considering them basically a problem of negotiability of land) and recommended the introduction of a Trust for Sale.

<sup>4</sup> FAO, op. cit.

The Commission also endorsed a previous recommendation regarding legal provisions to establish the minimum size of agricultural holdings in accordance with ecological conditions. Given this approach, alternative courses of action stressing the economics of small farming and collateral options for reconsolidation of small holdings were not considered.

### **5.1.2. Insecure forms of tenure**

The Commission recommended the introduction of legislation to make land rentals and other forms of unsecure tenure statutory, thereby putting tenants and landlords under the control of the courts. The recommendation emphasised the encouragement of emphyteutic leases to give long-term security to tenants in order to foster land development investment in rented lands.<sup>5</sup> This alternative was recommended for short-term actions since the elimination of sharecroppers and tenants, by means of land redistribution on a freeholding basis or by the creation of state farms, was not considered feasible. It was decided that while long-term solutions are preferable the short-term disadvantages of current arrangements must be addressed.

<sup>5</sup> A long-term lease by which the tenant is entitled to compensation from the landlord at the end of the tenancy for all improvements made to the land by mutual consent.

### **5.1.3. Inefficient system for the registration of ownership**

After a review of the benefits and disadvantages of various systems of land registration currently in use in the Caribbean, "deeds registration" and "registration by certificate of title", the Commission opted for a system of registration by certificate. It recommended the ODA System, a variation of the Torrens System.<sup>6</sup>

<sup>6</sup> The Overseas Development Administration of the British Government devised this variation and introduced it in Antigua, Montserrat, Cayman Islands, Turks and Caicos Islands, British Virgin Islands and Anguilla.

To produce a new system of registration of lands (a registered title and cadastre) the following steps are required:

- a) A Land Adjudication Tribunal (adjudicator, demarcators, record officials, and surveyors) must be appointed.
- b) The adjudication officer must request persons with claim to land within the adjudication area to make a claim and demarcate the boundaries.
- c) Demarcation and survey officers should meet with claimants and reach agreement on their rights and boundaries. If no agreement is reached the matter is referred to the Adjudication Tribunal.
- d) A demarcation index map must be prepared and show all land parcels with a unique identification. An adjudication record must also be prepared, showing each parcel by number reference to the map, owner of the parcel and registered land rights.
- e) After expiration of an appeals period the adjudication record must be declared final and delivered to the Registrar of Lands for compilation.

The Commission also recommended that all land disputes be solved by a Land Court with further right to appeal to the West Indies Associated Court of Appeal.

The implementation of this new system needs to be phased, according to the financial and institutional capacity of the country. The peculiarities of Saint Lucia (British-French legal heritage, topography, high incidence of land disputes, high fragmentation of holdings, etc.), as opposed to the other islands where the system has been implemented, makes previous regional experiences somewhat irrelevant. The requirement for more knowledge of types of tenure problems likely to appear and the need to test surveying methods, map scales, types of registry, etc., led to the proposal of a Pilot Project, whose characteristics are discussed in Chapter 8.

## 5.2. Alternatives for land redistribution

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[5.2.1. Basic objectives and options](#)

[5.2.2. Indirect intervention](#)

[5.2.3. Limited direct interventions](#)

[5.2.4. Comprehensive direct interventions](#)

[5.2.5. Broad policy options](#)

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The alternatives for land redistribution discussed here represent a selection from the options considered. This selection was based on an analysis of the socioeconomic and political context in which the actions

are to be implemented. As a result, options involving significant departures from the existing and foreseeable sociopolitical framework have not been considered. Attention has therefore been focused upon alternative actions that are politically viable in the short and medium term within the financial and administrative capacity of the country.<sup>7</sup>

<sup>7</sup> Rojas, E., *op. cit.*

## 5.2.1. Basic objectives and options

There is no final definition of the specific objectives the Government will pursue to reduce existing land distribution constraints to agricultural development. However, there is a strong commitment to solve problems of land tenure related to land registration, insecure tenure, family lands and land disputes. In fact, recommendations made by the Land Reform Commission for the resolution of these problems have already been accepted by the Government and implementation is under way. Steps have also been taken to initiate a cadastral survey, an indispensable technical instrument for planning and implementing an integrated land redistribution programme.

All governments in Saint Lucia have emphasized the need to deal with the problems posed by the ownership and distribution of lands, with a view to improving both the productive capacity of the economy and the productivity of the agricultural sector, and to ensure that the landless agricultural workers and the land starved peasant families have access to land for agricultural production.

The land redistribution model envisaged is based upon a strong agro-industrial structure capable of processing locally the production of small- and medium-sized farmers organized in cooperatives, thereby maximizing the employment-creation capacity of the agricultural sector at the local level. This scenario has been pursued by all Saint Lucian governments during the past 15 years.

Fulfillment of the objectives of this land distribution model involves introducing of important changes in the current land distribution structure. These changes can be introduced by means of direct government intervention or by indirect intervention that will guide ongoing market processes towards the desired objectives. The differences between these two options are the time required to achieve the changes and the certainty of their achievement. When well planned and executed, direct intervention by government can attain results more rapidly and with greater certainty than indirect intervention. However, indirect intervention has the advantage of being less disruptive of the ongoing economic processes and much less costly. Of course, combinations of direct and indirect interventions not only are possible but constitute the path often chosen by governments.<sup>8</sup>

<sup>8</sup> Rickman, R., and E. Rojas, "Alternative Approaches to Land Redistribution in Saint Lucia," Technical Report, Ministry of Agriculture/OAS, Castries, August 1981 (mimeo).

The choice of the preferred alternatives required recognition of certain broad constraints. These relate to the overall stability of the country's economy and the capacity of the government to implement the recommended actions. Agriculture provides 60 percent of all the country's exports and employs nearly 40 percent of the labour force. Consequently, any decline in agricultural production would have important effects on the whole economy. In this sense, Saint Lucia is ill equipped to cope with the possible short-term drop (which can persist for several years) in agricultural production observed in many countries where direct government intervention has introduced important changes in the land distribution structure. Regardless of the case, both direct and indirect interventions in land distribution structures are

very demanding on financial, legal and bureaucratic capabilities of governments. Therefore, analysis and evaluation of the compatibility between policy choices and implementation capabilities is critical for success.

## 5.2.2. Indirect intervention

Almost all the negative aspects of concentration of land ownership, such as underutilization or scarcity of land for sale in the market, can be affected by indirect actions, particularly taxation and Government regulations. To obtain results, indirect actions rely on the operation of market mechanisms which can be modified by the Government's indirect intervention. Uncertainty in obtaining the desired results and the time lag involved in the operation of these mechanisms are disadvantages of this approach. Indirect interventions, in general, allow the economic system time to adapt to the new circumstances, thus producing less disruption than drastic direct actions. The more important indirect interventions are described in the following paragraphs.

### i. Progressive land tax

The predominant negative aspect of concentration of land ownership, the holding of large portions of land unused or underutilized by large holders, can be effectively discouraged by progressively increasing the currently very low land tax rates. Rates in Saint Lucia can be increased substantially without affecting agricultural production but may result in land owners having either to put land into production or to sell it. This option is not only highly feasible, given the extremely low rates of the land tax (up to EC\$1 per acre in holdings of over 1 000 acres), but also easy to implement because of the small number of holdings over 10 acres (796 farms in 1974). This increase in rates will supply additional revenue to the Government that can be used to finance direct interventions in the land distribution structure.

### ii. Taxation of underutilized lands

Taxation for underutilization of lands is an alternative that can be very effective in encouraging productivity in agriculture. The tax system can also be used to discourage land uses potentially dangerous to the conservation of soils. However, in a complex topography and land capability structure like that of Saint Lucia these alternatives are difficult to implement. Clear technical parameters defining the potential of the different types of lands with regard to updated market trends need to be devised. The relevant soil conservation measures must also be defined. Additionally, clear assessment procedures and rights of appeal must be established together with the development of the necessary technical capabilities at the Department of Inland Revenue.

### iii. Financing of land purchases

If the encouragement of land sales through progressive taxation is to be effective, credit for land purchases must be made available through either the banking system or other specialized agencies. Legal advice and surveying may also be required to facilitate land acquisition, at least until a full system of registration of titles is in operation.

### iv. Loan guarantees

The Government can guarantee the loans made by local credit institutions to selected farmer-buyers. This system allow farmers to acquire land by borrowing money and then use the land as security for development loans, or vice versa. Control over the utilization of the system through supervised farm

development plans is required to ensure that the farmer does not exceed his repayment capacity.

#### v. Regulation of sales and leases

Creation of flexibility in the land market will require measures to regulate sales and leases to prevent the increased availability of capital for land purchases from generating price increases. Unfair land prices can be regulated by linking credit for land purchase to the assessed value of the land. The assessment should be made by the lending institution and should be based upon the productive potential of the land and the value of the capital investment made on the land. Imposition of fairly high land taxes would require some tenancy protection measures to prevent landlords from passing tax increases on to their tenants. By linking rents to the pre-tax levels and introducing a system for readjustment according to inflation rates in all the statutory tenancies some protection could be provided. The problem is not very extensive because in 1974 only 2.8 percent of the total land in holdings was held in tenancy, but it may affect a fair proportion of small holders (18.3 percent of total holders were renting land in 1974).

#### vi. Regulation of land subdivisions

A more active land market may generate pressures to subdivide lands beyond a minimum economic size. This will rarely happen when land is acquired for agricultural purposes, particularly when this is done by means of a loan. However, the subdivision of agricultural land may occur and result in conversion to urban uses. In situations where agriculture is highly profitable this problem tends to be minimal. Nevertheless, government control over all land subdivision is advisable to minimize the drain of lands from agriculture.

### **5.2.3. Limited direct interventions**

The Government may intervene in the land distribution structure to solve specific natural resource problems, alleviate problem situations in small communities, or take advantage of land acquisition opportunities such as the sale of estates. The scope of these actions may be limited either spatially or by the type of action required. No single action in isolation will solve the complex land distribution problems of the country. However, a combination of Government actions may constitute good pilot projects to test the feasibility of innovative ideas, train personnel in land redistribution undertakings, and show effective results in the short term. Included among limited direct interventions are the following:

i. Reconsolidation and resettlement provides a solution to the land scarcity problem faced by full-time farmers who hold less than five acres. According to 1973/74 figures, there were nearly 3 250 full-time farmers unable to participate optimally in agriculture as a result of not having sufficient land to farm (average size of farms, 1.17 acres).

Currently these 3 250 farmers control no more than 3 800 acres. A total of 16 250 acres would be needed to supply each farmer with 5 acres. Reconsolidation would involve displacement of some of the full-time holders in order to redistribute their portion of the 3 800 acres. Another 12 450 acres previously in large holdings must then be added to resettle of the remaining 2 490 farmers. Although this alternative is conceivable, it is not feasible in terms of the inherent implementation difficulties involved and the social disruptions that might be generated. Solutions of this type must be confined to small areas for selected groups of farmers, where resettlement of some of them on new lands alleviates the scarcity of land for those who remain. Given the number of people and the amount of land involved

in Saint Lucia, direct intervention is advisable only on a very small scale and in selected areas. In the final analysis, if land markets are made more flexible and population continues to pull out of agriculture, the rural problem will be gradually alleviated by land transfers within this group of farmers.

New and diversified complementary sources of employment at the local level (agro-industries) may reduce pressure on land by simply reducing the number of small holders engaged in full-time farming. If all the available land existing in 1973/74 holdings were distributed equally, the 22 300 acres of good agricultural land would accommodate approximately 4 500 holders at five acres each. Another 2 700 holders could be accommodated on the 40 000 acres of marginal land, but 3 200 holders would still be left with no land.

## ii. Redistribution of unused estates

Acquisition of estates that are for sale provides the Government with another type of opportunity to undertake limited direct intervention in the redistribution of lands. The precise contribution to redistribution that this type of intervention can make is related to the kind of participation that those who are going to farm the land will have. Various alternatives can be used, each involving different degrees of integration of the farmers into the undertaking:

- a) Individual operations: Land is distributed among farmers on a freehold basis. Capital is provided by loans on an individual basis and each small farmer operates independently, repaying the loans directly to the lending agency.
- b) Joint operations: Like individual operations, except that for specific tasks both land and labour are pooled and paid according to the amount of labour and capital provided (e.g., harvesting of crop, irrigation).
- c) Joint farming: Much the same as joint operations except that the pooling of resources and joint operations center on farm enterprises operated in common (e.g., bananas in common, food crops individually).
- d) Cooperative farming: Land and capital are cooperatively owned and individuals will have reversion rights. Wages are paid according to the amount of work performed, and payments on land and capital are made on the basis of contributions by individuals to the cooperative farming venture.
- e) Collective farming: All farm enterprises are operated collectively. Land and capital are owned collectively, ordinarily without reversion rights. Wages are paid with no payment for land or capital individual members may have contributed.
- f) Government farms: Land and capital are owned by government, while management and labour are hired.

A combination of these types of integration may be used to suit specific circumstances. The final decision on the degree of integration may vary according to institutional and technological requirements.

## 5.2.4. Comprehensive direct interventions

As an alternative to the restricted scope of limited direct interventions discussed previously, the Government may choose to speed up the land redistribution process aiming at a nationwide impact. These comprehensive direct interventions can be of two types: 1) land purchase and disposal programmes that speed up and stimulate the conditions of a competitively functioning land market (land bank), or 2) elimination of certain types of holdings nationwide.

### i. Land bank

To speed up the land redistribution process that is slowly taking place through market mechanisms, the Government may decide to increase the land supply on the market to match the foreseeable demand. To facilitate the process the Government may form a land bank that would acquire properties for sale on the open market (or expropriate land, when necessary), which in turn would be sold to small farmers in appropriate sizes once the land is developed. Besides this function of adjusting supply of land to demand, the land bank may fulfill other tasks. The most important would be to ensure full and rational land utilization and prevent subdivision of lands below viable economic size. The land bank can fulfill these aims by attaching conditions to the transfer of land to small farmers. A convenient system is to effect the transfers by lease for the number of years required to pay for the land. During the lease period the farmer must comply with the farm production plan as a condition for continuing in the programme. At the end of the established period the land becomes a freehold under a final limitation giving the land bank first choice of the property in case of sale and the right to acquire it for reallocation to one heir, with compensation to the others, should the holder have died.

A complement to the above action could be land acquisition by the farmer from the land bank using capital borrowed through various types of credit schemes. Again, underutilization and uneconomic subdivision of land may be prevented by attaching the final limitation conditions to the loan agreement before full title to the land is granted.

### ii. Elimination of very large land holdings

The elimination of large estates can be attempted by Government on a nationwide basis by determining a maximum economic scale (related to size) for large holdings and operating according to the following alternatives:

- a) Acquisition of all lands in excess of the determined maximum size whenever a large estate is for sale.
- b) Expropriation of all underutilized lands on large estates that exceed the defined limit.
- c) Expropriation of all lands in excess of the maximum defined size without regard to their utilization status.

These alternatives involve various degrees of direct intervention, and their selection will have to be made on the basis of an objective evaluation of the implementation capacity of the government. The lands acquired can then be redistributed using one of the alternatives already discussed (Section 5.2.3, ii).

Government leasing of underutilized lands on large estates for direct development is a land utilization improvement alternative that poses serious management problems. Although direct intervention may be justified if dangerously high underutilization of lands in large estates is detected, indirect interventions

may be more effective.

## 5.2.5. Broad policy options

Selection of one, or a set, of alternative modifications of the land distribution structure must be made with the understanding that their implementation may initiate different long-term development trends. The existing land distribution pattern in Saint Lucia is inefficient and therefore incapable of sustaining long-term diversified agricultural development. The pattern represents a situation of inequitable distribution of opportunities among the population. A more efficient and equitable pattern will be difficult to establish because of restricted availability of land resources and population pressures. Two broad policy options are open in, this respect.

One is provision to existing holders of farm holdings of sufficient size to guarantee the generation of enough surplus for reinvestment and development facilitating agricultural development by achieving optimum farm sizes. It must be noted that in this option the proportion of the rural population in the wage earning labour force will increase. In this circumstances the agricultural or primary sector is unable to absorb all the rural labour force, then it is necessary to consider policies for development of secondary and tertiary activities to absorb surplus labour

The alternative to this pattern of development is one in which capital and labour remain undivided, as in the cooperative models already outlined in Section 5.2.3, ii. Achievement of this type of development will require far reaching changes in the organizational arrangements of agricultural production simultaneously with the changes required in land distribution patterns.

Realization of the multiple benefits of a more egalitarian development of agriculture is dependent upon choices that the Government makes on land redistribution and on its efforts to promote new forms of organizing the systems of production. Land redistribution can only play a meaningful role within the wider context of other agricultural development activities. The benefits of a land redistribution process can only be fully enjoyed if an integrated transformation of the agricultural sector occurs. Existing constraints on marketing, capital and the availability of inputs must also be removed to achieve the transformation.





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# Chapter 6. Short-term strategy for land redistribution

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[6.1. Basic characteristics of the strategy](#)

[6.2. Intervention at the national level](#)

[6.3. Intervention at the local level](#)

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## 6.1. Basic characteristics of the strategy

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[6.1.1. Objective of the strategy](#)

[6.1.2. Structure of the strategy](#)

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The implementation of the Land Registration Programme recommended by the Land Reform Commission provides an opportunity to initiate a coordinated set of actions aimed at modification of the skewed land distribution pattern of the country. The land adjudication process and cadastral survey are instrumental to the Programme's implementation and will allow the Government to accurately ascertain the extent of land ownership concentration and to carry out research on production and income characteristics in rural communities.

The introduction of the registration by title system will bring about flexibility in land markets. Existing evidence shows that without Government intervention this flexibility will not benefit small farmers. Coordinated Government action is therefore required to ensure that subdivided land will not continue to be acquired only by groups with access to capital or credit. Consideration of the short- and medium-term political circumstances has directed Government attention to a limited range of the possible actions discussed in Chapter 5. They do not represent a full scale land reform but are designed only to initiate a process of change whose ultimate objective is the attainment of a more equitable and efficient land distribution structure in Saint Lucia.

### 6.1.1. Objective of the strategy

The proposed strategy has been designed to enable the Government to initiate implementation of actions leading to the achievement of its goal of removing land distribution constraints now facing farmers. The objectives of this strategy are to improve the productive capacity of the agricultural sector and to guarantee that the majority of full-time small farmers have access to sufficient land to enable them to

engage in surplus production agriculture. The design of the strategy included consideration of 1) the limited financial and institutional capabilities the Government currently has for programme implementation, and 2) the need for avoiding disruption in agricultural production, which is critical to the country as a foreign exchange earner and major source of employment.

The aim of the strategy is gradual transformation of the land distribution structure by provision of incentives which it is hoped will encourage positive aspects of existing trends in land ownership distribution. Direct and indirect actions and interventions within the context of the institutional, legal and financial framework of the country are proposed.

The strategy adopts a short-term, multi-level approach, to avoid the difficulties of obtaining full coordination between long-term complex actions at various levels of Government. Each recommendation included represents a set of possible actions or projects at one level (national or local) of the land distribution problem. While integration of the recommendations into a comprehensive programme of land reform and rural development is desirable in the long run, the recommendations are sufficiently independent to allow for differential phasing in of their implementation without sacrifice of efficiency.

The identification of points of direct intervention at the local level has been based upon opportunities presented by the Government decision to change the system of registration of land rights and to carry out a cadastral survey at the national level. The implementation of the Land Registration Programme requires a pilot project to be undertaken in an appropriate area and that the Programme be expanded from the project area to the rest of the country as the process of land survey and adjudication advances.

## **6.1.2. Structure of the strategy**

Of the alternatives available for direct and indirect interventions to fulfill Government objectives, six were chosen as part of the strategy. Three are directed to the national level and three to the local level (see Table 6.1). Interventions at the national level are both direct and indirect and are geared to guide spontaneous operation of the market mechanism towards the removal of land concentration constraints. Direct interventions at the local level are aimed at small holding consolidation, redistribution of unused land on large estates and expansion of the agricultural frontier.

Indirect national interventions of the type included in the strategy can have significant impact on the structure of land redistribution in the long run. The proposed direct interventions are very limited in spatial scope and therefore do not intensify the impact significantly.

## **6.2. Intervention at the national level**

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[6.2.1. Land taxation](#)

[6.2.2. Financial instruments](#)

[6.2.3. Regulation of land development](#)

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## 6.2.1. Land taxation

The objectives of land taxation are 1) to increase the availability of agricultural lands in the market by inducing large holders to dispose of land they cannot farm efficiently, and 2) to generate revenue for implementing other land redistribution projects.

A progressive land tax already exists in Saint Lucia. Holdings under 10 acres are exempt, and the rate rises as holding size increases. The combined effect of the low level of the tax and the nature of the collection procedures makes the existing land tax system ineffective both as a source of revenue and as a policy instrument for attainment of land redistribution goals.

**TABLE 6-1. SHORT-TERM STRATEGY FOR LAND REDISTRIBUTION**

Level of Intervention	Direct Interventions	Indirect Interventions	Objectives
National		1. Land taxation	Promote disposal of unused lands by large holders, and as source of revenue for land redistribution
		2. Financial instruments	Facilitate access to land for small farmers, adjust supply and demand of lands
	3. Regulation of land development		Prevent inefficient utilization of natural resources and subdivisions of agricultural lands
	Cadastral Survey and Land Adjudication		Secure tenure of lands
Local	4. Consolidation of small holdings		Reduce land scarcity as a constraint to small farmers to engage in surplus agriculture
	5. Redistribution of land		Allocation of unused or underutilized land in large holding to committed small farmers
	6. Expansion of the rural frontier		Incorporation into agricultural production of unused land by adoption of new technologies

Source: Rojas, E., and L. Strachan, "A short-term Strategy for Land Redistribution in Saint Lucia," OAS Technical Report, Castries, September 1981.

Collection procedures can be improved and there is considerable latitude for increasing the tax base without creating undue hardship for farmers effectively working their land and for discouraging speculative retention of lands. The present tax rate for large properties is only EC\$1.00 per acre. A higher tax would encourage the sale of land that is not being productively farmed, the possible effect being expansion and improvement of the land market. Tax revenue must be used to finance land acquisition and other aspects of land reformulation. Increase in this tax should be phased to allow farmers to adjust to the new levels and for Government to incorporate land productivity considerations to avoid excessive taxation of infertile lands.

According to the 1973/74 Agricultural Census, a total of 54 729 acres the 796 holdings will be affected by an increase in land taxation, although differentially, because it is advisable to retain the progressive nature of the tax. The tax is to be designed to include in the land market lands currently unused in large holdings (approximately 22 900 acres) which have agricultural potential (over 40 percent).

### **6.2.2. Financial instruments**

Facilitation of access to land for small farmers by provision of long-term financing for land purchase and adjustment of the long-term supply and demand for agricultural lands are two objectives of the use of financial instruments.

No effective capital market exists in Saint Lucia for long-term financing of land purchases. The absence of an effective market decreases the chances of small farmers to acquire more land in the open market. Bank loans are granted for short periods and at commercial interest rates. This discriminates against the farmer who has no alternative income source to pay for land in the short run. Long-term credit for land purchases would help small farmers to acquire 1) lands presently unused or underutilized by large holdings, 2) adjacent small properties that may be consolidated with their existing property, or 3) the inheritance rights of co-heirs of family lands so as to get enough land into surplus agriculture. Adjustment of supply and demand in the land market is particularly important when large undeveloped tracts of land are put on sale. Development of these lands prior to sale is a function that can be undertaken by a land bank. Such a bank can also provide the financing function described above and serve as a repository and clearing house for lands acquired by the Government for land redistribution.

A nationwide and fully comprehensive attempt to consolidate small holdings in Saint Lucia requires the transfer of ownership of no less than 12 000 acres to provide the nation's full-time farmers with at least 5 acres each. At an average price of EC\$2 000 per acre, the land bank may be dealing with financing over EC\$24 million worth of land purchases and become involved in developing the necessary infrastructure on at least 50 percent of this land (6 000 acres). Given the possible scope of the land bank, it is necessary to consider the use of alternative purchase instruments (bonds, treasury notes, etc.) and a phased programme of land acquisition as the land survey programme advances. This would greatly reduce the cash flow requirements.

### **6.2.3. Regulation of land development**

A major objective of land development regulation is the utilization of the country's most important natural resources (land, water and coastal areas) to prevent ecological damage from misuse. Long-term development of agriculture and tourism, the country's most important economic activities (in terms of employment and foreign exchange earnings), is heavily dependent upon the rational utilization of natural

resources.

Degradation of resources is observed in agriculture in the form of soil erosion, which goes unchecked because of lack of capital investment and inadequate agricultural practices. Progressive deforestation of the headwaters of watersheds has reduced the availability of water for irrigation and is affecting the stability of coastal ecosystems on which tourism heavily depends. Loss of agricultural lands to urban use, arising from uncontrolled urban growth in recent years and excessive subdivision of some agricultural land, is systematically reducing the number of holdings effectively engaged in agriculture. These problems persist because of the deficient institutional arrangements for land development control. Considering the changes in land distribution that will occur in the near future, it is necessary that control aspects of national land use and development should ultimately be vested in a single entity to eliminate duplication of action and provide definition of authority. This entity, the Natural Resources Development Authority, would be responsible for both rural and non-rural land and would control the utilization of natural resources of economic importance in the country. In addition, it would control subdivision of agricultural lands and ensure that new holdings arising from subdivisions conform to a set of criteria for long-term economic viability.

## 6.3. Intervention at the local level

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[6.3.1. Reconsolidation of small holdings](#)

[6.3.2. Redistribution of land](#)

[6.3.3. Expansion of the rural frontier](#)

[6.3.4. Coordination with other agricultural development activities](#)

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The strategy contains three types of actions at the local level: 1) reconsolidation of small holdings to fully utilize land actually occupied by small farmers, 2) redistribution of land to farmers who cannot be accommodated on lands previously occupied by the community, and 3) expansion of the rural frontier. The two initial steps closely follow the implementation of the Land Registration Programme. The primary focus should be on a pilot project area selected to satisfy certain criteria. The project area should:

- a) Illustrate problems of land registration whose solution would provide valuable experience for future stages of implementation of the Land Registration Programme.
- b) Contain a majority of full-time farmers controlling less than five acres of good agricultural lands (or the equivalent in lands on lower classes).
- c) Be situated in an area where underutilized land exists, so that the Government may obtain control of land that can be used to alleviate the scarcity of land experienced by small farmers.

The tangible results of the complex undertaking of such a programme must involve the appropriate combination of reconsolidation and redistribution activities. A project including these activities has the advantage of helping to solve conflicts that may arise from a land registration programme, particularly those related to land occupation accompanied by no proven claim. Local community participation is critical in this regard because community feedback is continuously necessary to optimize the

consolidation and redistribution activities. Property owners must therefore be prepared to accept and participate in the survey process.

### **6.3.1. Reconsolidation of small holdings**

Reconsolidation is aimed at reducing the land scarcity constraint on small farmers and thus enabling them to engage in surplus agriculture and make a larger contribution to agricultural development. Existing data indicate large numbers of holdings in small farmer communities that are composed of too little land to support the owner family and permit productive investment. Only a minority of the families in these communities (about 40 percent) are full-time farmers. Others depend on rural wage employment or urban jobs as their principal source of income and work small garden areas primarily for subsistence. The reconsolidation of small holding will hopefully create viable full-time farming unit by facilitating the exchange of lands between farmers and through the purchase of previously unused lands by qualified candidates drawn from the same communities. Land reconsolidation activities will be linked with land redistribution activities when purchase of unused land occurs.

### **6.3.2. Redistribution of land**

The reconsolidation activity outlined in the preceding section will reveal the existence of a shortage of land for full-time farmers. Acquisition and redistribution of estate land will be necessary to accommodate these families. Allocation to committed farmers of unused or underutilized lands currently controlled by large holdings is the objective of land redistribution.

While the precise extent of land underutilized in large estates is unknown, there are indications that up to 50 percent of the land included within their boundaries falls within this category, representing 21 000 acres. A large portion of these lands may be marginal for cultivation with present technology, thus reducing the extent of redistribution of suitable land to small farmers. Questions on how the rich valley lands should be organized once estates are purchased as well as those regarding tenure rights for squatters will further affect the actual amount of land available for distribution. Regardless, lands suitable for agriculture must be developed and subdivided into economically viable plots with development and subdivision based upon ecological and technological criteria. A major role of Government in this process will be the provision of necessary conditions conducive to the establishment of a productive rural community. Two very important preconditions for that development will be feeder road construction and technical assistance to farmers.

### **6.3.3. Expansion of the rural frontier**

To satisfy the objective of expanding the rural frontier, marginal lands must be incorporated into agricultural production through the introduction of new technologies and crops and innovative forms of production.

The lands specified for local level intervention actions in sections 6.3.1 and 6.3.2 are those with potential for permanent farming using existing technology. Where moisture or soil constraints are severe, large areas of land are rendered submarginal, making continuous traditional agriculture impossible. Technology exists for transforming these areas into forests for charcoal or methane production or into special arid areas for crops such as cashew. The process involves relatively large capital expenditures

and/or excessive gestation periods that are prohibitive for individual farmers. However, special projects can be designed for these areas, using Government participation as the necessary catalyst to attract private investors to these areas.

There is ample scope for projects on marginal lands and over 23 000 acres of this type of land exist in Saint Lucia. Nevertheless, topography, ownership problems, and technological constraints may reduce the amount of land that can actually be used to expand the rural frontier.

### **6.3.4. Coordination with other agricultural development activities**

The success of the local level interventions described in this chapter requires preferential support from the Ministry of Agriculture. Support is especially important for interventions related to extension, diversification of production, and marketing. The successful execution of limited actions of direct land redistribution by Government may in time become more sophisticated and comprehensive and approach what may be considered a desirable level of integrated rural development.

A continuous process of evaluation and reformulation of the actions being carried out as part of the strategy must be undertaken by the appropriate bodies of the Ministry of Agriculture. This process should concentrate mainly on the following activities;

- a) Detailed survey of the areas where the land registration is going to take place in order to identify possible conflicts and project opportunities;
- b) Continuous monitoring of the effect on the land distribution structure of the indirect interventions at the national level;
- c) Assessment of the results obtained through direct interventions.

The knowledge gained through this research and evaluation process is essential for the successful implementation of both the Land Registration Programme and the Land Redistribution Strategy.

The basic premise of the various activities outlined in the short-term strategy for land redistribution is that a strong political commitment to implement the land registration process does exist, and it is presumed that basic studies concerning land development regulation have been made. To illustrate the complexity and difficulties likely to be encountered in the implementation of even mild corrective actions related to agricultural development, the following chapters concentrate on 1) a brief discussion of the characteristics of the pilot project on land registration, and 2) the types of legal and administrative changes required to increase Government capacity to regulate the use of natural resources, protect the ecology, and implement land registration and redistribution actions.





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# Chapter 7. Guidelines for legal and institutional change in matters related to agricultural land development

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[7.1. Required actions and general principles](#)

[7.2. Legal developments](#)

[7.3. Institutional development](#)

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## 7.1. Required actions and general principles

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[7.1.1. Required actions](#)

[7.1.2. General principles](#)

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### 7.1.1. Required actions

The analysis provided in Chapter 3 of the institutional and legal structure concerned with agricultural land development problems identified two major inadequacies:

- a) Insufficient coverage of main problem areas, especially those of integrated natural resources management, originating from partial legal coverage of problem areas and technical manpower shortages in most institutions.
- b) Fragmentation of decision-making capacity at different levels within the Government hierarchy, which, coupled with scarce technical backing and rigid vertical lines of command, results in uncoordinated Government actions.

These shortcomings configure a situation in which the Government lacks legal and institutional structures to achieve its goals of agricultural development and land transformation.<sup>1</sup> The removal of this short-term constraint will require early action. Coordination of actions is needed at both legal and institutional levels. Legislation to empower Government to regulate key areas of natural resources development, particularly agricultural land development, must be provided and institutional change must occur to ensure technical implementation of legislation.

<sup>1</sup> Rojas, E., *op. cit.*

Broad areas to be covered by legal and institutional changes are natural resources management, land registration and agricultural land redistribution. Actions related to land registration have been initiated by Government in both the legal and the institutional areas (establishment of the appropriate operational unit in the Ministry of Agriculture and drafting of required legislation). In the following sections the actions mentioned above will be linked with concrete proposals for management of natural resources and agricultural land redistribution. The proposals include full consideration of the interdependent nature of the environment and the intricate linkages that exist between all forms of land development and the utilization of key natural resources (water, forest, beaches, areas of scenic interest and coastal ecosystems.)

## 7.1.2. General principles

To establish the changes required in the existing legal and institutional structure to regulate natural resources development, the following principles should be followed:

- a) Attainment of a unified decision making capability within a basically multi-sectoral problem area.
- b) Establishment of complete legal and institutional coverage of main issues concerning natural resource conservation and development and land registration and utilization.
- c) Introduction of long-term planning capabilities within the decision making structure by means of proper utilization of the scarce technical manpower available and organization of decision making procedures which enable thorough review of planning proposals and technical advice. This should be coupled with clear differentiation between policy decisions (entrusted to a unified decision making structure) and routine implementation (entrusted to the various ministries and institutions within the framework of the legislation.)
- d) Avoidance of disruption of ongoing bureaucratic and technical activities in the field by gradual introduction of the required changes.

The following sections contain specific guidelines for an institutional development process. The guidelines cannot be considered full-scale proposals for institutional rearrangements within the Saint Lucian Government structure but directives whose feasibility is worth being explored thoroughly. They are intended to convey the need for an integrated understanding of the problem and the defined priorities before specific changes are introduced.

## 7.2. Legal developments

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[7.2.1. Management of natural resources](#)

[7.2.2. Land registration](#)

[7.2.3. Land redistribution](#)

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## 7.2.1. Management of natural resources

Legal developments in natural resources management should enable the Government to protect key resources from improper use and to ensure the preservation in perpetuity of renewable resources. Accordingly, legislation should be developed to enable the Government to protect resources and regulate their utilization. A need for differentiation is implicit in the various types of actions included in these two activities. The protection activity normally concentrates on prevention of use of certain natural resources or on prohibition of uses that can damage the resources. Governmental action is required continuously when protection levels have been specified based upon determination of the known availability or scarcity of a resource. Regulation activities are different and require a flexible attitude on the part of the Government since the type and intensity of interventions may change according to the economic importance of the resource or the level of development reached by the whole economic system. Regulation requires permanent monitoring and evaluation to ensure its relevance to the changing development needs of the country and the preservation of the natural resources. Technical management plans and procedures are therefore required to give specific meaning to the broad definitions normally contained in legislation.

The main areas requiring conservation activities by the Government are forests, watersheds and watercourses, wildlife, marine ecosystems and areas of natural or historical interest. The natural resources where regulation of use is urgently needed are water, soil, beaches and areas of natural beauty, fisheries and harbours. Consequently, in the field of protection, it is suggested that, as a supplement to the existing Wildlife Protection Act (1980), the following legislation should be developed:

- a) Forest protection
- b) Watershed and watercourse protection
- c) Marine ecosystems protection
- d) Protection of areas of natural historical interest

The draft bill prepared by the Forestry Division can be used as a model, with minor amendments, for all aspects of protection.<sup>2</sup> The technical results expected from the CIDA technical assistance project to the Forestry Division on forestry management, particularly the Forestry Boundary Survey and the Forest Management Plan, can supply the technical information required for legislation on forest, watershed, and watercourse protection.<sup>3</sup>

<sup>2</sup> As was mentioned in Section 3.3, a major change has to be introduced in the institutional proposals of this Act. The powers proposed for a Forest, Watershed and Conservation Authority need to be merged with the Natural Resources Development Authority, as the decision making body in matters concerning the implementation of these Acts.

<sup>3</sup> CIDA, Forest Management Assistance, Saint Lucia, Plan of Operation, Project N°868/00702, October 1, 1981.

In the case of marine ecosystems (coral reefs, mangrove swamps, sea bed and fishing areas), there is little knowledge of protection requirements. The results of the project Conservation and Development Requirements for the Southeast Coast of Saint Lucia can be used to define the basic framework for legislation and implementation in this area.<sup>4</sup>

<sup>4</sup> Research project being implemented by the Eastern Caribbean Natural Area Management Programme with the collaboration of the Saint Lucia National Trust and the coordination of

the Central Planning Unit.

However, much more field research is required to fully ascertain conservation requirements.

In regard to the protection of areas of natural and historical interest, legislation is needed to define different levels of protection according to the nature and importance of the areas and to specify means of enforcement and procedures to determine when compensation or acquisition of land is necessary. The work done by the Saint Lucia National Trust supplies the necessary technical background to initiate meaningful work in this area.<sup>5</sup>

<sup>5</sup> Saint Lucia National Trust, "Review of the Saint Lucia National Trust - 1979," Castries, 1979 (mimeo); "Recommendations to the Commission on Land Reform Concerning the Preservation and Promotion of the Natural and Cultural Resources of Saint Lucia," Castries, 1980 (unpublished); "Proposed Maria Island Nature Reserve," Project Proposal, Castries, 1978.

Regulation should also be developed to permit Government intervention in private sector activities in the following natural resource areas:

- a) Regulation of water resources
- b) Soil conservation and use
- c) Utilization of beaches and areas of natural beauty
- d) Exploitation of fisheries
- e) Utilization of harbours

Regulation of water resources use is a critical problem that has not been integrally approached. Various interrelated actions are needed in this field, both legal and institutional, and there is a particularly urgent need for a water law to define ownership rights. Most modern water legislation declares water a national property and requires usage rights to be acquired by the private sector. Definition of public watercourses and utilization rights, use of water overspills, rights-of-way for infrastructure and the like, need legal definition in Saint Lucia.<sup>6</sup> Long-term conservation of water resources is extremely dependent upon obtaining the expected results from the watershed protection activities. Coordination between ownership rights and water protection legislation is essential, as is coordination of institutions that will administer these laws.

<sup>6</sup> Oelsner, J., "Water Resources," OAS, Department of Regional Development, Technical Cooperation Mission, 1980-1981, Technical Report, Castries, May 1980 (mimeo).

Soil conservation outside of protected forest and watershed areas is an activity that has to be carried out to avoid adverse effects of agriculture and urban development. Legislation in this field can play only a partial role in protecting soils. The bulk of the effort has to be focused upon promotion of sound land uses and agricultural practices. The Government must be legally empowered to intervene when gross misuse of soils occurs. Legislation should enable the Government to serve protection orders when necessary and to enforce compliance. Provisions enabling Government intervention on private lands to protect soil and prevent irreparable damage to the land should also be included in legislation.

Legislation regulating the use of the entire coastline of Saint Lucia should be directed at preservation of resources on which the tourism industry depends. Beaches and coastal areas are threatened by sand mining, obstructive buildings, clearing of mangroves, etc. The Government must claim its ownership rights over the Queen's Chain that covers most of the areas threatened and, as landowner, grant rights of

use or construction subject to conditions defined by an environmental impact study of the proposal.

Currently, little knowledge exists about Saint Lucia's fisheries. Resources have not been quantified and the activities of fishermen have only recently been regulated and controlled by the Fisheries Division of the Ministry of Agriculture. A more active involvement of Government in regulation of these activities and more legal powers of prosecution and prevention of malpractices are required.

Finally, the initiation of operations in the oil transshipment terminal at Cul de Sac and shipping activity in Saint Lucia's ports, increases the risk of pollution in harbours and on beaches generated by ships. Government action, both legislative and institutional should be at three different levels: prevention of pollution, control of accidents and compensation. At the preventive level, the Government should join the countries that have signed and enforce the provisions of the OILPOL Convention<sup>7</sup> and the MARPOL Convention<sup>8</sup> which will replace OILPOL. In the area of accident control the Government should join other Caribbean countries to establish a regional pollution control center, in conjunction with joining the INTERVENTION Convention, to ensure its right to act in international waters in case of an accident.<sup>9</sup> In addition, the Government should request shippers to be members of the TOVALOP and CRISTAL agreements as a supplementary assurance of their capacity to meet their eventual liabilities.<sup>10</sup> The Government should join the CLC Convention,<sup>11</sup> to ensure compensation to persons suffering property damage from oil pollution, and the Supplementary Convention FUND,<sup>12</sup> which provides compensation when CLC is inadequate and encourages shipowners to comply with safety measures.

<sup>7</sup> International Convention for the Prevention of Pollution of the Sea by Oil adopted in 1975.

<sup>8</sup> International Convention for the Prevention of Pollution from Ships, adopted in 1973 but not yet in force.

<sup>9</sup> International Convention Relating to Intervention on the High Seas in Case of Oil Pollution Casualties, which was adopted in 1965 and entered into force in May 1975.

<sup>10</sup> TOVALOP is the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution, adopted in 1969. CRISTAL is the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.

<sup>11</sup> International Convention on Civil Liability for Oil Pollution Damage of 1969, which entered into force on June 19, 1975.

<sup>12</sup> International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage of 1971. The convention has not yet entered into force.

These guidelines reflect the tasks required to provide the country with a minimum of laws to protect its fragile ecology. Although legislation plays an important role, there is a concomitant need for efficient institutions to manage the use of natural resources in accordance with national development needs. Institutional changes complementary to legislative introductions will be discussed in Section 7.3.

## 7.2.2. Land registration

Implementation of a system of registration of title has already been started by the Government. Currently, draft legislation covering all the aspects of the land registration process is being circulated for comments. These drafts are:

- a) Land Adjudication Act
- b) Registered Land Act
- c) Land Surveyors Act
- d) Survey Regulations

The draft legislation is well suited to the needs of the Land Registration Programme, apart from the shortcomings using general boundaries in the cadastral survey and titling documents.<sup>13</sup>

<sup>13</sup> Mae, Leslie B., "Registration of Title to Land, Proposals for a General Cadastre; Pilot Project Morne Panache," OAS Technical Report, Castries, November 1981 (mimeo).

## 7.2.3. Land redistribution

The legislation requirements of a land redistribution programme can vary according to the extent of the programme and the nature of the actions the Government attempts to implement in order to introduce changes in land distribution patterns. The implementation of the proposed short-term strategy for land redistribution will require some new legislation.

Of the three components of the strategy aimed at the national level, namely land taxation, financial instruments, and regulation of land development, only the last is covered by the suggested legislation reviewed in Section 7.2.1 Another instrumental, legal development needed in Saint Lucia is that related to subdivision. The Government must be empowered by legislation to control excessive subdivision of agricultural lands and ensure that every subdivision proposal is reviewed and approved by an authority. Subdivision regulation, including determination of minimum size of holdings, should be defined on the basis of analytical criteria specified by the Government. This information should be compiled and made available in a technical report which will serve as a basis for review of subdivision requests. Decisions on individual cases should be communicated in technical memorandum form.

Implementation of the land taxation proposals included in the proposed strategy will require modification of the existing land taxes<sup>14</sup> in order to meet the following minimum criteria:

- a) Differentiation of urban from agricultural land tax. Land has a different function in urban economies and taxation has to reflect this difference if it is to be used as a tool for Government intervention.
- b) Maintenance of the progressive nature of the existing legislation, and threshold differentials in order to provide incentives for modification of redistribution of unused lands in very large holdings.
- c) Definition of land valuation procedures according to the productive potential of the land.
- d) Introduction of a system of increasing tax rates for under-utilized lands once a cadastre becomes available.

<sup>14</sup> Land and House Tax Ordinance (11/1952) amended by Ordinances 19/1965 and 16/1966 and by Acts 20/1970 and 19/1971.

Finally, implementation of the financial instruments suggested in the strategy may not require enactment of new laws. All the land development functions of a land bank can be immediately assumed by the National Development Corporation, given its scope as defined by the legislation that created the Corporation.<sup>15</sup> Currently, NDC is managing important amounts of agricultural lands acquired by or being transferred to the Government. Expansion of this institution into a land bank is basically a matter of staffing. The financial activities of a land bank (loans, management of mortgages, etc.) can be managed by the recently created National Commercial Bank or other financial institutions. As suggested in the strategy, seed money for implementing this proposal may be needed but the bulk of the financing should be provided by the new land tax.

<sup>15</sup> The National Development Corporation Act (9/1971.)

More direct interventions the Government may want to make in the land market will involve acquisition of private lands for redistribution. The existing Land Acquisition Ordinance (12/1945) is unsuitable for any meaningful and prompt action by Government when acquisition must be compulsory; the procedures are not expeditious enough to guarantee uninterrupted production throughout the acquisition process. Furthermore, the valuation procedures established by the Ordinance are unsuitable in circumstances of a fairly inactive and distorted agricultural land market. Valuation methods reflecting the potential productive capacity of the land and the value of the capital invested would be more realistic when considering prevailing condition in rural Saint Lucia.

## 7.3. Institutional development

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[7.3.1. Management of natural resources](#)

[7.3.2. Land registration](#)

[7.3.3. Land redistribution](#)

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Compensation for the inabilities of the existing institutional structure to deal with issues of management of natural resources and land registration and distribution, calls for major changes in the decision making structure and in the operational procedures of many institutions.<sup>16</sup>

<sup>16</sup> Rojas, E., *op. cit.*

Relatively complex institutional changes are required to effectively manage the country's natural resources, which are affected by a multiplicity of socioeconomic activities. Because different institutions are responsible for specific activities, decisions of each institution must be highly coordinated with those of others. This is particularly true because of the confusion inherent in the dual management objective of conservation and regulation (Section 7.2.1)

Institutional development in relation to land registration is less complex, affecting only three institutions: the Lands Department, the Registrar, and the Judiciary System. Implementation of a Land Redistribution Programme at the level defined by the short-term strategy involves relatively minor changes in the

existing institutional structure. Any other, more intensive programme that includes direct Government involvement in land redistribution and reconsolidation will require upgrading the operational capabilities in the Ministry of Agriculture to deal with the complex planning and implementation problems posed by such an undertaking.

### 7.3.1. Management of natural resources

Unification of top level decision making in matters of policy and long-term planning and the full utilization of scarce technical manpower are the most pressing issues regarding management of natural resources. Institutions must be reorganized so as to cope with both problems simultaneously, ensuring the involvement and interaction of three ministries and seven organizations which have different resource management responsibilities.

Given the many shortcomings of creating yet another ministry to deal with problems of coordination and management, it is advisable to place the top decision making level in an institutional structure distinct from the central Government structure.<sup>17</sup> This institutional structure should be an authority, the National Resources Development Authority (NRDA). When dealing with long-term policy decisions its members will consult with other relevant institutions or organizations. The National Development Corporation, the Tourist Board, the Naturalist Society, the National Trust, commodity associations and the like can form an advisory body to the Authority.

<sup>17</sup> Being located at the same level in the decision making hierarchy, new ministries dealing with the management of natural resources tend to fall into advisory positions for actions to be undertaken by other ministries. Transfer of the multiplicity of duties and power from other ministries is normally difficult and ends up creating difficulties in coordination.

To allow the Authority the widest possible sphere of decision making in resources management and avoid overloading it with routine decisions, a distinction must be made between 1) long-term policy decisions and surveillance of implementation, and 2) regulation of resource use and project implementation. The first will be the responsibility of the Authority and the second that of the relevant ministries.

Long-term planning, of recommendation policy to the Authority and preparation of environmental impact assessments are complex operations requiring interdisciplinary and technical capabilities. No single existing Government organization includes the variety of technical personnel required to perform planning and policy tasks to the extent necessary. The performance of these tasks is irregularly required and the creation of a permanent institution responsible for undertaking them is not appropriate. Instead, it is recommended that a Technical Secretariat be created with the function of drawing on technical capabilities from different agencies for specific endeavors with defined time frames. To supplement deficiencies in technical personnel, the Secretariat could obtain technical assistance from international agencies and be empowered to contract short-term consultants when necessary.

The resulting proposal for the institutional structure for management of natural resources is shown in Chart 7-1. The basic activities of each component of the structure are quoted on the left and below each institution. Indication is given of each institution's sphere of influence in relation to each type of activity undertaken. Full arrows specify dependency within the structure (in matters related to management of natural resources) between the institutions shown. These institutions do not lose their dependency on the internal chain of command of their own ministries in all other matters. Broken arrows show lines of

advice (Technical Secretariat) or consultation (advisory body).

As is shown in Chart 7-1, the top decision making is left to the Authority. As a corporate body, representative of a wide variety of concerns, it would concentrate the capacity to give overall guidance and surveillance of implementation. Implementation of policies and plans is left to institutions more suited to cope with each problem. The denominations given to each are as close as possible to existing names but the need to have all these institutions at the same level of the command hierarchy within the ministries is stressed by the use of the name "division" for all of them. A division, the third level of decision making in the structure of the ministries, is considered the most suitable for implementation purposes. Institutions not at division level currently (i.e., Environmental Planning Section of CPU) should be upgraded to this level.

The duties of the different divisions remain the same but include expanded capacity of intervention to be provided to Government by the development of proposed legislation (see Section 7.2.1). Additionally, the divisions would be asked to place technical manpower at the disposal of the Technical Secretariat to undertake the long-term planning, policy preparation and impact assessment tasks required by the Authority. The Technical Secretariat would have only a small core of permanent staff (the technical secretary and a few clerical workers) required to support the routine activities of the Authority. This staff will be expanded by the means already described, when necessary.

### **CHART 7-1. Proposed Institutional Structure for Natural Resources Management**

Source: Rojas, E., 'Institutional and Legal Aspects of Agricultural Land Development Planning and Implementation in Saint Lucia,' *op. cit.*

The powers of the Authority should be ample but controlled by the Cabinet, once a decision is adopted the Authority will have to have the financial and administrative powers for implementing it.

## **7.3.2. Land registration**

Given the importance of agricultural land as the main natural resource of Saint Lucia, and the key role of the Land Registration Programme in future distribution and utilization of agricultural lands, it seems desirable to put the Land Registration Programme under the direction of the National Resources Development Authority. As is shown in Chart 7-2, the land registration activities entrusted to the judiciary system were also included within the sphere of control of the Authority. This control is confined to the definition of the spatial priorities for the land registration process and by no means should be construed as central Government interference with the judiciary system.

In the proposed institutional structure, both the Ministry of Agriculture and the Ministry of Finance carry out socioeconomic research within rural and urban areas, respectively, in order to supply the Technical Secretariat with information to recommend priorities. Once priorities have been set by the Authority and approved by the Cabinet the land adjudication process can be initiated by the adjudicator, the cadastral survey compiled by the Lands Department, and titles registered by the Registrar.

### 7.3.3. Land redistribution

Implementation of the proposed short-term strategy for land redistribution does not require major legal developments because its implementation is possible with only minor changes required in the existing legal structure. The same is true for the institutional aspects where most of the actions can be implemented by existing institutions.

The land development aspects of the financial instruments can be implemented by the National Development Corporation and the financial aspects by the National Commercial Bank (section 7.2.3). Although no changes in the institutional structure are required, it is necessary to point out that the institutions to be used to implement the policy should follow the guidelines and options prepared by the Natural Resources Development Authority. This is to ensure coordination with the other aspects of land development and avoid conflict with other Governmental actions in the field. Reinforcement of the staff of both institutions seems to be the only institutional change required at this stage.

Reinforcement of the Inland Revenue Department and modification of land valuation and tax collection procedures seem to be the main institutional development activities required to implement the land taxation proposals of the short-term strategy.

#### **CHART 7-2. Proposed Institutional Structure for Land Registration**

Source: Rojas, E., 'Institutional and Legal Aspects of Agricultural Land Development Planning and Implementation in Saint Lucia,' *op. cit.*

Finally, implementation of the regulation of land development activity outlined in the strategy corresponds with activities of the Natural Resources Development Authority. Therefore, all the institutional changes mentioned in Section 7.3.1 are advisable. The preparation of impact assessments of projects involving drastic changes in land use patterns and the control of subdivision of agricultural lands (key aspects of regulation of land development) will fall within the decision making sphere of the Authority. The Technical Secretariat will advise the Authority on assessments and related regulation will be implemented by the Extension Division of the Ministry of Agriculture and the Registrar.

Implementation of the proposed short-term strategy for land redistribution does not require major institutional changes. However, if the Government adopts a policy of direct acquisition and redistribution of land, more institutional changes will be necessary. Should such a policy be pursued, it is recommended that the Land Reform Management Unit of the Ministry of Agriculture be upgraded to the level of division in order to execute Cabinet-approved policies and plans adopted by the Authority. Plans and policies should be drawn from alternatives prepared by the Technical Secretariat.





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# Chapter 8. Pilot project on land registration: Morne panache

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[8.1. Project overview](#)

[8.2. Characteristics of the pilot project](#)

[8.3. Cadastral survey and land adjudication](#)

[8.4. Research on land redistribution needs](#)

[8.5. Financial analysis and assessment of farming systems](#)

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## 8.1. Project overview

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[8.1.1. Objectives](#)

[8.1.2. Selection of the project area](#)

[8.1.3. Main components of the pilot project](#)

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### 8.1.1. Objectives

The Pilot Project is designed to initiate, on an exploratory level, a programme of land registration and to carry out research on problems of land distribution in a specific area to allow detailed design of land redistribution activities. The basic premise of the project is that the land situation is a major constraint for a majority of the island's small farmers which can be eliminated or greatly reduced by a phased program of land transformation.

The Pilot Project has both national and local objectives. At the national level the project will:

- initiate land survey and registration activities planned by the Government, and
- test the technical feasibility of a national programme of land redistribution.

Within the Project area, two local objectives are to:

- increase the security of tenure by providing title to all legitimate rural landowners, and
- study the feasibility of providing an adequate land base for as many small full-time farmers as possible.

The land survey and registration activities of the Project, although experimental in nature, can be considered by the Government as the initial step of the National Land Registration Programme. The training and experience gained in the Project area will support progressive expansion of survey and registration activities throughout the island. The land redistribution policy dimension of the Project is more limited, because of the technical complexity and political sensitivity of this question. The research to be undertaken will provide valuable information on the need for and mechanics of redistribution in the Morne Panache area. Implementation of a nationwide program will require serious political decisions regarding the future structure of agriculture in Saint Lucia.

Project objectives have been kept as simple and operational as possible, to avoid placing heavy demands on the local administration. Nevertheless, the multi-dimensional nature of the objectives may still give rise to certain implementation difficulties. At the local level, the provision of security of title for some may imply unsecured tenure for others, i.e., squatters and tenants. Concern for the rights of landless producers must therefore be incorporated into the Project, and research on the opportunities for creating new holders must be undertaken. A knowledge of these and other problems likely to be encountered and the testing of alternative solutions to them are among the main of the Pilot Project.

### **8.1.2. Selection of the project area**

The area chosen for the Pilot Project (Map 8-1), is the Morne Panache farming community and the adjacent lands to the east, including the Bosquet D'Or and Glavier sections of the Government-owned Landco Limited.<sup>1</sup> The area consists of approximately 1 300 acres on the south side of the Mabouya River in the Dennery Quarter. The main criteria used in selecting the project area were the following:

- a) The area should exemplify problems of land registration whose solution will represent a valuable experience for future stages of the National Land Registration Program.
- b) There should be a land distribution pattern indicating a strong farming region, but with a severe land shortage for small, full-time farmers.
- c) The area should have underutilized estate land that can be incorporated into small-farm production.

<sup>1</sup> See Chapter 4, Section 4.2.2.

The Dennery Quarter was chosen over three suggested others (Gros Islet, Choiseul and Micoud), as a first approximation of a project region. The Gros Islet Quarter is of little importance agriculturally and is subject to pressures of urbanization and tourism that do not characterize other quarters to the same degree. The Choiseul Quarter is the most critical in terms of land demand but, given the scarcity of unused agricultural land, appears to offer little possibility for a successful pilot project within a reasonably short time.<sup>2</sup> The Micoud Quarter is a strong farming region, widely known for its land disputes. A land survey in this region would be slow and costly, hardly a suitable setting for a project in which a survey is only the first of several stages involving research and evaluation of future activities.

<sup>2</sup> Rojas, E., "Implementation of the National Transformation and Land Reform Policy in Saint Lucia, Second Part: Evaluation of the Pilot Project Area of Lafayette," OAS Technical Report, Castries, November 1980 (mimeo).

### **[Saint Lucia - Pilot Project Area - Land Capability](#)**

Source: G.O.S.L. Natural Resources and Agricultural Development Project, O.A.S.,  
Department of Regional Development

The Dennery Quarter, in contrast, has a larger proportion of small full-time holdings than the nation as a whole and contains Government lands (Landco Limited) that can be made available for redistribution. It is also located on a principal road 15 miles from Castries, facilitating project implementation without excessive exposure to urban influences.

Within the Dennery Quarter, two possible pilot areas were identified: the Morne Panache/Bosquet D'Or area to the south of the Mabouya River and the Derniere Riviere/Belmont area to the north. Both were sufficiently close to Landco lands that relocation of families needing land could take place without uprooting them from their communities. Closer examination revealed that much of the Government land in the Belmont area, while of satisfactory quality for small-scale farming, was already occupied by large numbers of squatters and small renters. This would have complicated the land redistribution research activities of the project and greatly increased the complexity of identifying land available for resettlement.

The Morne Panache area appears to be a more typical small-farm community, less dependent than Derniere Riviere/Belmont on the large estate as a source of wage income. While Government land in Bosquet D'Or offers somewhat less farming potential than in the Belmont area, it is relatively free of squatters and the available area is larger, permitting careful land use zoning prior to settlement.

The project area is delimited by the Mabouya River and one of its tributaries on the north and west, by the Glavier-Dennery road along a natural divide to the south and the boundary of the Bosquet D'Or and Glavier sections of Landco Limited to the east and southeast. These boundaries are sufficiently well defined to permit designation of the area as the registration block within the Land Registration Programme.

### **8.1.3. Main components of the pilot project**

The pilot project has five main components, and each represented by a set of activities that will be performed sequentially:

- i. Land survey and adjudication
  - a. Pre-adjudication dialogue with the community
  - b. Cadastral survey, land adjudication and title registration
  - c. Research and evaluation of the land adjudication and survey activity
- ii. Research on land redistribution needs
  - a. Land distribution structure
  - b. Land demands and availability
  - c. Planning of land reconsolidation and redistribution activities
- iii. Reconsolidation of holdings
  - a. Increase in community awareness of opportunities arising from land reconsolidation
  - b. Land exchanges or purchases within the small-farm community

#### iv. Redistribution of land

- a. Acquisition of land for redistribution
- b. Zoning and planned subdivision of land
- c. Resettlement of qualified farmers

#### v. Expansion of the agricultural frontier

- a. Identification of lands unsuitable for small farm agriculture
- b. Project design of alternative land uses

Successful completion of the land survey and registration activity is a prerequisite to the initiation of subsequent activities. Difficult land disputes may drag on for years, but clear title must be determined for a majority of holdings before any meaningful evaluation of the need for reconsolidation and redistribution can be made. Once this evaluation is available, both of these activities can advance simultaneously. Consolidation of holdings within the existing farming community will to some extent reduce the need for redistribution of land outside of it. The release of existing farm land by families purchasing new, larger farms in the resettlement area will, on the other hand, provide new opportunities for reconsolidation.

In the short term, the pilot project will concentrate on activities (i) and (ii), which will provide information required to prepare specific projects on activities concerned with the reconsolidation of small holdings, land redistribution and expansion of the agricultural frontier. A detailed analysis and evaluation of these activities will be made in the following sections. Activities (iii), (iv), and (v) will have to be designed when the results of activities (i) and (ii) are obtained.

The main characteristics of the pilot project area will be described first to give a general background to the problems of land registration and redistribution likely to exist.

## 8.2. Characteristics of the pilot project

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### [8.2.1. Land tenure and distribution](#)

### [8.2.2. Present land use](#)

### [8.2.3. Potential land use](#)

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### 8.2.1. Land tenure and distribution

The choice of a relatively small project area (approximately 1 300 acres) simplifies control over activities. Unfortunately, secondary data are generally not available at this level of disaggregation; the 1973/74 Agricultural Census and published data for the 1980 Population Census are only available at the quarter level.

Research by the Land Reform Management Unit of the Department of Lands and Surveys of the Ministry of Agriculture revealed four survey plans showing estates in excess of one hundred acres within the Project area (See Table 8-1). Two of these, Fournier (104 acres) and Theobald (163 acres), have been subdivided into smaller holdings.

**TABLE 8-1. REGISTERED HOLDINGS IN PROJECT AREA, BY SIZE CLASS, NOVEMBER 1981**

Holding size class (acres)	Holdings		Acreage	
	(No.)	(%)	(No.)	(%)
0-1	0	0	0	0
1-5	10	27	19.9	2
5-10	9	24	58.0	6
10 - 25	11	30	161.2	18
25 and above	7	19	680.0	74
Total	37	100	919.1	100

Source: Information from the Department of Lands and Surveys, 1981.

The most significant inference to be made from Table 8-1 is the fact that no registered holdings of less than one acre are recorded, while the 1980 Farmer Survey shows 8 percent of the holdings in two communities of the study area as being less than one acre (see Table 8-2). This is probably the result of the expenses of deed and title registration under the current system, which prevents small farmers from properly registering their lands.

An analysis of holding sizes in these two communities is presented in Table 8-2. The Farmer Survey registration shows 152 holdings with a total of 699 acres, or 4.6 acres apiece. This area constitutes 77.7 percent of the estimated 900 acres in the pilot area, excluding Landco lands, and 54.6 percent of the 1 280 acres calculated to be within the total Project boundary.

Nearly 80 percent of these holdings and 60 percent of the land are in the 1.0-9.9 acre size categories, precisely those in which a large percentage of land-hungry full-time farmers are located. While this apparent need for more land satisfies one of the Project area selection criteria, the results must be qualified by observations of the Farmer Survey compared with the findings of the 1973/74 Agricultural Census (the latter shows only 51 percent of land holders in these size groups).

Secondary data sheds little light on land tenure in the Project area. Information gathered in the field indicates that, as in the Dennery Quarter as a whole, renting and sharecropping of small areas is common. Cases of boundary and ownership disputes were noted, which suggests that the Project area is no less complex than any other areas of a similar size.

Taking into consideration this underestimation and the fact that some holdings exist on Project land outside the Morne Panache and Dubonair communities, the total number of holdings to be considered will probably approximate 200.<sup>3</sup>

<sup>3</sup> While the number of squatters on Landco land is known to be large, observation suggests that they do not occupy a significant area in the Bosquet D'Or and Glavier sections.

## 8.2.2. Present land use

Data on land use collected by the 1980 Farmer Survey are restricted to an estimate of the plants and trees destroyed by Hurricane Alien. Because banana tree losses reached an average of 98 percent, statistics given for this crop can be taken as the total before the hurricane. Using survey data, it can be estimated that in 1980 the Morne Panache and Dubonair areas contained 430 000 banana trees, covering approximately 358 acres (at 1 200 trees per acre).<sup>4</sup>

<sup>4</sup> This density, rather than the recommended density of 800 trees per acre, is used here for conversion to area because of the observed lack of pruning and resultant thicker tree stands.

Field observation reveals that coconuts and food crops are widely grown, but bananas are clearly the dominant income source. A systematic point sample of land use in the central portion of the Project area (excluding part of the Morne Panache and the Landco Limited lands), based on 1981 air photos, reveals the land use structure highly dominated by bananas and tree crops and other trees (see Table 8-3). Land tenure situations likely to be encountered in the project area include:

- a) Individual owner-operator, with or without deed and survey of the land.
- b) Co-owner of family land, with or without documentation.
- c) Occupant with consent of owner but without rent payment.
- d) Tenant (renter, sharecropper, lessee) with payment in cash or kind, with or without a fixed lease period.
- e) Squatter with prescription rights (30 years' permanence on land).
- f) Squatter with no legal right to the land he works.

**TABLE 8-2. RECORDED HOLDINGS IN PROJECT AREA BY SIZE CLASS; DISTRIBUTION IN TWO FARMING COMMUNITIES, 1980**

Holding size	Morne Panache		Dubonair		Total			
	No. of holdings	Area (acres)	No. of holdings	Area (acres)	No. of holdings	%	Area (acres)	%
0.0 - 0.9	8	3.45	4	2.25	12	7.9	5.70	0.8
1.0 - 4.9	71	165.50	16	39.50	87	57.2	205.00	29.3
5.0 - 9.9	30	186.75	4	20.50	34	22.4	207.25	29.7
10.0 - 24.9	7	73.75	9	119.00	16	10.5	192.75	27.6
25.0	2	62.25	1	26.00	3	2.0	88.25	12.6
	118	491.70	34	207.25	152	100.0	698.95	100.0

Source: 1980 Farmer Survey.

An individual may have access to land through a combination of two or more of the above situations. Individual or multiple plots of land may be involved. When the land is not owner-operated, the owner may reside in the neighbourhood, elsewhere in Saint Lucia, or overseas. Such land may even be Crown

Lands, with or without the Government's knowledge.

Disputes will typically arise over property boundaries or ownership of land. The latter will involve claims of individual ownership, claims to a share of family land, or prescription rights through squatting. The data underestimate the number of extremely small (0.0-0.9 acre) holdings and those with 25 acres or more. To the extent that this is true in the Project area, the proportion of small (1.0-9.9 acre) holdings and the area they control will be relatively smaller.

### 8.2.3. Potential land use

An analysis of land capability classes shows that nearly all the land in the project area is marginal, particularly that in large estates (Class IV or poorer). Yet much of it is intensely cultivated by small holders.<sup>5</sup>

<sup>5</sup> See Annex A, sections A.3 and A.5 for description of and data on land capability in the country.

**TABLE 8-3. LAND USE STRUCTURE, PILOT PROJECT AREA**

Land use	%
Roads and urban areas	2
Annual crops	4
Coconuts	15
Bananas	28
Tree crops and other trees	23
Secondary scrub growth	24
Grass and pasture	3
Total	99

The distribution of private and state land by capability class is shown in Table 8-4. The location of the land capability classes is shown on Map 8-1. Highly productive land (classes I, II and III) constitutes only 10.9 percent of the Project area. These are valley lands located immediately south of the Mabouya River. Hillside land is divided between Class VI, where continuous farming is possible as long as the necessary conservation measures are taken, and Class VII, where permanent cover (for example, tree crops) is recommended. Part of the Class VII land is unsuitable for small farm agriculture.

The land available from Landco Limited is predominantly Class VII, which means that only part will be suitable for redistribution purposes. The remainder will be set aside for permanent forest cover or special large scale agricultural projects.

**TABLE 8-4. LAND CAPABILITY CLASSES IN THE PILOT PROJECT AREA (acres)**

Capability class	Private	Landco	Total	%
I	60.2	26.2	86.4	6.7
II	23.2	12.3	35.5	2.8

III		18.5	18.5	1.4
VI	616.1	49.2	665.3	52.0
VII	200.8	273.6	474.4	37.1
Total	900.3	379.8	1 280.1	100.0

Source: Pretell, O., "Land Resources in Saint Lucia," OAS Technical Report, Washington, 1982 (unpublished).

## 8.3. Cadastral survey and land adjudication

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### [8.3.1. Title registration](#)

### [8.3.2. Essential procedures](#)

### [8.3.3. Cadastral survey](#)

### [8.3.4. Cadastral survey methodology](#)

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### 8.3.1. Title registration

Of the three systems currently used to record the rights to and over land, that of registration of title is considered the most advantageous one.<sup>6</sup> Its benefits are recognized by many countries but establishment has been delayed in many because of its technical requirements. One important requirement is the provision of plans (maps) of sufficient accuracy, in which every parcel can be clearly identified.

<sup>6</sup> Mae, Leslie B., *op. cit.*

The other two systems are private conveyance and registration of deeds. The latter is currently in use in Saint Lucia. The shortcomings of private conveyance and of registration of deeds have been the subject of many discussions and reports. A comparative analysis of the various systems of land record and a review of the previous reports on this subject have been very effectively carried out by the Land Reform Commission, as is shown in the Interim Report of June 1980.

The system of registration of title, when competently established and efficiently operated, confers the following benefits:

- a) An inspection of the register shows, at any time, the legal status of the land. Consequently, any person dealing on the evidence of the register need have no fear of eviction. Only the registered owner can dispose of his rights.
- b) All dealings in land can be carried out with security, expeditiously and at reasonable cost.
- c) A registered land owner can borrow money quickly and easily on the security of his land.
- d) Litigation over land is greatly reduced.
- e) Absentee landlords and reversionary beneficiaries need have no fear that they will lose their rights.

- f) The acquisition and holding of land by small proprietors is greatly facilitated.
- g) Complete protection is given to persons who have restrictive rights over land, e.g., a right of way or water.
- h) Absolute security is given to creditors who lend money on the security of land.
- i) The administration of every public service and every branch of national activity connected with land is greatly assisted by the existence of an up-to-date and accurate map and record of land property throughout the country.

### **8.3.2. Essential procedures**

There are four main procedures for efficient registration of land titling, which will be followed in the Project area:

- a) Definition of the parcels of land, the nature of the rights and interest affecting each parcel and the persons affected. Each parcel must be indexed by a unique number because confusion can result if the titles are indexed by using the owner's name. It is not unusual to find more than one person with the same or similar name.
- b) Title depends on the act of registration, not on the documentary instruments, but the creation, annulment and transfer of rights to land are affected by these instruments. Land transfer or interest in land by a certain party is not affected by the presentation of documentation until registration has occurred.
- c) The working records must be kept accurate, safe and continuously cleared of out-of-date material. Protective duplication of the primary documents is the basic precaution ensuring the safety of the records. Duplication by photocopy or microfilm and safe storage is a relatively inexpensive insurance against the cost and confusion resulting from the destruction of a registry.

### **8.3.3. Cadastral survey**

The primary function of the cadastral survey is to lay the foundation and satisfy the initial requirements of title registration. This is normally accomplished by dividing the country into registration sections, which are further subdivided into registration blocks. In the case of the Pilot Project, its entire area can be considered a registration section subdivided into three registration blocks. The objectives of the cadastral survey are as follows:

- a) Definition of the procedures for assigning boundaries to parcels of land within the Pilot Project.
- b) Unambiguous location of parcels on the ground in a manner that permits easy relocation when necessary to the satisfaction of the courts.
- c) Assurance that there are no gaps between, or overlaps of, the parcels.
- d) Incorporation of all changes and consolidations as they occur.

By far the greatest source of litigation related to land tenure is the definition of boundaries. If boundary disputes are to be reduced to a minimum, the land to which entries relate must be clearly defined. A very convenient way to ensure such definition of units of land is to divide the region into blocks and to tie each block to the national grid.

#### i. Cadastral blocks

The use of cadastral blocks is an effective way of controlling both field and office compilation by dealing with small areas at a time. The most important working feature of such blocks is that they must be capable of being depicted in the plan as a whole on a single manageable sheet of paper. The maximum dimensions of the blocks on the ground are determined by the scale to be employed. There is some flexibility here, as both the sheet size and the scale can be varied to suit the local situation. Suggested scales for the Pilot Project area are 1:1 250 and 1:2 500. The use of cadastral blocks provides the following advantages:

- a) It avoids the partial depiction of single parcels on two or more map sheets.
- b) It permits an orderly and permanent reference numbering of registered parcels to occur. This is especially important in the case of mutations.
- c) It makes for the economical demarcation and location of the land parcels by the systematic subdivision of the registration section.

#### ii. Grid ties

In the last decade some of the English-speaking Caribbean islands recognised the importance of tying all surveys to the national grid. To emphasize this importance a number of them have actually written this requirement into their legislation; such is the case of the British Virgin Islands, the Cayman Islands, Antigua, and the Turks and Caicos Islands. The vast majority, however, continue to carry out surveys in a haphazard manner. In some instances even when the survey is done in relation to important topographical detail such as rivers and roadways, these are not properly indicated; such problems have been frequent in Saint Lucia.

The importance of making grid ties cannot be overemphasized. A cadastral plan, apart from unambiguously defining the parcellation of land, should also provide the necessary information for the relocation of lost boundaries. Such relocation can best be accomplished if the surveyed lands are tied to the grid. Fortunately, in Saint Lucia the density of major and minor control grid points is such that ties can be made with little extra effort on the part of the surveyor. Another advantage of tying the cadastral plan to the national grid is that it can then be easily related to the existing topographic maps, making planning of land use and land development easier and less costly.<sup>7</sup>

<sup>7</sup> The Directorate of Overseas Surveys has produced topographic maps sheets of Saint Lucia at 1:50 000 and 1:25 000 scales. Work is being carried out at present on 1:2 500 scale maps.

Regulation Number 5 (subsections 1 and 2 under Section 28 of the Draft Land Surveyors Act) implies that all future surveys in Saint Lucia will be tied to the national grid. This is a welcome change in the legislation and will greatly facilitate compilation of the index map for registration of titles. The process of compilation under the current system is most difficult and clearly identifies the shortcomings of an unstructured system of land titling and registration.<sup>8</sup>

<sup>8</sup> Serieux, J. E., "Report on the Progress of the Map Index of Land Parcels in Saint Lucia from Available Government Records," Ministry of Agriculture, Castries, November, 1981 (mimeo).

### iii. Control network

It is essential to have an adequate and dense supply of control stations to effectively execute the necessary grid ties. There are approximately 162 control stations uniformly distributed over Saint Lucia. Therefore, a reasonable assumption may be made that the existing control is sufficiently dense to allow ties to be made without great effort on the part of surveyors. However, there may be a need for further breakdown of the control in some instances. Within the Pilot Project area itself there is a need for such further control. This can easily be done by traversing along the existing roadways and tying the traverse to existing control. There are two control stations (92 and 127) within close proximity of the Project area.

It is the responsibility of the Lands and Surveys Department to maintain and extend the control, as necessary. The control stations might be adequate in terms of their numbers and density but they are not always adequately targeted. Stations must be beacons and kept in place, and properly maintained to be fully utilized.

### iv. Manpower resources

A review of the manpower available reveals that the implementation of a general cadastral survey of Saint Lucia will depend on the use of survey technicians operating under the general supervision of licensed land surveyors. Regulation 13 of the proposed legislation (Subsection 3 under Section 28 of the Draft Land Surveyors Act) allows for such a procedure. This new provision greatly facilitates the implementation of the cadastral survey in the Morne Panache Pilot Project area and also reduces the cost of surveying smaller landholdings.

## 8.3.4. Cadastral survey methodology

The basic goal of the survey is to provide control of sufficient density to form a framework on which to base the compilation of boundaries. The actual location of the individual parcels will be done by use of conventional ground survey methods. The standard of accuracy obtainable will be determined by such factors as available personnel, methodological approach and the limitations imposed by terrain.

The cadastral operations will be carried out in the following stages:

- i) preparation of an index map at an appropriate scale,
- ii) field compilation,
- iii) adjudication, and
- iv) completion.

### i. Index map

The Directorate of Overseas Surveys is preparing maps at a scale of 1:2 500 to cover all developed areas of Saint Lucia. The areas excluded from this mapping exercise are the rain forests of the South Central Section and the areas of Millet, Mount Gimie and Saltibus. If necessary, these areas could be included in the mapping without further photography. The 1:2 500 mapping will provide a natural base map for development of the index map.

At present all survey plans relating to definition of parcels and boundaries are kept at the Department of Lands and Surveys, where they are checked and approved by the Superintendent of Lands and Surveys and Commissioner of Crown Lands. A detailed search will be made at the Lands and Surveys Office to determine the existence of recorded surveys within the project area. These plans will be reduced or enlarged to a scale of 1:2 500 and compiled into an index map showing all registered and certified plans.<sup>9</sup>

<sup>9</sup> Land Reform Management Unit staff have already commenced such work on a country-wide basis on the 1:25 000 scale maps that allows for a minimum mapping unit of 10 acres. See Serieux, J. E., op. cit.

## ii. Field compilation

The next stage of the Land Titling and Registration activity is to publicise the programme in the Pilot Project area and proceed with the pre-cadastral dialogue with the community. This can be done by radio broadcasts and in publication newspapers. The latter method, of course, will be very limited in its effect, not only because of the problem of illiteracy but because quite a substantial proportion of the farming community speak only Patois, a French Creole dialect (53 percent of the banana farms' inhabitants are illiterate and 30 percent speak Patois alone).<sup>10</sup> The Agricultural Extension Officer could disseminate information about the project through collaboration with farmers in the extension service programmes and through general dialogues with community leaders.

<sup>10</sup> WINBAN Survey.

## iii. Adjudication

The Land Adjudication Act 1981 (Draft Legislation) clearly establishes the process to be followed in defining the boundaries of, rights to, and interest in the various parcels of land. This legislation follows recommendations of the Land Reform Commission in order to provide a complete cadastral survey and the basis for the systematic introduction of title registration to land.

### a. Adjudication order

In accordance with Section 3 of the Land Adjudication Act, the Minister may by order declare that he intends to adjudicate and register rights and interest in land within a specific area. The Minister has the right to amend or revoke the order. Once it is carried it is then published in the Gazette for public notification.

### b. Appointment and powers of officers

Under Section 4 of the Land Adjudication Act, on or after the publication of an order the minister appoints an adjudication officer for the area. This officer may appoint demarcation, recording, and survey officers necessary for performing the duties and exercising the power imposed and conferred upon them by the Act. The officers involved in the adjudication listed below have the power to act on the behalf of minors and absentee parties.

**Demarcation Officer:** outlines the boundaries of each and every parcel of land whether it is the subject of a claim or not. All parcels must be accounted for including public roads, rights of way and other Crown Lands. The powers of the demarcation officer are:

He may divide the adjudication section into blocks which shall be given distinctive numbers or letters.

With consent of the interested parties, adjust the boundaries of any land in the adjudication section, reallocate the same to ensure more beneficial occupation thereof or to effect a more suitable subdivision thereof.

Make any reservation he considers necessary for the purposes of defining existing roads, pathways and drains.

The Survey Officer: has the overall responsibility to execute survey work as required by the adjudication process and the specific responsibility of completing the demarcation index map ensuring that all parcels have an identifying number.

The Recording Officer: will consider all claims to any interest in land and prepare a register of the rights and interests arising from these claims.

The Demarcation Officer or Survey Officer may, at any reasonable time, enter any land within the adjudication area for the purpose of demarcation or survey of any parcel and may summon any person who can provide information regarding the boundaries.

### c. Claims and demarcation

Sections 5 through 15 of the Land Adjudication Act allows for the following procedures:

The adjudication area can be divided into sections, in keeping with the Registration Blocks previously mentioned, and each area may be given a distinctive name. The names of settlements in the Pilot Project area can be applied to these adjudication sections, e.g., Morne Panache, Dubonair.

The Adjudication Officer prepares a separate notice for each section with the following elements for claims and demarcation.

- a) Specification as early as possible of the situation and limits of the adjudication section.
- b) Requirement of any person who claims any interest in land within the adjudication section to make a claim either in writing or in person or by his authorised agent according to law within the period, place, and manner specified in the notice.
- c) Requirement of all claimants to land within the adjudication section to mark or indicate the boundaries of the land claimed, in such manner and before the date specified by the Demarcation Officer.

The Adjudication Officer must give the adjudication exercise full publicity in the most effective manner in order to bring it to the attention of all interested parties. At least seven days' notice of demarcation must be given before the demarcation exercise begins. Notice of the time and place at which the demarcation will begin is given and require that every claimant to indicate the boundaries of the land affected by his claim. It is the responsibility of each claimant to have his boundaries cleared.

### iv. Completion of an adjudication record

The adjudication record, as specified in sections 18 to 24 of the Land Adjudication Act, consists of a form on each parcel of land showing:

- a) The number and the approximate area of the parcel as shown on the demarcation map.

- b) Either 1) the name and description of the person entitled to be the registered owner of the parcel, with particulars of the manner of acquisition and any restriction on his power of dealing with it, or 2) the fact that the parcel is Crown Land. It is not unusual to find two people with the same name. Therefore, any information that will positively identify the person entitled, such as a National Insurance number, should be noted.
- c) Particulars of any registrable right under the Registered Land Act, such as a lease, mortgage, charge, easement, profit or restrictive agreement affecting the parcel, together with the name and description of the person entitled to the benefit and particulars of any restriction on his power of dealing with it.
- d) The name of the guardian of minors, people suffering from unsoundness of mind, or disabled persons for the purpose of adjudication.
- e) A list of the documents, if any, produced to the Recording Officer and retained by him for the purpose of adjudication.
- f) The date on which the form is completed.

When completed, the form will be signed by the Recording Officer and if possible, in the case of privately owned land, will include an acknowledgement signed by the owner of the parcel and by any person recorded as having an interest in the parcel. In this fashion the owner and every other claimant accept the record.

When the Adjudication Record of an adjudication section has been completed, the Adjudication Officer signs and dates a certificate to that effect. Notice is immediately given of the completion and of the place at which the adjudication record can be inspected along with the corresponding demarcation map.

Provisions allow for objection by any aggrieved person affected by the adjudication and demarcation exercise, provided that this objection is made within ninety days of the publication of completion of the adjudication record. After the expiration of ninety days, or the determination of all petitions, the adjudication records will become final.

The procedure for hearing disputes will normally be the same as those of a civil suit. The only exception is that the Adjudication Officer may admit evidence which would not be normally admissible in a court of law, use evidence from other claims contained in any official record, and call evidence of his own.

The Registered Land Act 1981 (Draft), following recommendations of the Land Reform Commission, provides for the systematic registration of title to land in Saint Lucia. Through systematic compilation, the following will be accomplished: definition of parcels, determination of rights and interested parties, and registration in a methodical manner and orderly sequence by sections, blocks and parcels throughout the island.

For the purpose of registering the title to land, a Registrar will be appointed. His responsibility will be to administer the Registry which will be established in Castries. For the purposes of the Morne Panache Pilot Project, however, the present Registry of Deeds will undertake the functions of the new Registry. The Registry as established by the Registered Land Act 1981 will contain the following components: a) 1) Land Register; 2) a registry map; 3) parcel files containing the instruments supporting existing entries in the Land Register and any plans and documents filed; 4) an application book in which applications are

recorded and numbered consecutively as they are made at the Registry; 5) an index showing the names of proprietors of land, together with all leases and charges showing the number of the parcels in which they are interested, and 6) a register and file of powers of attorney.

The Land Register will consist of three sections in respect to each parcel:

- a) Property section, containing a brief description of land or lease with reference to the registry map or filed plan, the number of the registration block, the reference number of the parcel, and other information relating to the parcel, such as its area.
- b) Proprietorship section, containing a full description of the proprietor and a note of any caution or restriction affecting right of disposition.
- c) Incumbrances section, containing a statement of mortgages, charges, leases and other incumbrances.

## 8.4. Research on land redistribution needs

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[8.4.1. Evaluation of the land registration experience](#)

[8.4.2. Analysis of land distribution problems](#)

[8.4.3. Institutional framework for project implementation](#)

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### 8.4.1. Evaluation of the land registration experience

An evaluation of the multiple aspects of the land registration experience of the Pilot Project is required to design the National Land Registration Programme. While the full impact of the programme cannot be anticipated, several areas for research and evaluation can be identified:

- a) The process of land ownership clarification will sharpen existing disputes and bring latent ones into the open. The ability of the adjudication system to deal fairly and efficiently with such disputes is essential.
- b) Producers in the Project area who have no claim to land or who are unable to produce satisfactory claims may find their position threatened by survey and registration. Alternative forms of access to land (lease agreements, etc.) may be required to avoid expulsion of these families.
- c) Family lands are likely to present special problems for survey and registration. This institution serves an important social function in Saint Lucia, e.g., it discourages excessive fragmentation of land (implicit in the present inheritance laws) and provides access to land for many who could not otherwise afford it. Any change introduced by the Pilot Project should therefore be carefully evaluated.
- d) Community involvement procedures and public information methods used in the Pilot Project need to be evaluated for their further utilization at the national level.
- e) Land surveying methods, surveying team composition and procedures, map scales,

indexing systems, and recording and duplicating methods tested in the Pilot Project area need to be appraised for their applicability and relevance to the National Land Registration Programme.

The experience gained in the Pilot Project will allow the Government to calculate the resources (human, institutional and financial) required to introduce the system of registration of title at the national level and to negotiate resources from lending or donor agencies to complement those that can be devoted to this programme from the Government's regular budget. In addition, by linking the knowledge gained concerning the land distribution problems existing in small farming communities with that concerning national agricultural development policies it will be possible to identify the basic land adjudication blocks and to set priorities for the execution of the land adjudication and cadastral survey activities. In this way, the long-term programme of land registration can be linked with short- and medium-term agricultural development goals.

## **8.4.2. Analysis of land distribution problems**

Land survey and adjudication activities will provide a precise picture of the ownership and land distribution pattern in the Project area and permit the identification of small full-time farmers with too little land. This knowledge will allow for the design of specific projects aimed at amelioration of this situation including both reconsolidation of holdings within existing communities and redistribution of estate lands in the surrounding area. While closely related, the two activities need to be analyzed separately. Reconsolidation requires an initial analytical stage followed by a guided programme of exchange and land purchase.

### **i. Land shortage**

The following variables must be taken into consideration in determining land shortage:

- a) Predominant income source. Families who depend primarily on farming will be given priority in the programme.
- b) Productive capability of the land. This must be translated into classes of average income potential to allow determination of the amount of land needed to provide a target income for an average farm family.
- c) Total area of land owned or controlled by each full-time farm family. The ownership of multiple holdings, whether in the project area or not, must be taken into consideration.

A comparison of minimum holding size (item b) and the area of land already owned (item c) will provide a first approximation of land shortage. Determination of the amount of family labour available and the intention to continue full-time farming will clarify the need for additional land and the ability to effectively work it. Investigation of the economic structure of small farms will allow a more precise definition of minimum holding sizes. Existing knowledge on the operations of small farmers does not allow a precise definition of this central decision making criterion.

### **ii. Reconsolidation by exchange and purchase**

Several types of opportunities for reconsolidating holdings within the small-farm community will emerge once the survey and adjudication process has been completed:

- a) Farmers with scattered plots may exchange land so as to reduce travel time and rationalize farming operations. Total holding size may remain unchanged.
- b) New land titles will activate the local land market, e.g., various properties owned by non-residents or farmers about to retire may become available. A special line of credit could be used to direct these sales, assuring that they serve to create as many new viable small units as possible.
- c) Additional plots may become available as families who chose to buy larger areas of former estate land surrender holdings in the small farm community.

The precise conditions on which such a reconsolidation process can succeed are not known. Research is required to assess the amount of land involved, loan requirements for land purchases or compensation in exchange, the loan repayment capacity of farmers willing to undertake the reconsolidation, the extent to which reconsolidation may occur spontaneously if financing for land purchases is available, etc.

The success of this reconsolidation activity will depend, in large part, on a line of preferential credit at the disposition of Project management. In its absence, changes will probably take place to worsen the pattern of land distribution in the Pilot Project area. The security of carefully titled land may attract new buyers to the area, forcing land prices beyond affordability for the smallest farmers. Apart from this possibility, market forces will tend to favour larger local purchasers regarding competition to buy land, leaving behind the farmers who most need additional land. At best, reconsolidation will only solve part of the land shortage problem in the Project area. Redistribution of estate land may be required to further reduce this constraint.

### iii. Land redistribution

An initial evaluation of land needs among Morne Panache and Dubonair farmers, based on the 1980 Farmer Survey, suggests that up to 300 acres may be needed in addition to land gained from the reconsolidation process. The objective of land redistribution in this case will be to make unused or underutilized land available to full-time small-farm families who are willing and able to work it.

Research should concentrate on an evaluation of the economics of land redistribution under conditions of extreme scarcity of good agricultural lands in the Project area and in most of the small farming settlements in Saint Lucia. The size of viable holdings, requirements of infrastructure, investment in soil conservation and field development, etc., need to be carefully explored to assess the feasibility and desirability of the whole undertaking.

The size of holdings should be determined in large part by the desired income level. To determine the size, the objective of full use of family labour is important, with recognition that some underemployment in settlements may be inevitable. The Project will attempt to define suitable farm enterprise combinations with regard to land resources and income potential classes.

Research activities will be initiated with the preparation of a land use zoning and subdivision plan for the area. Lands to be subdivided must be first classified into three general use zones: 1) suitable for small scale agriculture; 2) suitable for large scale special projects, and 3) compulsory permanent forest cover. Only lands in the 1) category will be subdivided for redistribution. Farm size will vary according to the quality of the resource base. Access to each holding from the place of residence of the prospective purchasers must be taken into account in the subdivision design. Access to new holdings is an essential

condition for success. Analysis of project viability should consider that purchasers will probably not live on the farm but commute daily from a neighbouring village and that the commercial orientation of even the smallest farmers in the area requires access to markets.

Land purchase will not eliminate all the constraints facing the small farmer. The need for technical assistance, secure markets and production credit will assume greater importance once land constraints are removed. The project will identify minimum service support levels and special assistance requirements of farmers in the Project area.

#### iv. Expansion of the agricultural frontier

Land capability analysis within the Project area reveals the existence of lands which are unsuitable for small agriculture but have potential for certain unconventional production alternatives. Climate and/or soils seriously limit the growth of bananas and food plants but certain tree crops may produce satisfactorily. The long gestation period to bring these crops to maturity, the need to introduce new production technology, and the relatively low value/acre/year (implying the need for large acreages) discourages many potential investors.

To encourage the Government and private entrepreneurs to initiate experimentation and productive investments on these lands, the Pilot Project proposes to: 1) conduct a natural resources inventory of the area, 2) identify commercial crops appropriate for its natural environment and an existing market, and 3) undertake an initial evaluation of their feasibility.

The information gathered will assist in the design of experimental farming of alternative crops for these lands. As estimated, 23 000 acres of such lands exists in Saint Lucia and a major part of it could be brought under extensive production.

### **8.4.3. Institutional framework for project implementation**

It is estimated that the cadastral survey and land adjudication in the Pilot Project area can be implemented within a period of four months from the moment the survey and adjudication teams begin field activities. Preparatory work with the community and compilation of registered surveys that must be undertaken prior to the field work are not included in this time frame.

The executing agency of the Pilot Project will be the Ministry of Agriculture through the Land Reform Management Unit, established with the purpose of implementing the Land Registration Programme and the land redistribution policies of the Government. Full involvement of the Department of Lands and Surveys, also of the Ministry of Agriculture, is contemplated in the preparation of the cadastral survey and maps. The Registrar of Lands will perform the registration activities in the Pilot Project and serve as the institutional core for the new Registry.

As a result of the work undertaken by the Government through the Land Reform Commission, four interrelated legislative acts have been drafted and are currently being considered for approval. These are: 1) Registered Land Act, 2) Land Surveyors Act and Survey Regulations, 3) Land Adjudication Act, and 4) Agricultural Small Tenancies Act. This legislation needs to be approved by the House of Assembly before the Project teams initiate field work.

## 8.5. Financial analysis and assessment of farming systems

### [8.5.1. Project costs](#)

### [8.5.2. Assessment of farming systems](#)

### 8.5.1. Project costs

Pilot Project costs are estimated on the order of EC\$365 781 (US\$136 485).<sup>11</sup> Estimates of personnel requirements and expenditures for field operation are presented in Table 8-5 for a four month period for the land titling and registration activity. The Pilot Project is now under way and consequently actual staff and costs may vary from the estimates shown.

<sup>11</sup> 1 US\$ = EC\$2.68 at December 1981 prices (when project was designed.)

Of the aforementioned EC\$254 981, a total of EC\$60 000 is already in the 1981 Government Budget and will be devoted to the purchase of land surveying equipment for the Project. The balance of EC\$194 981 remains to be grant funded.

In addition to the EC\$194 981, an amount of EC\$171 600 should be funded in order to implement the research activity. Thus, the total unfinanced Project costs are EC\$366 581, or US\$136 783.

Of the of EC\$171 600, EC\$118 800 (US\$44 328) would be devoted to defraying the expenses of senior research staff and the remaining EC\$52 800 (US\$19 701) to covering auxiliary staff, transport, office space and supplies.

The research effort requires four senior specialist months in each of the following fields:

- a) Agricultural economist with farm management and/or land economics orientation;
- b) Rural sociologist or cultural anthropologist with field experience; and
- c) Field agronomist with farm systems and crop diversification experience.

**TABLE 8-5. PILOT TITLING AND REGISTRATION PROJECT PERSONNEL REQUIREMENTS AND EXPENDITURES FOR FIELD OPERATION (FOUR MONTHS)**

Personnel or project component	EC\$	EC\$/month
Managerial staff	26 000	6 500
A. Field staff		
2 Surveyors	10 400	1 300
2 Survey technicians	6 000	750
4 Chainmen	6 400	400
12 Labourers	16 800	350
1 Driver	2 080	520

Labour overhead costs	14 690	-
Subtotal A	56 370	
B. Office staff		
3 Draughtsmen	8 700	725
1 Secretary/typist	2 900	725
Labour overhead costs	3 240	-
Subtotal B	14 840	
C. Equipment		
2 Theodolites	25 000	-
1 Electromagnetic Distone		
Measuring equipment, e.g.,		
Guppy with set of triple reflectors	25 000	-
2 Compass theodolites (Wild T 0)	12 000	-
2 Steel tapes (80 meters)	1 100	-
2 Electronic calculators	1 056	-
- Boundary marks	5 000	-
- Drawing tables and stools	2 000	-
- Miscellaneous (ranging rods, etc.)	2 000	-
Subtotal C	73 156	-
D. Transportation		
1 Land Rover 4 WD	45 000	-
E. Adjudication and registration		
- Adjudication magistrate, 4 months fee	7 000	1 750
- Registrar	7 000	1 750
Subtotal E	14 000	
F. Office rental (6 months)	4 800	1 200
<u>Summary</u>		
Chief surveyor	26 000	
Field staff	56 370	
Office staff	14 080	
Equipment	73 156	
Transportation	45 000	
Adjudication and registration	14 000	
Office rental	4 800	
10% unforeseen expenses	20 815	

Total	254 981
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On strictly financial considerations it appears that the estimated surveying, titling and registration cost of approximately EC\$85 per acre is within a reasonable range and affordable by the farmers themselves. It can be anticipated that land with clear title would bring a premium price, higher than current market prices by at least this amount. The productivity gain, 15 percent of net returns of banana production, would cover this expenditure in one year.

No holdings of less than one acre are registered at present time while the 1980 Farm Survey indicates that a full 8 percent of farmers in the area (Morne Panache, Dubonair) fall in that category. It is likely that the expense of deed registration under current legislation is far too high in proportion to land value. Assuming net return of EC\$500/acre of bananas, the expense of the Pilot Project seems well within reasonable boundaries.

### 8.5.2. Assessment of farming systems

Current land use intensity has created concern over steep hillside farming in Saint Lucia. However, the multi-canopied production system present in the Pilot Project area (e.g., bananas, coconuts, dasheen) seems sufficiently protective of topsoil. This cropping pattern is standard throughout the country, although it may be more effective in the northern part of the island, which has older soils and a more well-developed soil profile, than in the south, where skeletal soils and igneous aggregates are more common.

The many unanswered questions regarding appropriate and sustained land use will be best answered by an analysis of farming systems and their relationship to farm size and land tenure patterns. The existence of a titling programme and a cadastral survey should provide a unique opportunity for investigating the technology of hillside farming systems and making a contribution to sound environmental management and utilization.

In accordance with the typology of human settlements prepared by the Project the Morne Panache area corresponds to settlements where there is a concentration of small farmers producing crops that enjoy the most reliable market system (bananas, coconuts, fresh vegetables).<sup>12</sup> The area receives good rainfall and contains soils not easily eroded and a higher percentage of holdings in the 1-5 acre and 5-10 acre categories.

<sup>12</sup> See Carnegie, C., *op. cit.*

The following rural settlements are considered similar to the Pilot Project area in accordance with the criteria outlined above:

1. Babonneau
2. Balata
3. Paix Bouche
4. Chassin
5. Forestierre
6. Ti Rocher (Castries)
7. Guesneau
8. Bogious

9. La Gare
10. Cocoa
11. Marquis
12. Fond Cannie
13. Bocage
14. Trois Piton
15. Marc
16. Ravine Poisson
17. Odsan
18. Deglos
19. Barre de L'Isle
20. Fond Petit
21. Derniere Riviere
22. Au Leon
23. La Ressource
24. Morne Panache
25. Grande Ravine
26. La Caye
27. Saint Joseph
28. Micoud
29. Ti Rocher
30. Blanchard
31. Desruisseau
32. Degard
33. De Mailly
34. Ti Riviere
35. Mahaut
36. Morieux
37. La Cour Ville
38. Seleau
39. Choco Mel
40. Praslin
41. Patience
42. Mon Repos
43. Mamiku
44. Raillon
45. Lombard
46. Durocher
47. L'Eau Mineur
48. Galba
49. Latille
50. Grace
51. Woodlands
52. Belle Vue
53. Banse
54. Canelles

55. Vige
56. La Rue
57. Annus
58. Giraud
59. Londonderry
60. Saltibus
61. Millet
62. La Croix Maingot

Of the 131 settlements identified (see Chapter 1), 47 percent, comprising 30.5 percent of rural households, have characteristics similar to those of Morne Panache. Consequently, the experience to be derived from the Pilot Project area should be an applicable and operational procedure replicable in close to half of the island's communities.

A substantial number of the benefits from the two Pilot Project activities of land title registration and research for land redistribution are indirect and external to the Pilot Project itself. The major indirect benefits that can be singled out at this time include the following:

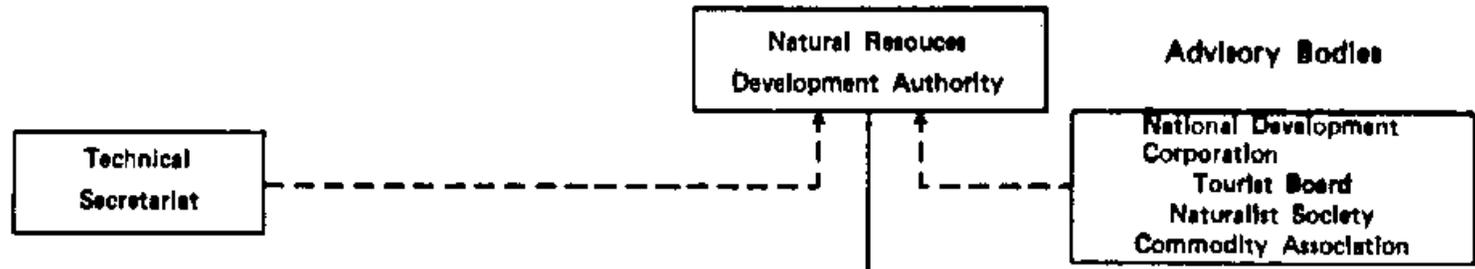
- a) Field operation experience with land titling and registration procedures.
- b) Understanding of the internal farm organisation of hillside farming on a variety of soil types.
- c) Development of farm economics models and management recommendations compatible with sound conservation.
- d) Better knowledge of the land redistribution needs of small farming communities and the best ways of implementing specific projects.

The Pilot Project area covers 1 300 acres (500 hectares). Land cadastre and registration activities cost EC\$85 per acre, excluding management costs and vehicle and equipment investment that can be used in the national cadastre survey. The land redistribution research activity will cover an estimate 200 farm-operator households with a total population of 1 100 inhabitants. Farm systems and household survey costs are estimated to be EC\$43 per person exclusive of ordinary services paid by Project funds.



**Policy Decision Making**

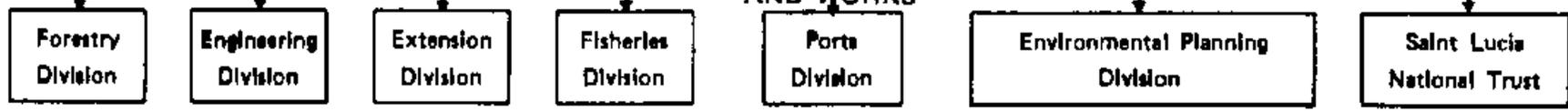
Long-term Planning  
Policy Recommendations  
Impact Assessment



**MINISTRY OF AGRICULTURE**

**MINISTRY OF COMMUNICATIONS AND WORKS**

**MINISTRY OF FINANCE AND PLANNING**



**Protection**

Forests  
Watersheds  
Wildlife

Marine ecosystems

Areas of natural or historic interest

**Regulation**

Forest exploitation

Soil Management  
Water Resources

Agricultural Land use

Fisheries

Use of harbours

Urban land use

**Implementation**

Soil Conservation

Agricultural Development Projects

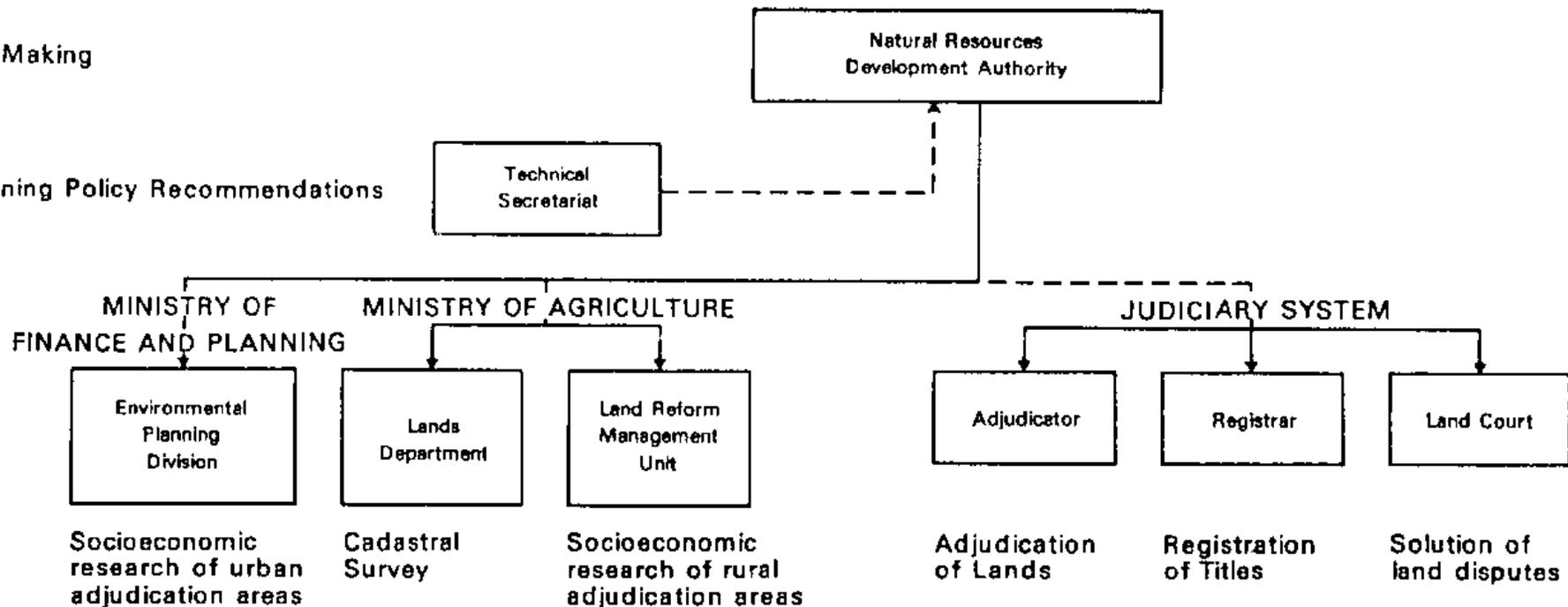
Pollution Control

Beaches and areas of natural beauty

Irrigation

Policy Decision Making

Long-term Planning Policy Recommendations





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# Annex A. Land resources

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## [Summary](#)

### [A.1. Factors affecting soil formation](#)

### [A.2. Characteristics of the vegetation](#)

### [A.3. Land capability classes](#)

### [A.4. Environmental management of land resources](#)

### [A.5. Land capability in selected watersheds](#)

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## Summary

Leslie R. Holdridge's analytic method of establishing life zones was used to define five complete and two transition life zones. The criteria are location, climatic conditions, topography and natural vegetation. The life zones defined are tropical dry forest, tropical dry forest transition to tropical very dry forest, tropical moist forest, subtropical moist forest, subtropical wet forest, subtropical wet forest, transition to subtropical rain forest and subtropical rain forest. In Saint Lucia, the zones are located in nearly concentric rings as a consequence of the topography and the rainfall pattern.

Eight land capability classes were defined based on soil fertility, stoniness, soil drainage, depth, slope, erosion hazard and rainfall. The land capability classes in 31 watersheds are summarized in Tables A-7 and A-8. Class I soils comprise 2.65 percent of the total land area; they are suitable for cultivation and irrigation, and have flat topography and no limiting factors. Class II soils comprise 0.94 percent of the total land area; they are also suitable for cultivation and irrigation, having flat to rolling topography; limiting factors can be compensated by good management. Class III soils, 1.20 percent of the total area, are suitable for cultivation or irrigation; they have flat to rolling topography and limiting factors such as medium-fertility soil due to stoniness or shallowness. They require intensive management. Class IV soils, 0.78 percent of the total area, have limited cultivation or irrigation possibilities and may be prone to erosion due to hilly topography. They require limited management when used for permanent tree crops; if clean cultivation is attempted, the danger of erosion increases, requiring soil conservation measures. Class V soils, 3.82 of the total area, are unsuitable for cultivation but are suitable for intensive pasture. There are severe limitations, especially drainage considerations, and intensive management is required. Class VI soils, 16.90 percent of the total area, are unsuitable for cultivation but appropriate for permanent crops; soil cover is shallow and stony soils impose severe limiting conditions, requiring strict conservation measures. Class VII soils, 67.01 percent of the total area, are usually natural forest and unsuitable for cultivation; in selected areas they can support timber production or permanent crops. There are extremely severe limitations associated with this class and requirements for strict conservation measures. Class VIII soils, 6.70 percent of the total area, are unsuitable for any cultivation and are appropriate only for national parks and wildlife zones; they should be left in their natural state and protected. The distribution of land

capability classes has been mapped and will appear in the Saint Lucia Development Atlas, a collection of maps of the country in preparation by the OAS.

Encroachment on natural forest and the clearing of land on the steep mountainous interior for the cultivation of bananas has caused serious erosion. This has reduced the infiltration capacity of critical watersheds, reducing water flow in rivers during dry seasons and causing excessive run-off during wet seasons. Erosion adversely affects coastal ecosystems through sedimentation, and damages irrigation systems by silting their channels, rendering valuable land unusable because of the high cost of clearing these channels. Slumping, sliding, gullying and sheet erosion are common on improperly cleared soils. Solutions to these problems require comprehensive changes in cultivation practices (such as diversification), investment in infrastructure, adoption of soil-conserving cultivation practices, mixed cropping and the protection of existing forests. Analyses of major river basins are presented summarizing soil, life zones, rainfall, land capability and management recommendations.

## A.1. Factors affecting soil formation

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### [A.1.1. Geology and lithology](#)

### [A.1.2. Climate](#)

### [A.1.3. Relief](#)

### [A.1.4. Soil characteristics](#)

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Of the five major factors influencing the formation of soils (parent material, climate, topography, vegetation and time) the narrow range of parent materials from which the soils have developed and the wide variation in rainfall patterns (see A.2.2) caused by the steep topography of the island are the ones that best explain the great variety of soils in Saint Lucia.<sup>1</sup> A brief review of these basic characteristics is of help in understanding the origin of the soils existing in the country.

<sup>1</sup> Stark, J., et al., Soil and Land-Use Surveys N°20, Saint Lucia, The Regional Research Centre, Imperial College of Tropical Agriculture, University of the West Indies, Trinidad and Tobago, October 1966.

### A.1.1. Geology and lithology

Saint Lucia is almost entirely of volcanic origin, presenting andesite, dacite and basalt rock formations probably of Tertiary or Quaternary age. Sedimentary beds occur but are of small extent. Beds of mixed sedimentary and volcanic origin are more common; they have good bedding and stratification such as tuffs, agglomerate tuffs and conglomerates.<sup>2</sup>

<sup>2</sup> Newman, W.R., A Report on General and Economic Geological Studies, St. Lucia, West Indies, United Nations, Programme of Technical Assistance, St. Lucia, November 1965 (mimeo).

The north, east and central sections of the island are geologically older than the midwestern section. The youngest areas of Saint Lucia are the fan-shaped glacial slopes in the south. Uplift has certainly affected the island, since coral limestone has been found in small quantities between 100 feet and 150 feet above

sea level. This coral limestone is believed to belong to the Pleistocene age.<sup>3</sup> "A shower or series of showers of dacitic-type ash, containing abundant bipyramidal quartz crystals, have fallen at a relatively recent date over most of Saint Lucia especially the south and central parts, probably at the time of the last eruption in the Soufriere area. Of varying depth when deposited and of even greater variation in depth after early movement and transport by rain and water, the effects of this layer of ash over different underlying materials can be seen in many soil profiles. A large number of Saint Lucia's soils are developed from a combination of different lithological parent materials."<sup>4</sup>

<sup>3</sup> Stark, J., et al., *op. cit.*

<sup>4</sup> *Ibid.*

## A.1.2. Climate

Saint Lucia's location (between 13° 43' 00" and 14° 07' 00" latitude north and 60° 53' 00" and 61° 05' 00" longitude west of Greenwich) defines its tropical climate tempered by the influence of the ocean and the northeasterly trade winds. Table A-1 shows the average monthly temperatures at three stations, all at less than 100 feet above sea level. The average temperature during winter (December-May) is approximately 2.5°C lower than in summer (June-November). Considering the topographic configuration and on-site temperature measurements, it is estimated that temperatures decrease by 1°C for each 100 meters of altitude change (3.5°F over 1 000 feet).

**TABLE A-1. SAINT LUCIA AVERAGE MONTHLY TEMPERATURES (°C)**

<u>Station</u>	<u>Period</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Average</u>
Hewanorra	73/80	25.6	25.8	25.8	26.5	27.6	27.7	27.8	27.7	27.7	27.4	26.9	26.0	26
Roseau	69/78	24.7	24.7	25.1	25.7	26.7	27.2	23.1	26.9	26.8	26.4	26.0	24.8	26
Union	75/80	25.7	26.2	26.2	26.0	26.8	27.6	27.7	27.6	27.5	27.7	27.4	26.8	27

Source: Ministry of Agriculture, Land and Water Use Unit.

In Saint Lucia, 50 percent of the yearly evaporation occurs during the dry season from December to May (see Table A-2). However, the relative humidity shows little variation, on average, as indicated by Table A-3 (Roseau Station). Rainfall patterns in Saint Lucia are highly dependent on elevation. High levels of rainfall (over 150 inches) occur in the mountainous interior, whereas the lowlands in the south and north receive less than 60 inches per year (see Annex B, section B.2).

**TABLE A-2. AVERAGE MONTHLY EVAPORATION (Pan A)**

<b>Roseau Station 78/80</b>													
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>TOTAL</u>
(mm)	112	118	146	180	153	146	143	138	130	105	105	105	1 632
(inches)	4.41	4.64	5.75	6.14	7.09	6.02	5.75	5.63	5.43	5.12	4.13	4.13	64.64
<b>Union Station Union Station</b>													
(mm)	134	132	181	168	173	145	146	134	130	118	99	102	1 662
(inches)	5.27	5.22	7.13	6.60	6.82	5.70	5.74	5.27	5.10	4.65	3.90	4.03	65.43

**TABLE A-3. RELATIVE HUMIDITY (%)**

Roseau Station 68/70 and 72/79												
<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Average</u>
75.1	72.8	71.9	69.7	72.6	74.1	74.4	76.5	76.0	77.1	75.8	75.4	74.3

Source: Ministry of Agriculture, Land and Water Use Unit.

### A.1.3. Relief

The island has a steep, mountainous topography except in the south and extreme north. Saint Lucia is crossed by a central mountain ridge running axially south-southwest to north-northeast, which causes a radial drainage pattern with rivers running to the coasts on either side of the island (see Annex B, section B.1).

Three main physiographic areas can be distinguished. The first comprises the central, eastern and northern parts of the island, which have mature relief and alluvial valleys (Roseau, Cul de Sac, Fond D'Or and Marquis); peaks range from 200 feet in the north to 1 800 feet in the center. The second area is the midwestern section, starting south of the Roseau Valley and extending 5 miles inland up to the Pitons; the area includes the highest and most precipitous mountains (Mount Gimie 3 117 feet, Piton Canarie 3 012 feet, Paix Bouche 2 445 feet) and youthful land forms. It contains the only active soufriere (hot water sulphur spring) on the island. The third region, located in the southwestern section of Saint Lucia, is characterized by a fan-shaped glaciis sloping gently seaward, deeply cut by narrow gorges.

### A.1.4. Soil characteristics

Although the range of parent rocks is narrow (andesites, dacites and occasional basalts), there are a variety of forms (from fine ash to coarse agglomerates and dikes) with different compactness and porosity; when combined with the climate they are significant in soil formation.<sup>5</sup> While the island temperature is relatively uniform, it has a widely varying rainfall pattern. Thus the parent materials are subject to different amounts of leaching.

<sup>5</sup> Ibid.

The complicated and steep topography of the island and dacitic ash showers contribute to the further differentiation of soil types. "In comparatively stable areas with heavy rainfall and little or no dry season, latosols or latosolic soils have developed. The clay of these soils is usually kaolinitic, but it is thought that allophane and illite may also occur under special conditions. In dry areas with several months dry season, expanding lattice clays of the montmorillonitic type are found, sometimes associated with pan formation resulting from cementation by siliceous products released by weathering."<sup>6</sup>

<sup>6</sup> Ibid.

## A.2. Characteristics of the vegetation

### [A.2.1. Ecological classification](#)

[A.2.2. Methodology used in the classification](#)[A.2.3. Description of life zones](#)

## A.2.1. Ecological classification

Although there are numerous methodologies of environmental classification, the one used here is the classification of Natural Life Zones or World Plant Formations, devised by Leslie R. Holdridge.<sup>7</sup> This system has been used in the environmental mapping of a number of Latin American countries; it permits cartographic identification and depiction of the relationships between climatic factors.

<sup>7</sup> Holdridge, Leslie R., *Life Zone Ecology*, 1967.

The system uses the relationships between mean annual biotemperature, average annual precipitation and the potential evapotranspiration derived from these two measurements, to divide altitudinal and latitudinal belts into life zones. These major climatic units are closely correlated with characteristic plant associations, defined by the physiognomy of the natural vegetation. From climatic data, the classification can be used to predict the natural vegetation of an area or suggest crop species. Conversely, observation of the natural vegetation can be used to predict environmental conditions where such data are not available.

When using the life zone classification, three limitations must be borne in mind. First, ecological change is usually gradual rather than abrupt. Second, other factors such as soil type, wind and salt spray may have a significant effect. For instance, thin soils will dry out rapidly in the dry season and therefore support a drier type of vegetation than valley bottoms that have the same climate but deeper soils fed by rivers from wetter areas. Third, the historical effect of man on observed vegetation must not be forgotten. Clearing dry areas for cultivation promotes soil erosion which cannot support regrowth. Where there is cutting for charcoal and for banana crops, a return to the original climax vegetation is indefinitely delayed.

When mapping, each life zone is assigned a different symbol and colour. The symbol consists of the name of the base region or altitudinal belt, in capital letters, followed by the name of the formation or life zone in small letters. For example, S-wf represents the Subtropical wet forest formation. Transitional formations also carry geometric figures which indicate temperature and/or precipitation variation. For example, S-df > S-vmf indicates the life zone Subtropical dry forest transition to Subtropical very dry forest.

## A.2.2. Methodology used in the classification

The information contained on the topographic map was studied as basis for the actual mapping of the class boundaries through field observations using Holdridge's system.

### i. Cartographic compilation

The life zones were sketched on a 1:50 000 scale topographic map after field verification of life zone boundaries on the ecologic map.

### ii. Preparation of the ecologic map

The investigatory work included an analysis of precipitation and temperature data. The identification of life zones from knowledge of vegetation is based on physiognomic differentiation observable in natural

secondary vegetation. Life zone identification was facilitated by observing cultivation indicators such as typical crops, the organization of agricultural activities and land use in the densely populated areas.

Elevation levels were verified by altimeter to determine the altitudinal belts. At points within a life zone where a change was observed in vegetation or cultivation practices, or the presence was noted of indicator species that did not correspond to the life zone identified, the elevation was calculated to determine the corresponding altitudinal belt. These indicators provided the basis for the projection of a line on the topographic maps. In projecting the lines, orographic position, wind direction and atmospheric factors were considered.

### iii. Life Zones of Saint Lucia

The ecology of Saint Lucia is extremely diverse; vegetation ranging from cacti to giant evergreen forest trees is found within a few miles. Five life zones and two transitional life zones were identified. Their arrangement is almost that of concentric rings, as a result of rainfall increases towards the mountainous centre of the island. The major life zones are:

- Tropical dry forest
- Tropical dry forest transition to Tropical very dry forest
- Tropical moist forest
- Subtropical moist forest
- Subtropical wet forest
- Subtropical wet forest transition to Subtropical rain forest
- Subtropical rain forest

## A.2.3. Description of life zones

### i. Tropical dry forest (T-df)

#### a. Location

The areas belonging to this life zone form a continual coastal belt around Saint Lucia except for the area around Soufriere, which is Tropical moist forest (T-mf), and the extreme south and north of the island, which are transitions to Tropical very dry forest (T-vdf). The belt is wider in the north, east and south than in the west: in the west it extends inland a maximum of one mile, while in the east it reaches up to 3.5 miles inland. The lower valleys of all the rivers in the country belong to the Tropical dry forest. Most of the main agricultural lands of the Marquis, Fond D'Or, Dennery, Troumasse, Canelles and Vieux Fort rivers belong to this life zone. However, deep soils in these valleys and the rivers flowing through them produce growing conditions closer to those of Tropical moist forest.

#### b. Climatic conditions

Generally, the Tropical dry forest formation has temperatures above 24°C (Hewanorra International Airport). Precipitation in the life zone is recorded by a number of rain gauges. Its annual rainfall varies from 61.26 in (1 556 mm) at La Fargue to 85.16 in (2 163 mm) at Corinth. Its average potential evapotranspiration may be 60 percent higher than the total annual precipitation.

#### c. Topography and vegetation

The coastal belt of Tropical dry forest has been cleared in the past. Some areas have been largely

abandoned, while in others natural vegetation has been replaced by permanent agriculture. Rainfall seasonal crops can be productive, but intensive agriculture requires irrigation infrastructure. The secondary woodlands have variable growth and lack of cultivated structure. Most of the growth is shrubby. The composition of these secondary woodlands is chiefly Goyavier, Myrtaceae spp.; Grand Feuille, Cocolobis pubescens L.; Adegond, Maytemus elliptica (Lamb) Urb.; Commier maudit, Bursera simaruba.

The shrub species include Faramea occidentalis v.a., Myrcia citrifolia a., Ixora ferrea f., Melastomaceae spp. O., Aiphenes minima r., Fagard trifoliata, Ardisia guadalupensis and Tabernaemontana citrifolia. Most of the dry woodlands do not contain large trees. Instead they consist of a low, dense thicket of saplings. The most severely degraded areas often become covered with croton thicket, principally Croton populifolius, C. choristolephus and C. wuellschlaegilianus with mats of Pitcairnia albucidifolia on rocks. Whether these areas, if left alone, would eventually support their previous climax vegetation is a matter for debate.

#### d. Considerations for appropriate land use

Natural vegetation in flat areas of the Tropical dry forest has completely disappeared, and the land is now used for agriculture. The land in these flat areas consists of alluvial soils that constitute the more valuable soils of the country because of their high capability (classes I to V). These are irrigable soils and, except for class V, can be used for intensive cultivation of many annual crops.

In appropriate soil conditions, and with supplementary irrigation, the climate characteristics of this life zone allow production of a wide variety of crops such as avocados, pineapples, watermelons, sugar cane, cotton, sesame, bananas, rice, peanuts, beans, yams, cassava, corn, tobacco, cacao, tomatoes and grapes. Wood from these climatic conditions is in high demand all over the world, including Tectona grandis, Swietenia macrophylla, Tabebura spp., and Credrella spp.

#### ii. Tropical dry forest transition to tropical very dry forest (T-df > T-vdf)

The areas identified are in the extreme north and south, near Cap and Vieux Fort respectively, which are Saint Lucia's driest areas. The dry scrub woodlands merge into thorn scrub and poor grazing similar to thorn savannah.

Rainfall is 51.80 inches (1 313 mm) in the extreme north; the soils are predominantly shallow and stony, which prevents their use for agriculture. In certain areas of alluvial and colluvial soils the land is suitable for agriculture with irrigation.

#### iii. Tropical moist forest (T-mf)

##### a. Location

Areas belonging to this formation extend over the important agricultural valleys in-country. The widest areas of the Tropical moist forest are in the eastern part of the island, occupying a large portion of the Cul de Sac and Roseau valleys. The Marquis and Fond D'Or river valleys and the Soufriere area also have characteristics of Tropical moist forest zone.

##### b. Climatic conditions

The Tropical moist forest zone has as climatic limits average temperatures above 24°C and an average annual rainfall between 2 000 and 4 000 mm. In Saint Lucia, it is possible to find these conditions from

sea level (Soufriere) to approximately 150 m above sea level.

Rainfall occurs all year, and the annual average precipitation varies from 2 199 mm in Roseau to 2 786 mm in Vanard. The wet season is from June to December; June and October are the months of most precipitation. During this period, run-off is extensive and adequate drainage is essential for both agriculture and roads. Generally, there is a water shortage from January to May, the worst months being February and March.

#### c. Topography and vegetation

The topography is flat to undulating in the greater part of this life zone; elevations vary from sea level to 150 m. Trees used to make up the natural vegetation, but the forests have been cleared for agriculture with only a few remnants left.

#### d. Considerations for appropriate land use

The determining factors for land use in this life zone are soil type, gradient and proper selection of species. The cost of agricultural production is higher than in drier zones - first, because of the need for more intensive control of pests and diseases, which are more common and numerous owing to the greater humidity, and, second, because of the periodic need for cultural practices owing to the rapidity with which most of the cultivated soils lose their fertility.

Agriculture in this life zone requires careful management. The farmer who continuously works the same land finds that rainfall leaches out plant nutrients, exhausting the soil and rendering the land unproductive.

Proper selection of crops is very important. An example of a species improperly selected would be pineapple. It is unable to compete with the faster growing weeds, and the fruit will be of inferior quality because it requires a long dry season for concentration of the sugar in the fruit. The only lands suitable for intensive agriculture are those of very fertile alluvial soils; even here only high-yield crops can be profitable. Lands with shallow soils and moderate gradient are the best suited for perennials such as cacao, certain tropical fruits and coffee, on a smaller scale. Due to the variable deficit of water in the areas of this life zone between January to May, usually occurring in February and March, the establishment of irrigation can be advantageous.

#### iv. Subtropical moist forest (S-mf)

##### a. Location

This life zone is of limited extent and is isolated between areas of Tropical dry forest. These lands are located at higher altitudes than the Tropical dry forest, between 400 to 1 000 feet above sea level.

##### b. Climatic conditions

This formation has as climatic limits a mean annual temperature between 18 and 24°C and an average annual rainfall between 1 000 and 2 000 mm.

There are two rain gauges located in this life zone, one in Patience and another in Girand (see Table A-4). The amount of rainfall is the same as in the Tropical dry forest, but, because of the lower temperature, the evapotranspiration is also lower and consequently more water is available.

The soils, however, are shallow, stony and low in fertility.

## c. Topography and vegetation

The relief varies from very undulating to broken. Because of edaphic conditions in this life zone, the vegetation consists of species characteristic of drier ecosystems.

**TABLE A-4. SUBTROPICAL MOIST FOREST (S-mf)**

River Basin or Area	Rain Gauge Name	Continuity years	Average annual rainfall	
			mm	in
Black Bay	Giraud	1933-47	2,490	98
Fond	Patience	1951-80	2,000	79

Source: Oelsner, J., "Water Resources," OAS Technical Report, Castries, June 1981.

## d. Considerations for appropriate land use

There are two areas with characteristics of Subtropical moist forest, one around Mount Gomier, in the southwestern part of the country, and the other around Mt. Victoria in the eastern part. In both cases the edaphic conditions prevent agricultural use for seasonal crops. These two areas, along with others belonging to the Tropical dry forest, are considered marginal land for agricultural use except for certain species like cashew, or trees for charcoal or methanol production.

## v. Subtropical wet forest (S-wf)

## a. Location

The lands in this life zone are located primarily between the slopes of the mountains that form a south-southwest to north-northeast axial ridge and the belt consisting of Tropical dry forest and Subtropical moist forest. The Subtropical wet forest is the largest life zone of the country.

## b. Climatic conditions

Climatic conditions in this life zone vary under the influence of the anticyclones and the trade winds that traverse the country. The rainfall pattern is similar to that of the Tropical moist forest and Subtropical moist forest except that the orographic rain is heavier. Because the rain is longer in duration, it exerts a major influence on the composition and physiognomy of the vegetation.

This formation has climatic limits between 18 and 24°C and an annual rainfall between 2 000 and 4 000 mm.

Within this life zone, average annual rainfall ranges from 2 117 in Londonderry to 2 970 in Barre de L'Isle, which has recorded the highest precipitation (see Table A-5). The temperature in this life zone varies according to location and is estimated at 24°C near the coast, but falls to as low as 18°C on the slopes at 2 950 feet (900 m) above sea level.

**TABLE A-5. SUBTROPICAL WET FOREST (S-wf)**

Rain Gauge Name	Continuity (years)	Average Annual Rainfall	
		mm	in
Woodlands	1933-54	2 904	114.33

Londonderry	1933-60	2 117	83.36
Park	1933-68	2 297	90.45
Beausejour	1933-48	2 606	102.61
La Perle	1933-50	2 283	89.91
Barre de L'Isle	1941-80	2 970	116.92

Note: This formation has climatic limits between 18 and 24° C.

Source: Oelsner, J., *op. cit.*

The average potential evapotranspiration may be estimated at 60 percent less than the total average annual precipitation. In this life zone, three-fifths of the rain water escapes as run-off, so that the rivers carry water throughout the year.

### c. Topography and vegetation

The topography is predominantly mountainous in this life zone. The elevation ranges from 500 feet (152 m) to 1 000 feet (304 m). The natural vegetation consists of tree species of variable commercial value. Most of the primary forest has been cut down, with the remaining natural forest on the steepest slopes.

The boundary between the Tropical moist forest and the Subtropical wet forest was identified by the existence of tree ferns (the natural vegetation of this life zone) after crossing the Ravine Creviche in the Castries-Dennery border zone, near Barre de L'Isle Ridge.

### d. Considerations for appropriate land use

The main determining factors for land use in this life zone are soil type, gradient and species. The cost of seasonal agricultural production is higher than in drier zones, for two reasons. There is a need for adequate drainage infrastructure and for control of pests and diseases, which because of greater humidity are more common and numerous. Second, there is a need for land rotation because of the rapidity with which most of the cultivated soils lose their fertility.

The lands suitable for intensive agriculture are those containing very fertile alluvial soils. Lands with shallow soils and moderate gradient are best suited for perennials such as cacao, rubber, subtropical fruits and coffee and tea on a smaller scale.

The steeply sloping lands not suitable for agriculture should be kept forested. With efficient management, these forests can supply wood and serve as protection for the catchment basins. Failure to do so will result in accelerated erosion of the best soils, located in the lower part of the river basin, as has happened in some areas of the Fond D'Or valley (Dennery Estate), where the irrigation channels are completely filled with silt from the erosion of the upper part of the valley. This situation prevents the use of the land under irrigation.

In the deforested areas, commercially valuable species such as pine in the Barre de L'Isle area and eucalyptus in the Millet area have been established with good results. Another species used in some countries with similar life zones, besides *Pinus occidentalis*, is *Didynopanax morototoni*.

The guava (*Psidium spp.*) grows in second growth areas dispersed throughout the country as in the Chopin Ridge. The fruit of this tree can provide the basis for the development of a large scale industry, as can other subtropical fruits. The experiments on fruit processing carried out by the Union Agricultural Station

will be useful in establishing such an industry. Cultivation of bananas is recommended only on the mild slopes and alluvial soils.

vi. Subtropical wet forest transition to Subtropical rain forest (S-wf S-rf)

The areas identified are at higher altitude and have more rainfall than the Subtropical wet forest. These rains preclude the use of the land for agricultural purposes and it is recommended that the area remain forested for the protection of the catchment basin.

An exception is Belle Plaine, where even with an average annual rainfall of 4 259 mm agriculture is possible because of the high quality of soil (Table A-6). Improvement of the drainage system is required.

**TABLE A-6. SUBTROPICAL WET FOREST TRANSITION TO SUBTROPICAL RAIN FOREST (S-wf S-rf)**

Area or River Basin	Rain Gauge Name	Continuity years	Average Annual Rainfall	
			mm	in
Troumasse	Quillesse	1935-78	3 743	147.35
Canelles	Edmund Forest	1980		
Choiseul	Bath Nursery	1950-80	2 623	103.30
Choiseul	Belle Plaine	1933-48	4 259	167.69
Soufriere	La Dauphine	1933-40		

Source: Oelsner, J., *op. cit.*

vii. Subtropical rain forest (S-rf)

a. Location

The Subtropical rain forest area is centered in the wet forest zone. The rain forest areas are located at the headwaters of the Troumasse and Roseau (Canelles) rivers, between Mt. Gimie and Piton St. Esprit, and in the northeastern part of this area.

b. Climatic conditions

No meteorological data have been recorded for this life zone in Saint Lucia. However, the plant species and physiognomy endow it with distinct characteristics that differentiate it from the wet forest zone. This zone receives the highest rainfall in Saint Lucia, in the form of orographic rains. The average annual rainfall is probably about 4 000 mm. The temperature varies around 19°C. The average potential evapotranspiration may be estimated at 75 percent less than mean annual rainfall. In this life zone, more than three-fourths of the rain reaches the rivers, which therefore carry water throughout the year.

c. Topography and vegetation

Relief is broken over the greater part of this zone. The elevation ranges from 1 000 to 2 000 feet (300-600 m). The natural vegetation consist of trees, characteristically covered with parasitic and epiphytic plants. The species native to this life zone grow more rapidly than those of the wet forest zone and exhibit great natural regeneration.

d. Considerations for appropriate land use

Because of the excessive humidity, the lands of the Subtropical rain forest life zone are valueless for direct agriculture. It is essential that the natural plant cover of these lands be preserved as a means of controlling run-off and soil erosion.

## A.3. Land capability classes

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[A.3.1. Definition of land capabilities](#)

[A.3.2. Characteristics of the land classes](#)

[A.3.3. Land availability by capability classes](#)

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### A.3.1. Definition of land capabilities

Land capability classes were defined using information available on the characteristics of the 49 different soils that exist in Saint Lucia,<sup>8</sup> mapped at a scale of 1:25 000. Data on slopes were taken from the 1:25 000 scale map of Saint Lucia (DOS Edition 3, 1974); this information in conjunction with the climatic information was used to define land capability.

<sup>8</sup> Stark, J. et. al., *op. cit.*, pp. 28-46, and Soil Map of Saint Lucia scale 1:25 000.

The following criteria were used to characterize the soils:

- fertility: subdivided into high, medium or low;
- stoniness: subdivided into high, moderate and low;
- drainage: subdivided into good, moderate and poor;
- depth: either shallow or deep; and
- erosion hazard: either high, moderate or low.

These variations in soil characteristics were defined using the detailed information supplied by the soil survey in relation to soil location, parent material, topographic conditions where they occur, propensity to erosion, vegetation, physiography, drainage, stoniness, permeability, horizontal profile, chemical characteristics, etc.

Slopes were subdivided into groups: 0 to 5 percent, 5-10 percent, 10-15 percent, 15-20 percent, 20-25 percent, 25-30 percent and 30 percent and over. The available rainfall information was analyzed and the different areas of the country were divided into areas of low, moderate and high rainfall.

Using these criteria, the different soils of Saint Lucia were classified in eight land capability classes.<sup>9</sup> Given the multiple combinations possible, the classification of each soil poses a specific problem. A slight variation in slope or rainfall pattern may determine a change in capability class of a basically homogeneous soil type in a fairly small area. It is not possible to document each of the classifications made; in the following sections, the broad characteristics of each land capability class will be indicated and examples of soils in each class will convey the criteria used in the classification.

<sup>9</sup> Klingebiel, A., and P. Montgomery, "Land Capability Classification," Agriculture Handbook, No. 210, 1966.

The eight classes of lands were mapped on a 1:25 000 scale map and measured with a planimeter in order to estimate the availability of land resources in each of the 31 watersheds identified. Table A-7 shows average of land capability classes for the various river basins and basin areas. The river basins listed in Table A-7 are shown on Map A-1. Table A-8 contains information illustrative of specific characteristics of land capability classes in selected river basins and areas.

### A.3.2. Characteristics of the land classes

#### a. Land capability class I

Included in land capability class I are all lands suitable for cultivation and irrigation with flat topography and no major limiting factors. With good management, these lands are highly productive and do not present special conservation problems (see Table A-8).

#### b. Land capability class II

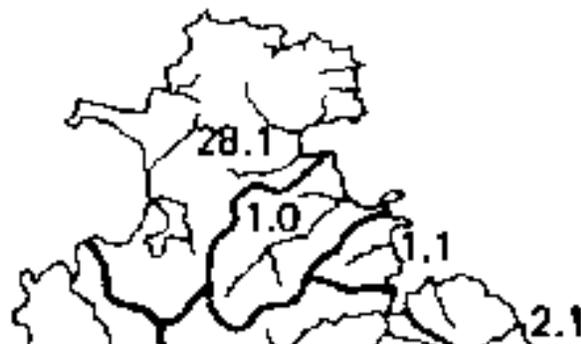
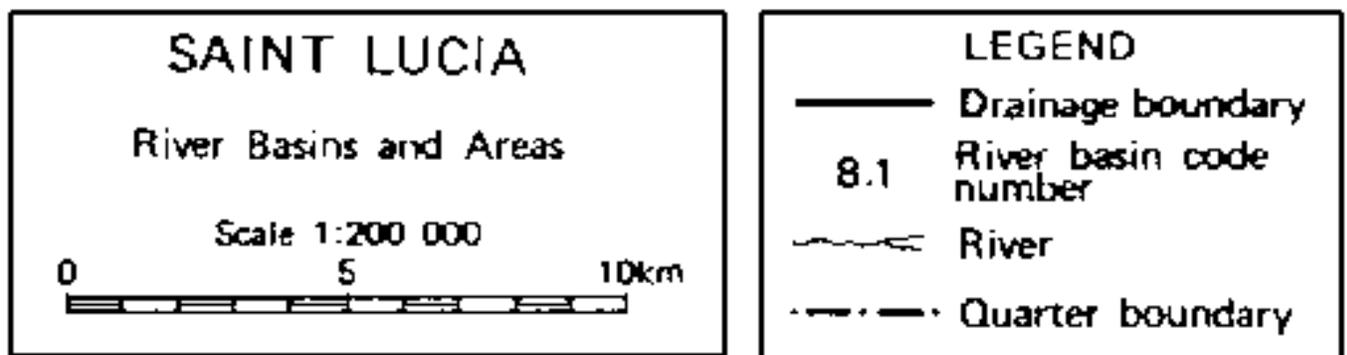
These lands are also suitable for irrigation and cultivation. They have flat to gently undulating topography. Limiting factors are not severe and can be compensated for with good management practices. High productivity can be attained with good management and by implementing moderate conservation measures, generally drainage or contour planting in undulating areas (see Table A-8).

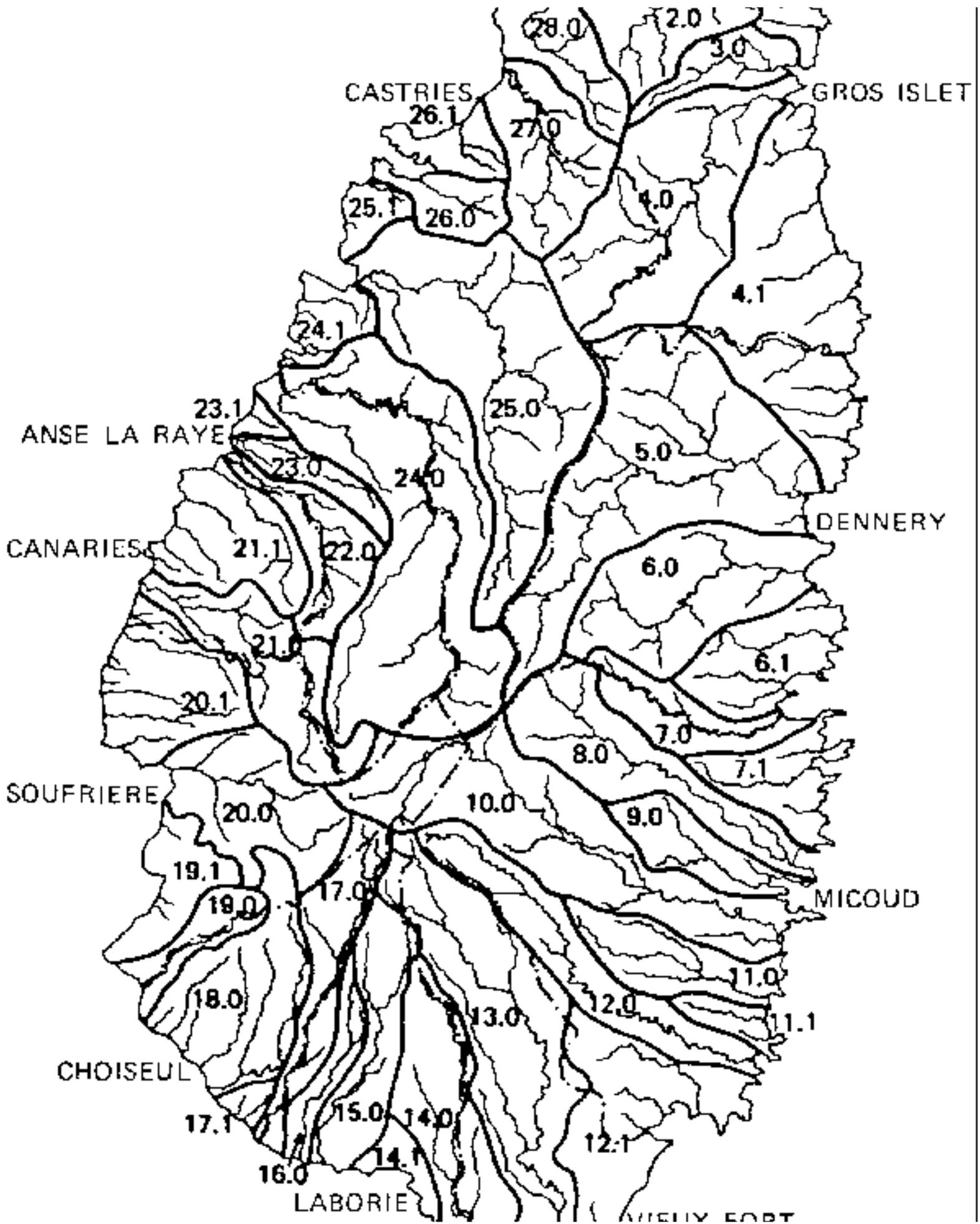
#### TABLE A-7 LAND CAPABILITY CLASSES BY RIVER BASINS

Source: Pretell, O. and S. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October, 1981.

Oelsner, J., "Natural Resources and Agricultural Development: Mater Resources", OAS Technical Report, *op. cit.*

**Map A-1. Saint Lucia. River Basins and Areas**







**Note:** River basin and area names are listed by code number in Table A-7

Source: Pretell, O. and J. Polius, 'Land Capability Classification and Allocation in Saint Lucia,' O.A.S./Ministry of Agriculture Technical Report, Saint Lucia, October, 1981

#### c. Land capability class III

Class III contains lands suitable for cultivation and irrigation with flat to undulating topography but with limiting factors (generally medium fertility soils, or moderate stoniness or shallowness). Medium to high productivity can be attained under intensive management and conservation, particularly from sheet erosion (see Table A-8).

#### d. Land capability class IV

This group of lands has limited cultivation or irrigation possibilities. Flat to very undulating topography may make these lands prone to erosion. When used for permanent tree crops, limited soil conservation measures are required; with other crops requiring clean cultivation, the danger of erosion increases, demanding soil conservation as part of the technological management package. Medium productivity can be attained with good management (see Table A-8).

#### e. Land capability class V

These are lands which are unsuitable for cultivation but suitable for intensive pasture. Severe limiting factors exist, particularly drainage considerations. When intensive management is applied, high productivity is possible with pasture and crops adapted to water-logged conditions. Soil conservation is necessary for long-term preservation of these lands (see Table A-8).

#### f. Land capability class VI

These lands are unsuitable for cultivation but appropriate for permanent crops (tree crops, fruit trees) and natural pasture. Under certain conditions of soil and climate, some intercropping is possible with annuals which require no tilling. Topography, shallow soils and stoniness are very severe limiting conditions. Use of these lands requires strict observance of soil conservation measures (see Table A-8).

#### g. Land capability class VII

Land in Class VII is normally natural forest unsuitable for cultivation. In selected areas, timber production is possible; in areas where soils, topography and climatic conditions are better, coffee and cacao can be grown. Extremely severe limitations are associated with this class of lands and strict conservation measures should be observed in their use (see Table A-8).

### **TABLE A-8. RIVER BASINS: AREAS ILLUSTRATIVE OF SPECIFIC CHARACTERISTICS OF LAND CAPABILITY CLASSES**

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981.

Olsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

#### h. Land capability class VIII

Land totally unsuited to cultivation, suitable only for national parks and wildlife zones. These lands should be left in their natural state and protected (see Table A-8).

### A.3.3. Land availability by capability classes

Table A-9 is based on the information contained in Table A-7 and shows the skewed distribution of land capability classes. The predominance of class VII and the lack of land in the desirable classes I-IV is evident.

**TABLE A-9. LAND CAPABILITY CLASSES: TOTAL AREA AND CULTIVATION POSSIBILITIES**

Class	Land area (acres)	% of total area	Cultivation possibility
I	3 989.70	2.65	Cultivable
II	1 422.03	0.94	Cultivable
III	1 809.57	1.20	Cultivable
IV	1 178.08	0.78	Limited cultivation
V	5 757.58	3.82	Pasture
VI	25 477.51	16.90	Permanent crops
VII	101 050.70	67.01	Timber, natural forest
VIII	10 103.90	6.70	National park
	150 789.07 or 235.6 sq mi	100.00	

Source: Table A-7.

The factors that render areas unsuitable for agriculture are steep slopes, shallow soil, stoniness, low fertility and aridity. Despite these factors, population pressure results in attempted intensive cultivation of these lands and their degradation. A study should be done and the findings serve as a basis for the provision of alternative technological packages that would allow continued productive use of the lands, both in low and high population density areas.

Lands suitable for intensive agriculture, Classes I-IV, cover about 8 400 acres, or about 5.5 percent of the total land of the country. Intensive agriculture will continue to be established in these areas. Efforts must be made to maintain these high-potential lands in agricultural production and restrict their use for urban and industrial activities.

It is evident that land of a particular class is not continuous in its distribution. For example, Class I soils are found scattered over twenty river basins, and range in size from under 10 acres, in the Savannes Bay-Vieux Fort area, to over 700 acres in Cul de Sac. Such a pattern makes it difficult to plan for the optimum utilization of any one or more parcels of land in a particular class (Table A-7).

## A.4. Environmental management of land resources

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[A.4.1. Environmental considerations for management of agricultural natural resources](#)

[A.4.2. Characteristics of soil erosion](#)

[A.4.3. Principles of land resource management](#)

[A.4.4. Recommendations for land resource management](#)

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### A.4.1. Environmental considerations for management of agricultural natural resources

Water unifies and links all ecosystems; indeed, rainfall patterns play a major role in explaining soil formation in Saint Lucia (Annex B, section B-2). Further, another water-related process, erosion, is at the root of the gradual degradation of land resources on the island.

Erosion can be the result of natural factors (heavy rainfall over very steep slopes) or be catalyzed by man's activities (deforestation of areas with steep slopes and shallow soils). These two problems differ in terms of the capacity that society has to cope with them. Whereas the effects of natural erosion can be modified by man's action (reforestation, contour drainage construction, etc.), man-generated erosion can normally be avoided or at least reduced to manageable proportions.

Although man's activities have been the cause of some soil erosion for many years (sugar cane cultivation, shallow soils, timber exploitation in unsuitable areas, etc.) the recent practice of cultivating bananas in the steep mountainous interior of the island has caused serious erosion to take place; encroachment into natural forest to expand banana cultivation is daily aggravating the problem. Population pressure on a limited amount of good agricultural lands, together with a highly concentrated land ownership pattern, creates the need to cultivate unsuitable lands and this in turn fosters soil erosion.

Heavy erosion adversely affects coastal ecosystems through sedimentation on seabed vegetation, an initial component of the animal food chain. Mangrove forests, which often reduce all the effects of heavy erosion, are being destroyed to accommodate tourism development.

Clearing of forest lands for agriculture has seriously reduced the infiltration capacity of many of the most critical watersheds on the island, reducing water flow in streams and rivers during dry spells. Excessive water run-off is at the origin of the heavy soil loss being experienced in many areas of the country.

Encroachment into protected areas is increasing soil damage. This is the case at the Castries Waterworks Reserve (created in 1916), which covers the slopes of Piton Flore and La Sorciere. It contains mainly primary forest with some advance second growth. It is connected by a narrow strip along the Barre de L'Isle or central watershed to the southern and more extensive block of forested public land. This was not a defined forest reserve until recently and has not been well protected, so that, while there is a large central core of inaccessible primary forest, shifting cultivators have been very active at the periphery.

The present Central Forest Reserve covers approximately 16 561 acres, or about 11 percent of the total area of the country. There has been a variable degree of intervention. For photointerpretation and fieldwork, accessible areas were defined. Three kinds of use or degrees of intervention can be defined: 1)

natural forest, 2) secondary forest, plantations of maho, mahogany and pine or a combination of clandestine agroforestry activities, and 3) areas cleared for agriculture.

The part of the Central Forest Reserve with the greatest degree of intervention is the Castries Waterworks Reserve area in the north, where almost one-third of the area has been cleared and is under secondary forest. In the strip along the Barre de L'Isle more than 75 percent is under secondary forest, plantation of pines and agroforestry activities, with some areas dedicated to agriculture. These two areas of the Central Forest Reserve (Castries Waterworks Reserve and Barre de L'Isle) are the headwaters of the Fond D'Or river basin, and intervention affects profoundly the lands at the bottom of the valley, which are of high capability, classes I to IV, and have one of the best irrigation systems in the island. This intervention is causing accelerated soil erosion that damages the irrigated lands by silting the channels of the irrigation system, making the land unsuitable for irrigation because of the high cost of maintenance of the channel. The damage has been so great that areas of valuable land have been declared marginal for agriculture use.

In the southern part of the Central Forest Reserve the intervention occurs mainly in the south portion, affecting directly the Troumasse, Canelles, Vieux Fort and Doree river basins.

### **A.4.2. Characteristics of soil erosion**

Many of the soils that are found in Saint Lucia are very susceptible to erosion. Slumping and sliding are common on recently cleared soils in the steep interior where tree roots are no longer present to retain the soil. Gully erosion is commonly found in Saint Lucia under various slope and rainfall conditions. When no drains are built, gullies often start near roads and footpaths where water flow concentrates, increasing its erosive power. All sloping cultivated lands in Saint Lucia are affected by sheet erosion of the surface soil. This soil is rich in organic matter and has important physical and chemical properties. Adverse effects of sheet erosion are more rapidly and severely felt on shallow soils resting upon hard substratum.

Once soil has been lost very little can be done to remedy the problem; over the years decreasing yields and abandoned lands are the result of heavy erosion. The pattern of shifting cultivation practiced by small farmers and squatters in the interior hills is a consequence of the process of permanent exhaustion of the land base; after a few years of cultivating a patch of cleared forest, yields decrease so much that the land is abandoned and new forest is cleared. Heavy erosion and water loss are the ill effects of such practices.

### **A.4.3. Principles of land resource management**

The adverse impact of man's activities is the result of economic, social and environmental factors. Avoidance of these adverse effects requires change in all the interacting factors. Although soil erosion is an important negative consequence arising from current agricultural practices in Saint Lucia, the solution to these problems is not just technical (in terms of soil conservation practices and investment in the required infrastructure). Only when agricultural output generates a sufficient surplus can capital investment in soil conservation be profitable. New husbandry practices and crop combinations may be required to reverse the exhaustion of fertility.<sup>10</sup>

<sup>10</sup> Pool, D., "Natural Resource Management," OAS Technical Report, Castries, October 1981 (mimeo).

A solution of the soil erosion problem now facing Saint Lucia involves the introduction of important changes into structural factors of the country's agricultural development process. Diversification of

production (introduction of tree crops in areas not suitable for clean cultivation), increases in productivity and in value added locally to agricultural production (so as to generate capital for investing in soil conservation), and redistribution of underutilized lands to reduce pressures on lands unsuitable for cultivation are structural changes that are necessary to foster a sound pattern of natural resource utilization in the agricultural sector and to reduce the risks of soil erosion.

#### **A.4.4. Recommendations for land resource management**

Sound utilization of land resources involves consideration of an environmental management dimension prior to decisions regarding what constitutes the best land uses. Land capability, as discussed in the preceding section, is one aspect of this issue. Soil conservation is the other aspect that defines the limitations affecting the use of the resources.

Parent material, slope cover and rainfall determine a soil's risk of erosion. Given the topography of Saint Lucia and the variety of rainfall patterns that exists, it is not possible to make specific soil conservation recommendations applicable to all circumstances. Nevertheless, as a general framework, the following guidelines are applicable to soil conservation and the slope of lands.

- i. Lands with slopes of over 30 percent should not be used for agriculture; the permanent vegetative cover must be protected.
- ii. Lands with slopes of 20-30 percent can be used for tree crops and forestry with conservation measures to avoid gully erosion and landslides in areas of high rainfall.
- iii. Lands with slopes of 10-20 percent can be farmed using soil conservation measures as appropriate (terracing, benches, etc.).
- iv. Lands with slopes of less than 10 percent can be intensively farmed depending on other aspects of land capability; in areas of heavy rainfall, the steeper lands may require soil conservation measures (contour planting, terracing, etc.) and others may require drainage.

Less than 20 percent of the lands in Saint Lucia can be farmed without important soil conservation investment; this is indeed a restrictive situation, particularly when returns from agriculture are not very high.<sup>11</sup>

<sup>11</sup> Stark, J., et al., op. cit., p.27.

Among the soil conservation measures, those involving low capital investment (contour drains, planting patterns perpendicular to slope, permanent tree cover to provide protection to the soil) are to be encouraged for small hillside farming communities. Capital intensive conservation practices such as bench terracing and orchard benches should be undertaken on a small scale when land use changes are attempted to move toward high productivity crops. In the absence of specific soil conservation measures, mixed cropping of bananas and ground provisions as currently practiced in many small hillside farming communities is to be encouraged for the soil conservation benefits and for helping the farmer to spread the risks of natural disasters.

Protection of existing forests is important not only to preserve the water catchment areas of important watersheds but also to avoid excessive water run-off that may damage agricultural lands downstream. Protection of coastal ecosystems (mangrove forests, for instance) is necessary to preserve fishing grounds and scenic beauties in the country. Coastal waters are also being threatened by shipping activity.

Specific environmental management recommendations were prepared for each of the watersheds analysed in the study, taking into consideration the general criteria spelled out above and the particular characteristics of each watershed (rainfall patterns, soils, slopes, etc.).<sup>12</sup>

<sup>12</sup> Pretell, O., and J. Polius, *op. cit.*

## A.5. Land capability in selected watersheds

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[A.5.1. Marquis River basin](#)

[A.5.2. Roseau River basin](#)

[A.5.3. Vieux Fort River basin](#)

[A.5.4. Canelles River basin](#)

[A.5.5. Troumasse River basin](#)

[A.5.6. Fond d'Or River basin](#)

[A.5.7. Cul de Sac River basin](#)

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To illustrate the main characteristics of the detailed land capability analyses made, profiles of land capabilities for the important watersheds are summarized in this section. The main environmental management recommendations for these watersheds are also given. The watersheds of the Marquis, Roseau, Vieux Fort, Canelles, Troumasse, Fond D'Or and Cul de Sac Rivers have been selected because they include the important water resources (Annex B) and most of the good agricultural lands in the country. Detailed information concerning other watersheds included in Table A-7 can be found in the original analysis of land capability classes.<sup>13</sup>

<sup>13</sup> *Ibid.*

### A.5.1. Marquis River basin

#### i. General characteristics

Located in the northeast of the island, it has 7 659 acres. In the upper parts of the river basin the parent rock is comprised of hornblende andesite, andesite ash and altered andesite. The middle and lower portions of the river basin are on basalt with some andesite. Along the river there are detectable concentrations of manganese. The average annual temperature is above 24°C and the average annual rainfall is about 88 inches (2 240 mm). Tropical dry forest characterizes the lower part of the valley; the upper part is Tropical moist forest. The watershed divide near the coast is characterized by Subtropical moist forest; the interior is Subtropical wet forest. The rainfall near the coast is 70 inches (1 778 mm); it is more than 100 inches (2 540 mm) in the upper river basin (see Table A-10).

#### ii. Soil conditions

Along the central part of the valley alluvial soils of medium to high fertility occur with almost no requirement for special management. Near the coast the alluvial soils have limiting problems of drainage and salinity. A great portion of the soil bordering the alluvials has slopes from 5° to 20°, where the major limitations are drainage and erosion, and is thus classified as Class VI, suitable for tree crops. The soils

with slopes primarily of 20° have been classified as class VII with limitations of erosion. Soils with slopes between 20° and 30°, near the coastal area, have been classified as Class VII with the limitation of aridity; these are marginal for agricultural use except for production of trees to be used for charcoal and methanol, and permanent fruit trees like cashew.

### iii. Crop allocation

Marquis is the most fertile river basin in the northeast because it receives the most water. Nevertheless some irrigation is necessary in the lower valley area during dry spells.

### iv. Environmental management

The upper watershed requires total protection since it serves as a water source for Castries. Any human intervention within the water catchment area will increase erosion, producing sediment that will result in deterioration of the water supply and quality. Alluvial soils along the Marquis River can be intensively cultivated with good management and conservation practices.

Class VI soils can be used for permanent tree crops or managed for forestry production as appropriate. Experience with bench terraces cropped with bananas, coconuts and fruit trees has been positive.

## A.5.2. Roseau River basin

### i. General characteristics

This is the largest river basin in the country, covering 11 989 acres. The development of land is constrained by an obvious water deficit. The parent material consists of some recent alluvial material in the lower river basin. The middle and upper river basin lies on andesite porphyry, andesite ash and altered andesite. The estimated average annual temperature is 26°C and the average annual rainfall ranges from 70 inches (1 778 mm) to 150 inches (3 810 mm). The life zones that characterize the area are Subtropical rain forest in the upper river basin, Tropical moist forest in the middle and Tropical dry forest in the lower basin (see Table A-11).

**TABLE A-10. MARQUIS RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	265.30	3.5	Vegetables, bananas, limited food crops, sugar cane	None
II	49.41	0.6	Vegetables, bananas, limited food crops, sugar cane	Drainage (alight)
III	72.57	0.9	Vegetables, bananas, limited food crops, sugar cane	Drainage (slight)
IV	-	-	-	-
V	24.70	0.3	Permanent tree crops, limited food crops	Slope, erosion, drainage

VI	2 178.58	28.4	Permanent tree crops, limited food crops	Slope, erosion, drainage
VII	4 784.46	62.5	Timber and charcoal	Erosion
VIII	284.10	3.7	-	-
Total	7 659.12	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October, 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

## ii. Soil conditions

Approximately 1 310 acres of land have been identified as being of high quality, located between the delta of the Roseau River and its junction with the Millet River. Another 1 440 acres on gently sloping land with erosion hazard can be used for tree crop establishment.

## iii. Environmental management

Management of the upper watershed in the Forest Reserve requires absolute protection to prevent degradation and adverse effects on downstream areas, and also to maintain stable water supplies for domestic agricultural and industrial use. Proper forestry management should allow exploitation only in selected areas (plantation and natural forest management).

Limitations of classes VI and VII land allow only agroforestry production systems that provide fruit tree crops as well as charcoal and limited timber production. Some conservation measures such as contour drains and grass barriers should be implemented on a watershed basis. Terrace construction is not recommended because of high rainfall and unstable soil conditions.

Land classified I, II and III can be used for banana cultivation or more intensive crops as market and economic conditions dictate. Control of erosion and proper management are required to maintain these soils in continuous production. Irrigation may be required in the dry season.

Further salt water intrusion should be prevented at the mouth of the Roseau River. Control of industrial contaminants is necessary to maintain fisheries habitat along the coast.

## A.5.3. Vieux Fort River basin

### i. General characteristics

The basin covers about 7 205 acres and originates from an undisturbed forest area which receives over 150 inches (3 810 mm) of rainfall annually. The parent materials of the lower part are dacite (Belfond pumice flows) and tuffs, in the middle part they are andesite porphyry and in the upper part andesite ash and aphyric basalt. The average annual temperatures are 26.4°C in the coastal area and less than 24°C in the upper parts of the basin. The life zones that characterize the river basin are Tropical dry forest in the coastal area, Tropical moist forest in the middle valley area and Subtropical wet forest and Subtropical rain forest in the upper part (See Table A-12).

**TABLE A-11. ROSEAU RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	753.47	6.3	Food crops, bananas	None
II	404.53	3.4	Food crops, bananas	Drainage (slight)
III	121.99	1.0	Food crops, bananas	Drainage (slight)
IV	27.79	0.2	Limited food crops, pasture, bananas	Drainage
V	3.09	-	Limited food crops, pasture, bananas	Drainage
VI	1 440.55	12.0	Cocoa, citrus, avocado, mango, other tree crops	Erosion, slope
VII	7 923.81	66.1	Permanent tree crops, tree crops: timber and charcoal species	Slope, erosion
VIII	1 313.94	11.0	-	-
Total	11 989.17	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

## ii. Soil conditions

This long river basin is composed of an intricate pattern and distribution of soils. The flat alluvials are not continuous and are broken by soils having steep slopes. There are about 1 042 acres of flat land suitable for irrigation. The upper and middle basin are formed by highly erodible soils that are subject to slipping.

## iii. Environmental management

The upper watershed requires protection. Because of high precipitation and steep topography, agricultural practices must include strict conservation measures in order to prevent soil loss. Permanent tree crops mixed with banana production will help to reduce soil loss.

The flat coastal plain is relatively fertile but requires irrigation to sustain intensive agriculture of either crops or pasture.

## A.5.4. Canelles River basin

### i. General characteristics

The Canelles River has its origin in the area with the highest recorded rainfall. The forest cover of the headwaters area should be protected. It is a long, narrow basin, covering 4 188 acres. The parent rock in the lower part consists of dacite (Belfond pumice flows) and tuffs, the center part of andesite porphyry and in the upper part of andesite ash and altered andesite. Aphyric basalt occurs in the head water area. The

average annual temperature is 26°C in the coastal area; it is less than 24°C in the headwaters. The average annual rainfall is 60 inches (1 523 mm) in the coastal area and more than 150 inches (3 810 mm) in the headwaters. The lower part of the river basin is characterized by Tropical dry forest, the middle part by Subtropical wet forest and the upper part by Subtropical rain forest (see Table A-13).

## ii. Soil conditions

Along the river are about 240 acres of alluvial soil (Class I) suitable for irrigation and intensive agriculture. The hills on both sides of the river in the coastal area have shallow soils and, combined with existing arid conditions, have marginal value for agricultural use. The soils of the hills in the center part of the river basin are steeper (5° to 20°); their main limitations are erosion and, in some places, poor drainage and low fertility. In the upper part of the basin the soils are highly erodible and subject to slipping.

**TABLE A-12. VIEUX FORT RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	208.44	2.9	Food crops, bananas, sugar cane	None
II	-	-	-	-
III	-	-	-	-
IV	29.34	0.4	Food crops, bananas, sugar cane	-
V	805.97	11.2	Limited food crops, pasture	Drainage
VI	1 347.91	18.7	Cocoa, citrus, mango, other tree crops	Erosion, slope
VII	4 781.77	66.4	Permanent tree crops (coconuts, timber and charcoal species)	Erosion, slope, land slippage
VIII	32.42	0.4	-	-
Total	7 205.85	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

**TABLE A-13. CANELLES RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	240.86	5.7	Food crops, bananas	None
II	-	-	-	-
III	-	-	-	-

IV	-	-	-	-
V	15.44	0.4	Limited food crops, pasture	Drainage
VI	631.50	15.1	Citrus, cacao, avocado, mango	Erosion, slope
VII	3 301.07	78.8	Permanent tree crops, timber and charcoal species	Erosion, shallow soils
VIII	-	-	-	-
Total	4 188.07	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

### iii. Environmental management

The upper watershed lying within the Forest Reserve requires protection because if vegetation is removed the combined effects of heavy rainfall and steep topography will cause erosion. The Mount Gimie and Quillesse areas produce heavy stream flow in highly erodable soils. Production forestry should be carried out only in selected areas. The upper watershed is a parrot habitat also requiring protection from intensive human intervention.

Owing to high precipitation and heavily dissected topography, the practice of growing bananas on steep soils must be subject to strict conservation measures to prevent soil loss. Mixing permanent tree crops with banana trees (currently practiced in some areas) will help to reduce soil loss.

Marginal dry coastal lands can be used for charcoal production or extensive livestock raising but will not support intensive agriculture because of water shortage and low soil fertility.

Alluvial soils found in the lower portion of the Canelles River can be used for intensive banana production if good soil conservation practices are followed.

## A.5.5. Troumasse River basin

### i. General characteristics

The basin is located in the southeast and has 9 599 acres. It originates from an undisturbed forest area which has the highest recorded rainfall on the island, over 150 inches (3 810 mm) annually. The river basin has variable temperatures, from about 26°C in the coastal area to about 17°C at the top of Mount Gimie. Parent material is andesite or prophyry in the lower basin and andesite ash altered andesite in the upper part. The life zones that characterize this river basin are Tropical dry forest in the coastal area, Tropical moist forest in the middle valley, and Subtropical wet forest and Subtropical rain forest at higher altitudes (see Table A-14).

### ii. Soil conditions

The principal soil-forming factors here are rainfall and topography. In the coastal area there are marginal lands; limiting factors are aridity, shallowness and steepness. The soils peripheral to the central valley have high erosion hazards and are subject to slumping. In the center of the valley are 643 acres of good land suitable for irrigation.

### iii. Environmental management

In the management of the watershed the same guidelines should be followed as in the Canelles River basin.

**TABLE A-14. TROUMASSE RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	273.29	2.8	Food crops, bananas, sugar cane	None
II	-	-	-	-
III	46.32	0.5	Food crops, bananas, sugar cane	Slope (gentle)
IV	81.83	0.9	Limited food crops, pasture, fruit trees	Drainage, slope
V	242.41	2.5	Limited food crops, pasture, fruit trees	Drainage, slope
VI	2 768.39	28.8	Citrus, avocado, cacao, mango	Slope, erosion
VII	5 584.65	58.2	Permanent tree crops, timber and charcoal species	Slope, erosion
VIII	602.16	6.3	Leave in natural state	-
Total	9 599.05	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

## A.5.6. Fond d'Or River basin

### i. General characteristics

Located in the eastern part of the island (near Roseau and Cul de Sac) this basin contains the largest expanse of irrigable agricultural land. The parent material consists of agglomerate tuffs, andesite agglomerate and mud flow flanking the lower basin, while andesite agglomerate, andesite ash and altered andesite occur in the upper part. The average annual temperature is 26°C. The average annual rainfall is about 79 inches (2 007 mm) at La Caye in the lower river basin. The lower part of the basin is characterized by Tropical dry forest; further inland Tropical moist forest gives way to Subtropical wet

forest with changing altitude. The basin's total area is 9 992.76 acres (see Table A-15).

## ii. Soil conditions

The most valuable land in the basin is the flat alluvium, having land capability varying between classes I and IV. However, land clearing of the upper parts of the basin has created a high erosion hazard, causing silting of the drainage system in the valleys. The soils in the hills close to the coast are very shallow and rest on a cemented parent material, which creates conditions typical of drier areas; hence they are marginal for agricultural use. The hilly soils in the center of the river basin, especially around Mabouya, have high erosion hazards and are subject to slumping. The steeper soils of the upper river basin have erosion problems.

## iii. Environmental management

The upper limits of the watershed lie within the Forest Reserve; these lands should be maintained as natural forest and not cultivated.

Areas that are gently sloping and receive sufficient rainfall (Dernier Riviere, Fond Petit, Morne Panache) are suitable for the establishment of permanent crops. Erosion control is necessary where landslips and soil movement are a problem. Terracing may be tested in appropriate areas.

Only a small area is available for intensive cultivation of vegetables or annual crops. Under present economic conditions bananas are the most appropriate crop in classes I, II and III soils. Proper soil conservation and management are required for good yields.

Marginal dry coastal lands can be managed as natural forests supplying charcoal on a sustained basis. Reforestation should only be considered in denuded areas. Clearing natural forest to plant fast growing species is not an economically or ecologically wise policy.

**TABLE A-15. FOND D'OR RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	646.94	6.5	Food crops, bananas, sugar cane	None
II	231.6	2.3	Food crops, bananas, sugar cane	Drainage (slight)
III	245.5	2.5	Food crops, bananas, sugar cane	Drainage (moderate)
IV	78.74	0.8	-	-
V	81.83	0.8	Limited food crops, pasture, fruit trees	Drainage (severe)
VI	2 336.07	23.4	Citrus, avocado, cacao papaya, other permanent tree crops and limited semipermanent tree crops	Erosion, slope, land slipping

VII	6 069.46	60.7	Some permanent tree crops, timber and charcoal species	Land slipping, erosion
VIII	3 02.62	3.0	Leave in natural state	
Total	9 992.76	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

**TABLE A-16. CUL DE SAC RIVER BASIN LAND CAPABILITY**

Land capability class	Acres	Percentage of total basin area	Crop allocation	Limitation
I	776.63	6.9	Food crops, bananas, sugar cane	None
II	594.44	5.3	Food crops, bananas, sugar cane	Drainage (slight)
III	-	-	-	-
IV	98.82	0.9	Limited food crops, bananas, pasture	Erosion, drainage (severe)
V	75.66	0.7	Limited food crops, bananas, pasture	Erosion, drainage (severe)
VI	1 232.11	11.0	Mango, citrus, avocado, other tree crops	Erosion, slopes
VII	8 376.66	74.8	Permanent tree crops	Erosion, slopes
VIII	46.32	0.4	-	-
Total	11 200.64	100.0		

Source: Pretell, O., and J. Polius, "Land Capability Classification and Crop Allocation in Saint Lucia," OAS/Ministry of Agriculture Technical Report, Saint Lucia: October 1981. Oelsner, J., "Natural Resources and Agricultural Development: Water Resources", OAS Technical Report, *op. cit.*

## A.5.7. Cul de Sac River basin

### i. General characteristics

The basin is situated in the central western part of the island and covers 11 200 acres. It is the third largest river basin on the island, but has the largest extent of land suitable for irrigation. The river has its origin in the area with the highest rainfall. The greater portion of the basin lies in andesite ash and altered andesite. The average annual temperature is 26°C and the average annual rainfall varies from 80 inches (2 030 mm) to 150 inches (3 810 mm) in the headwaters. The basin is characterized by Tropical moist forest except for

the upper part near the headwaters, which is Subtropical wet forest and Subtropical rain forest (see Table A-16).

ii. Soil conditions

There are about 1 545 acres of land suitable for irrigation, of which 469 acres are suitable for intensive cultivation. The soil in the upper part of the river basin has erosion hazards. The slopes bordering the river basin are subject to erosion and sliding.

iii. Environmental management

The area of the Forest Reserve should be extended to include steeply sloping lands near the Barre de L'Isle to prevent cultivation, which would cause soil loss, and to provide a larger water catchment area under protection. These soils are highly erodible and should not be cultivated. Natural forests should be maintained for protective cover and wildlife habitat. Production forestry should be carefully managed in selected areas.

Erosion control is critical in areas which are otherwise suitable for tree crops and agroforestry. Charcoal production and management of the natural forest may provide some forestry products in appropriate areas. Natural vegetation should be kept on river banks to prevent slumping and soil loss.

Bananas and/or fruit tree crops can be successfully grown in alluvial soils. Irrigation may be necessary during the dry months. Before any intensive vegetable production is undertaken in the lower Cul de Sac valley, the problem of flooding and drainage must be resolved. Successful drainage operations in the lower valley are dependent on the adoption of compatible drainage systems by the oil transshipment terminal.

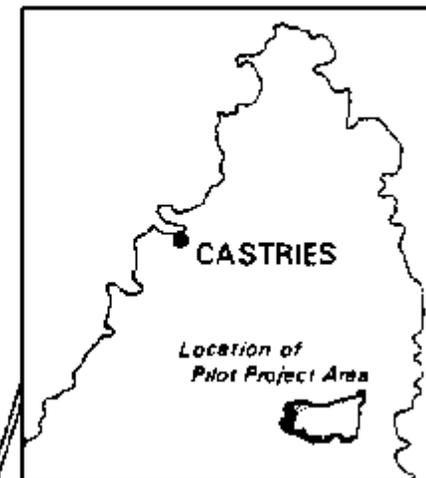
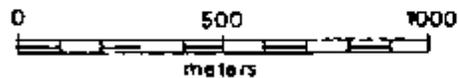


60°56'

# SAINT LUCIA

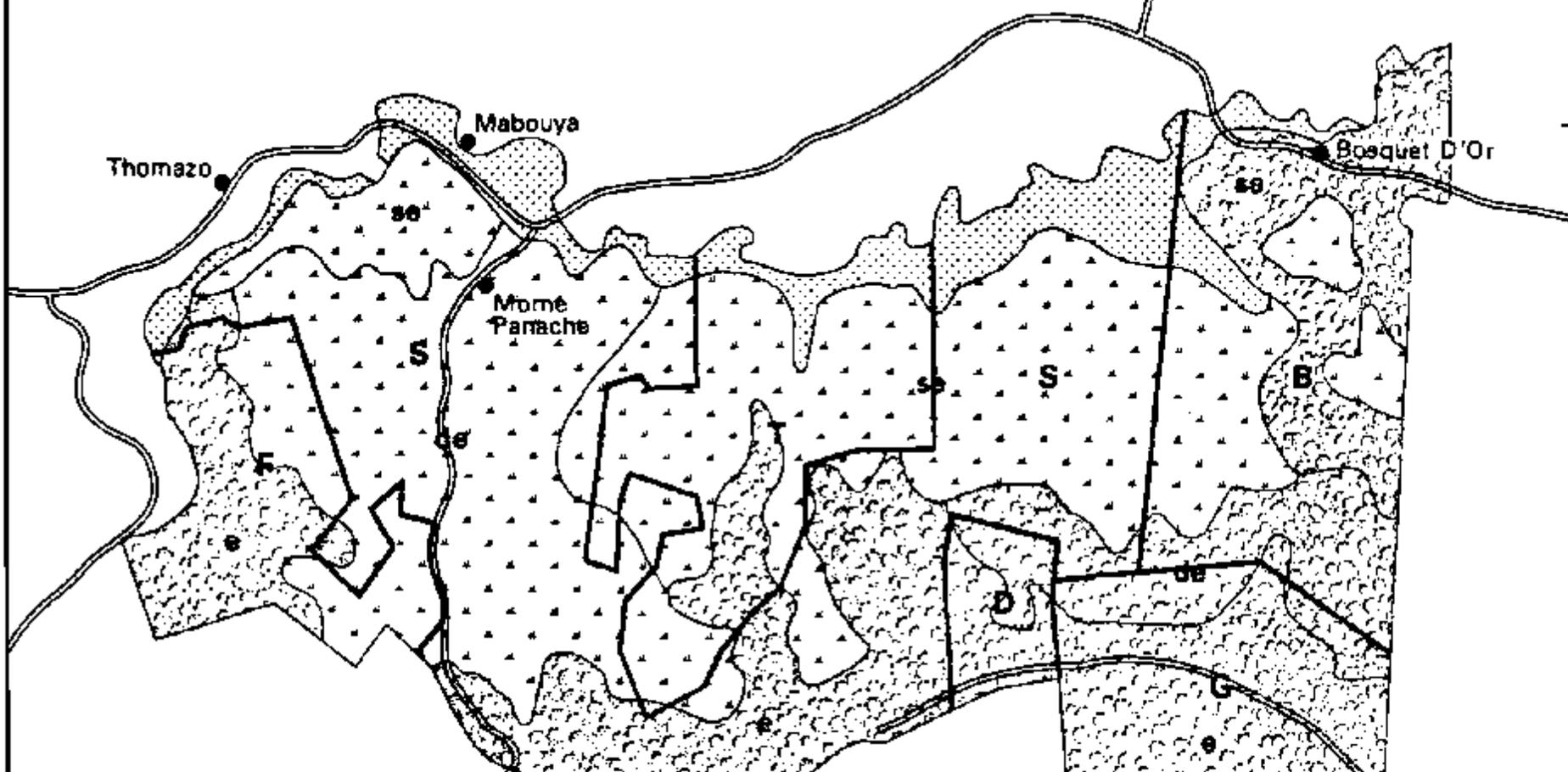
## Pilot Project Area Land Capability

Scale 1:25 000



● Grande Ravine

13°56'



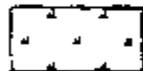


## LEGEND

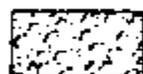
### LAND CAPABILITY CLASSES



**I-II** Suitable for all cultivation



**VI** Suitable for permanent crops with moderate conservation



**VII** Suitable for timber and forest, with moderate conservation

### Limiting factors:

- e** Erosion
- d** Drainage
- s** Shallow soils

### ESTATES

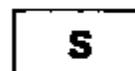
**B** Bosquet D'Or (Part of Landco Ltd. area)

**D** Dennery Farmco

**F** Fournier

**G** Glavier (Part of Landco Ltd. area)

**T** Theobald



**S** Parcels smaller than 25 acres



Estate boundary



Road



Village



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# Annex B. Water resources

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## [Summary](#)

### [B.1. General background](#)

### [B.2. Rainfall patterns](#)

### [B.3. Available flows at river basin level](#)

### [B.4. Demand at the river basin level](#)

### [B.5. Development potential at the river basin level](#)

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## Summary

The three objectives of this preliminary assessment of water resources are to evaluate existing information and ascertain its usefulness and relevance, to prepare a preliminary balance of water resources, and to make recommendations for water management.

The available maps and rainfall and climatological information were reviewed to identify contour lines, the river network and watersheds. Existing rainfall and baseflow information were analyzed to approximate the hydrological probability of flow occurrence in 28 river basins.

The following information deficiencies prevented a more substantial analysis: there are few operational rain gauge stations, so that complete rainfall statistics are lacking; the equipment at climatological stations is not standard, so that information is inaccurate; flow controls are not systematically located, so that the hydrological information is incomplete and inaccurate; and the lack of a water usage inventory precluded the preparation of an exact balance of water resources.

The limited information available permits the following statements about supply and demand. The Central Water Authority (CWA) has 25 intakes and the installed capacity to supply 3.4 million gallons per day (mgd) on the island. The Castries-Gros Islet urban area takes 2.25 mgd, Vieux Fort takes .5 mgd and the remainder is supplied to the rest of the country. The daily per capita demand in urban and rural areas is 48 gallons. In the hotels, 120 gallons per person per day are required. Banana boxing plants, numbering approximately 100 in the country, require between 3 200 and 28 000 gallons daily, depending on plant size; the plants usually operate two days a week. One million gallons a day are required to irrigate 200 acres (5 000 mgd per acre); irrigation is usually required for five months in the year. Land classes I-III (U.S. Conservation Service Land Classification System) have the best prospects for irrigation. A total of 5 034 acres requiring 25.7 mgd have been identified in 7 basins as being suitable for irrigation (see Table B-6).

Detailed analyses of water supply and demand are made for the Marquis, Roseau, Vieux Fort, Canelles,

Troumasse, Fond D'Or and Cul de Sac river basins. Recommendations for the use of surplus or provision for shortages are made.

## B.1. General background

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### [B.1.1. Objectives of the study](#)

### [B.1.2. Evaluation of basic information](#)

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#### B.1.1. Objectives of the study

There are very few sources of reliable information on water resources in Saint Lucia, which prevents a detailed analysis of the existing conditions and precise projections of long-term trends of water availability. The main objectives of this preliminary assessment of water resources in Saint Lucia are to evaluate the existing basic information, to ascertain its usefulness and relevance and to prepare a preliminary balance of water resources at the national level. In doing so, the study formulates recommendations for water management and development policies and identifies project proposals for short-term action.<sup>1</sup>

<sup>1</sup> Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo).

The following sections concentrate on the results of the balance of water resources for the various watersheds and discusses their development potential, matching supply with foreseeable water demands for urban, tourism, industrial and agricultural development. The recommendations for institutional and legal development for water resource management are summarized in Chapter 7 of this report.

#### B.1.2. Evaluation of basic information

##### i. Cartography

The 1:50 000 map scale (Edition 3, DOS, U.K., 1980) was used as the basis for calculations and analysis. This map contains contour lines at intervals of 200 feet; the river network; main, secondary and feeder roads and tracks; elevation bench marks referring to ground level; identification of beaches, cliffs, swamps and mangroves; and other detailed geographic data. For specific purposes (forestry coverage, cultivated areas, etc.) the 1:25 000 map scale (Edition 3, DOS, U.K., 1974) was used.

##### ii. Rainfall measurements

During the 1930's, there were 34 rain gauge stations in operation in Saint Lucia. This number was reduced to the present 15 stations during the early 1950's. Only six of the original stations are still functioning. Table B-1 indicates the distribution of the precipitation gauge network by river basin and the continuity of the measurements taken.

#### TABLE B-1. PRECIPITATION GAUGE NETWORK\*

<b>Basin or area</b>	<b>Name of precipitation gauge</b>	<b>Continuity Years Evaluation</b>
Marquis	Marquis Estate	33-80 Good
Marquis Babonneau		58-80 Good
Fond D'Or	Cardi La Ressource	80-
La Caye		41-80 Good
Ressource		41-45
Border		34-49
Rabot		36-48 Good
Ford Doux		36-40
Dennerly	Errard	35-
Prospect		33-48 Good
Fond Patience		51-80 Good
Fond Estate		72-80 Good
Troumasse	Mahaut	52-80 Poor
Troumasse Estate		33-69 Good
Quillesse		35-78 Good
Canelles	Edmund Forest	80-
Vieux Fort	Beause jour (V.F.)	33-80 Fair
Woodlands		33-54 Good
Retraite		33-42
Daubergour		33-34
Black Bay	Girand	33-48 Good
Black Bay		33-69 Fair
Piaye	Londonderry	33-60 Good
Balembouche	Morne Lezard	33-54 Good
Balembouche		41-70 Fair
Dorée	Park	33-68 Good
Choiseul	Fargue	48-79 Fair
Bath Nursery		50-80 Good
Belle Plaine		33-48 Good
L'Ivrogne	Union Vale	33-80 Good
	Beausejour (Soufr.)	33-48 Good
Soufriere	La Perle (Soufr.)	33-50 Good
	Ruby	33-48 Good

	La Dauphine	33-40
Roseau	Roseau	33-80 Good
	La Perle (Roseau)	33-
	Mont D'Or	33-50 Good
	Belair	33-54 Good
	Vanard	33-54 Good
Cul de Sac	Soucis	33-54 Good
	Crown Lands	33-51 Good
	Ravine Poisson +	33-36
	Barre de L'Isle	41-80 Good
Castries	Government House	45-80 Good
	Bol. Gdns.	33-41
	Barracks Vigie	33-42
Choc	Union	33-80 Good
	Choc	33-44 Good
La Brelotte or D'Orange	Trouya	77-80
	Corinth	33-53 Good
Northern Peninsula	Cap Estate	40-79 Fair
	Reduit	33-40
Southern Peninsula	Moule-a-Chique	33-67 Good
	Point Sable	33-38

\* Stations used in the analysis of water resources. Stations which started to operate during the last months of 1980 are excluded.

+ Ravine is a term used locally for tributary river.

Source: Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo).

### iii. Climatological information

There are only four climatological stations in operation in Saint Lucia and all are located in the coastal zone: one at Union Agricultural Station, one at Roseau Agricultural Station (WINBAN), and one at each of the two airports, Vigie and Hewanorra. The equipment in the Union and Roseau stations is similar. Both have a Type A evaporation pan, Campbell heliograph, actinometer, maximum and minimum thermometers, rain gauge, hygrometer, rain recorder and wind meter. In both cases the evaporation pan requires certain adjustments to conform to international standards: no painting, proper ventilation and leveling. It would be desirable to take 3 daily recordings. In the interior of the island at elevations above 100 feet the only available climatological information is for rainfall.

#### iv. Hydrological background

A significant restriction for water resource development and planning is the absence of systematic flow controls. In the past, various institutions have made water flow measurements but no permanent systematic hydrological information has been gathered for a list of all flow measurements taken in Saint Lucia (see Table B-7, at the end of this annex). Data have not been consistently collected over time; deficiencies in the existing information give an inaccurate picture of the hydrological behaviour of the watersheds. Nevertheless, by using the available information and making complementary flow measurements, it was possible to obtain an approximation of the availability of water resources in the island and to make a preliminary balance for the most important watersheds.

The configuration of the country's watersheds is defined by the location of the major elevations, which form a spine (La Barre de L'Isle) that runs south-southwest to north-northeast in the center of the island. Rivers that flow radially to the north and east have less pronounced gradients than those that flow to the Caribbean coast. Most rivers are rather short, the longest being 15 to 18 km in length. Some rivers, like the Roseau, have well defined high, medium and low courses, which have gradients ranging from 1:50 in the high course to 1:680 in the medium course and 1:6 000 in the delta.

## B.2. Rainfall patterns

The topography of Saint Lucia has an influence on rainfall patterns; there is high rainfall in the mountainous interior, while lands at the extreme north and south of the island get less than half as much rainfall. Table B-2 contains data on the average rainfall for 28 river basins; these represent 72 percent of the country's surface, omitting the very small watersheds of the northern section of the country.

**TABLE B-2. RAINFALL BY WATERSHED**

Basin No.	Name	Drainage area		Rainfall		Volume (hm <sup>3</sup> )
		acres	km <sup>2</sup>	in	mm	
1.	Salles	890	3.6	60.23	1 530	5.51
2.	Esperance	2 273	9.2	70.07	1 780	16.38
3.	Dauphine	1 409	5.7	69.68	1 770	10.08
4.	Marquis	7 512	30.4	88.18	2 240	68.09
5.	Fond D'Or	9 711	39.3	97.24	2 470	97.07
6.	Dennery	4 645	18.8	90.55	2 300	43.24
7.	Praslin	1 977	8.0	85.43	2 170	17.36
8.	Fond	4 472	18.1	106.69	2 710	49.05
9.	Volet	1 779	7.2	79.13	2 010	14.47
10.	Troumasse	7 586	30.7	119.68	3 040	93.32
11.	Micoud	2 298	9.3	76.77	1 950	18.52
12.	Canelles	4 028	16.3	101.18	2 570	41.89
13.	Vieux Fort	7 240	29.3	91.33	2 320	67.97

14.	Black Bay	3 583	14.5	74.01	1 880	27.26
15.	Piaye	2 768	11.2	92.91	2 360	26.43
16.	Balembouche	1 334	5.4	83.46	2 120	11.44
17.	Dorée	2 743	11.1	111.81	2 840	31.52
18.	Choiseul	2 273	9.2	89.36	2 270	20.88
19.	L'Ivrogne	1 433	5.8	87.00	2 210	12.81
20.	Soufriere	3 954	16.0	109.84	2 790	44.64
21.	Canaries	3 410	13.8	108.26	2 750	37.95
22.	Grand Riviere de L'Anse La Raye	2 174	8.8	106.69	2 710	23.84
23.	Petite Riviere de L'Anse La Raye	1 661	4.7	88.18	2 240	10.52
24.	Roseau	11 861	48.0	120.47	3 060	146.88
25.	Cul de Sac	9 563	38.7	111.02	2 820	109.13
26.	Castries	1 137	4.6	90.94	2 310	10.62
27.	Choc	3 410	13.8	87.79	2 230	30.77
28.	La Brelotte	2 397	9.7	72.04	1 830	17.75

Note: See Table A-7 for land capability characteristics.

Source: Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo). Table 8.

The evaluation of water resources for the main river basins based on yearly average values of rainfall presents severe constraints, given the small size of the watersheds (they never exceed 48 km<sup>2</sup>, 11 860 acres). The use of monthly values also presents limitations, but because of the scarcity of information. They were considered acceptable for this preliminary evaluation of water resources.

Statistical analysis shows that Saint Lucia receives a recordable level of rainfall every month. To identify the probabilities of occurrence of the recorded rainfall levels and to establish the normal distribution throughout the year, six stations were selected as representative of the rainfall regime at the most important locations and most significant elevations on the island: Barre de L'Isle, Troumasse, Marquis, Quillesse, Roseau and La Fargue.

Table B-3 contains the monthly values of rainfall (maximum, minimum and normal) for the selected stations but does not reflect the periods of drought, which can last up to 45 days, giving low run-off in watercourses due to the small size and lack of regulating capacity of the river basins. Some dry up completely during the dry season.

### **B.3. Available flows at river basin level**

The analysis will concentrate on the 28 river basins identified in Table B-2. While no water flow measurement stations exist, in the past some measurements have been taken and stage statistics taken during the dry season at three stations (Petite Riviere du Vieux Fort, Grande Riviere du Vieux Fort at

Woodland and at Boxing Plant) were converted to flow values. This information does not permit a precise identification of available flows and their reliability. It is also not possible to make a frequency analysis of monthly and daily flow values as required by the small size of the watershed. As a substitute, the available information was analysed to determine the minimum observed base flows for each watershed, correlating these values with the monthly rainfall data which would have given the flow. In this way an approximation of the hydrological probability of occurrence was obtained. For these purposes, metered discharge values were transformed into natural discharge values (values without alteration from upstream intakes). Table B-4 summarizes the results of this exercise, showing base flows per watershed with a high probability of occurrence.

## B.4. Demand at the river basin level

No water usage inventory has been taken for Saint Lucia. Table B-5 summarizes current water intakes for different river basins; background information was obtained from the Saint Lucia Central Water Authority (CWA). The columns "CWA Maximum Intake" contain the maximum installed pump capacity.

Water diverted by CWA is used for both domestic and industrial purposes. Present water requirements are approximately 48 gallons/person/day (160 liters/second/person/day) in the rural and urban areas and 120 gallons/room/day (63 liters/second/room/day) for the hotels. Banana boxing plants consume between 3 200 and 28 000 gallons/day, depending on their size, and normally operate twice a week. It is estimated that some 100 boxing plants are currently in operation.<sup>2</sup> Field packing technology, currently being introduced in Saint Lucia may change these estimates.

<sup>2</sup> Madramootoo, C.A. and H.M. Sanchez, "A Coordinated and Unified Approach to the Development of Water Resources in Saint Lucia," Castries, December 1980 (mimeo).

### TABLE B-3. MONTHLY RAINFALL PARAMETERS IN SELECTED RIVER BASINS

Source: Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo), Table 9.

### **TABLE B-4. NATURAL BASE FLOWS DETECTED WITH HIGH PROBABILITY OF OCCURRENCE**

Basin	Station	mgd	l/s	l/s	prob km	Observations %
Marquis <sup>1</sup>	Sorciere N°1	0.039	2	9.1	81	
	Sorciere N°2	0.005	0.3	0.48	83	Conserv. req.
	Piton	0.017	0.9	2.8	65	
	Joseph	0.010	0.5	2.6	65	
	Louisie	0.011	0.6	1.8	65	
	Marquis	0.195	10	3.6	81	
	Babonneau	0.028	1	0.33	83	Conserv. req.
Roseau	Roseau 700 ft	0.98	52	3.7	84	
	Roseau a. jct.					

	Millet	2.93	150	8.3	90	
	Millet a. jct.					
	Roseau	0.98	43	5.0	90	
	Sarot <sup>2</sup>	3.62	163	5.0	90	
	Roseau Factory					
	(WINBAN)	4.44	233	5.9	89	
Fond D'Or	Dernier, Ressource	1.98	104	8.4	98	
	Mabouya, Bona Vista	3.44	1.81	17.0	98	
	Bosquet D'Or	5.36	282	9.0	98	
	Mabouya, Fon D'Or	3.96	208	14.5	98	
Praslin	Mamiku	0.85	45	6.2	86	
Fond	Bridge	1.82	95	6.1	75	
Troumasse	Boxing Plant	4.73	248	9.2	75	
Cul de Sac	Geest pump	2.25	119	3.8	68	
	Ravine Poisson	0.26	13.7	2.8	75	
Choc	Union	0.29	15	1.8	90	
Dennery	St. Joseph Estate	1.37	72	5.6	86	
Vieux Fort	Woodland	1.00	52.4	11.3	98	
	Boxing Plant	1.73	91.2	4.9	98	
Petite	Above junction					
Riviere	Grande Riviere	0.51	26.7	5.7	98	
	At junction of Petite + Grande	2.25	118	5.1	98	

<sup>1</sup> Indicated are minimum recordings taken at different times. As shown in Table B-7, CWA abstracted on April 17, 1963, the most unfavourable or lowest combination which approximated 0.5 million gallons per day (mgd).

<sup>2</sup> In the driest years, such as 1977 (January-May), the flow could decrease to 2.6 mgd (4.2 l/s/km<sup>2</sup>) as estimated by CWA.

Source: Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo). Table 10.

There are currently 25 water intakes, of which the seven located in the Marquis basin, the three at Choc (2 wells and one surface intake), two at Cul de Sac and one at Roseau. All supply water to the Gros Islet-Castries urban corridor (see Table B-5). The CWA has the installed capacity to supply 3.4 million gallons per day (mgd) on the island: 2.25 mgd to the Gros Islet-Castries area, .5 mgd to Vieux Fort and the remainder to the rest of the country.<sup>3</sup>

<sup>3</sup> It should be noted that the figures refer to installed pump capacity at 100 percent

efficiency. Some pumps, like those at Talvern and Marquis, are currently operating at 25 to 40 percent efficiency. See Hughes, P., Report on Available Hydrological Data for the Marquis Catchment Area and Possible Modifications to the Existing Hill-20 Supply System to Minimize Pumping Cost, Jamaica, June 1978 (mimeo).

It is estimated that about 500 acres (200 ha) are currently under irrigation, with an approximate consumption of water of 300 mgd. Assuming a high efficiency rate for irrigation, approximately 2.4 inches/month is required to irrigate one acre of land (150 mm-ha/month).<sup>4</sup> On the average, 1 mgd are required to irrigate 200 acres; irrigation is required generally during the first 5 months of the year.<sup>5</sup>

<sup>4</sup> Based on an evapotranspiration rate of approximately 6 inches per month.

<sup>5</sup> Bannie & Partners, Saint Lucia, Water Resources Development Study; Stage III, Saint Lucia, June 1978 (mimeo); Madramootoo, C.A. and H.M. Sanchez, op. cit.

The areas with the best prospects for irrigation are those in land classes I to III which have non-erosive flat land: 0-5 percent slope, good soil depth, moderate to slow filtration capacity, moderate to high productive capacity and manageable clay texture (in some areas surface drainage may be required). A total of 5 034 acres (2 037 ha) of land have been identified as having the highest potential for benefitting from irrigation. For this purpose, a total of 25.17 mgd of water will be required (see Table B-6).

**TABLE B-5. CURRENT WATER INTAKES**

	Basin	Location of intake	CWA max	intake	CWA min	intake	Irrigation	
			mgd	l/s	mgd	l/s	mgd	l/s
1.	Sallee							
2.	Esperance							
3.	Dauphine	Upstream bridge road						
		La Guerre - La Borne	0.5	3	0.02	1		
4.	Marquis	Babonneau + Marquis	0.70	37	0.5	26	0.23 <sup>1</sup>	12
5.	Fond D'Or	Ravine Cochon + Ravine						
		Basin Noir	0.16	8	0.16	8	E	
		Ravine Saut	0.10	5	0.05	3	E	
6.	Dennery							
7.	Praslin							
8.	Fond	Ravine Calfoure	0.04	2	0.04	2	E	
9.	Volet							
10.	Troumasse	Affluent near to Latille					0.09 <sup>2</sup>	5

11.	Micoud							
12.	Canelles	At 1 000 ft a.s.l.	0.20	10	0.20	10	E	
13.	Vieux Fort	Ressource + upstream						
		Chateau Bel Air	1.50	80	0.40	21	0.53 <sup>1</sup>	28
14.	Black Bay						E	
15.	Piaye							
16.	Balembouche						E	
17.	Dorée		0.10	5	0.071	4		
18.	Choiseul							
19.	L'Ivrogne	French Canal, Deville Rv.		7		?	1	52
20.	Soufriere	3 Springs	0.15	8	0.10	5	E	
21.	Canaries		0.035	2	0.035	2		
22.	Grande Riviere de L'Anse La Raye	Mt. Plaisant Estate	0.03	2	0.03	2		
23.	Petite Riv. de L'Anse La Raye							
24.	Roseau	Sarot	1.50	79	0.54	28	E	
25.	Cul-de-Sac	Ravine Poisson	0.80	42	0.26	14	E	
26.	Castries							
27.	Union		0.25	13	0.25	13	E	
28.	La Brelotte							
	TOTAL		4.7	296	2.6	139	0.88	

<sup>1</sup> A Coordinated and unified approach to the Development of Water Resources in Saint Lucia (1980).

<sup>2</sup> WINBAN

E: Currently existing irrigation. Amount of water extracted is unknown.

Source: Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo), Table 11.

**TABLE B-6. IRRIGABLE LANDS AND WATER DEMAND IN SELECTED RIVER BASINS**

Basin	Ha	Acres	mgd
Marquis	153	378	1.89
Roseau	539	1 332	6.66
Troumasse	121	299	1.50

Fond D'Or	473	1 169	5.84
Canelles	101	250	1.25
Cul de Sac	584	1 443	7.22
Vieux Fort	66	163	0.81
Total	2 037	5 034	25.17

Source: Oelsner, J., "Saint Lucia, Water Resources," OAS Technical Report, Saint Lucia, May 1981 (mimeo). Table 12.

## B.5. Development potential at the river basin level

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[B.5.1. Marquis River basin](#)

[B.5.2. Roseau River basin](#)

[B.5.3. Vieux Fort River basin](#)

[B.5.4. Canelles River basin](#)

[B.5.5. Troumasse River basin](#)

[B.5.6. Fond d'Or River basin](#)

[B.5.7. Cul de Sac River basin](#)

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On the basis of the information in the preceding sections and considering existing water development projects, a basic evaluation of water resource development potential is presented for the most important and promising watersheds, including those of the Marquis, Roseau, Vieux Fort, Canelles, Troumasse, Fond D'Or and Cul de Sac. Lack of reliable information prevents a valid analysis of the other watersheds.

### B.5.1. Marquis River basin

Currently CWA intakes draw off all available base flow of the Babonneau subbasin at points upstream of the junction with the Ravine Talvern and the base flow of the Marquis river upstream of its junction with the Ravine Chassin. Table B-5 shows that the installed capacity is approximately 0.7 mgd, and to date the most critical observed flow is 0.5 mgd (see footnote, Table B-4). Consequently, the available flows are those from other subbasins located downstream of CWA's intakes.

The existing information indicates that Marquis Estate is willing to irrigate 60 acres of land, demanding 0.3 mgd, apart from the 0.23 mgd that is currently used for irrigation of lands that form part of the 378 acres identified with irrigation potential in the river basin. Additionally, the Babonneau Poultry Cooperative will demand 0.3 mgd for its boxing plants, water for livestock and small farm irrigation. Therefore, water demand can be estimated at 0.6 mgd within the basin. To meet these demands, water regulation works will be necessary. Three possibilities are open in the short term:

- i. Up to 0.327 mgd (17 l/s) might be obtained from the Babonneau River by using a collector canal or pipelines up to 9 km in length with intakes located on the left bank of the river at 175 feet and reaching Ravine Peauyane.

- ii. Similarly, about 0.212 mgd could be obtained by collecting the affluence on the right bank of the Marquis river constructing a canal of 5 km with intakes installed at 150 feet.
- iii. Water flows from the Dauphin River could be diverted to the Marquis watershed by means of a tunnel of 1 km starting in the Dauphin at an elevation of 200 feet and ending in the Ravine Peauyane, thus increasing its flow by 0.06 mgd.

These additional flows will meet demand during the dry season (January-May). To fully assess the feasibility of these proposals, the installation of flow measurement stations on the Marquis River at L'Hermitage and on the Dauphin River at 200 feet asl is recommended. It would be also desirable to re-establish the flow controls at the pumping and gravity intake stations on the Babonneau and Marquis rivers.

This study has established the limited water availability in the Marquis River basin, which depends heavily on the infiltration and ground storage capacity of the catchment areas of the rivers, creeks and springs currently in use. Efficient and equitable utilization of the water resources depends on a strict demarcation of the river basins. This is necessary for the Forestry Service to be given legal and financial power to assure the conservation of forest resources of the basins. This action will be of prime importance to the river basins that feed Sorciere N° 2 and the Babonneau intake, as observed in Table B-4.

## B.5.2. Roseau River basin

Although the Roseau River basin has important land resources (more than 1 300 acres of irrigable land) its development has been hampered by a lack of sufficient water. At present, CWA takes 1.50 mgd from the Roseau River at Sarot; additionally, some 0.53 mgd are being extracted to irrigate lands in the lower parts of the basin. The minimum natural flow measured at Sarot is 3.62 mgd, but CWA estimates that in the driest years this flow can decrease even further, to 2.6 mgd.

In the near future, CWA is considering increasing the amount of water drawn at Sarot from the present 1.50 mgd to 2.1 mgd to meet future demands in Castries.<sup>6</sup> The Saint Lucia Model Farms Resettlement Project will require additional water for irrigating 300 acres of bananas and vegetables, demanding an additional 1.5 mgd of water over current use.

<sup>6</sup> Tourism alone will require 70 000 additional gallons per day over current needs in the next 5 years if it expands according to projections. See OAS, Tourism Development Program, "Five Years Development Plan of Tourism, Saint Lucia," Technical Document, October 1981 (mimeo).

Construction of a stationary reservoir located outside the Roseau River bed in the Cender de Feu valley is being considered to satisfy total projected demand. This reservoir will have an initial capacity of 196 mg (0.7 hm<sup>3</sup>, Alternative A) or 318 mg (1.4 hm<sup>3</sup>, Alternative B), to be increased at a later phase to 327 mg (1.5 hm<sup>3</sup>) or 451 mg (2 hm<sup>3</sup>), respectively. The dam would collect the water by gravity from the Roseau near its junction with the Millet River and simultaneously serve CWA's requirements at Sarot and the irrigation needs of the lower Roseau. The cost of the dam (1979 prices) would be EC\$10 800 000 (Alternative A) or EC\$20 100 000 (Alternative B). To ensure proper siting and design of the dam, a more detailed study of the hydrological behaviour of the basin is required. A permanent flow measurement control has been installed in the Roseau downstream from its confluence with the Millet.<sup>7</sup> Further strong

protection measures are needed at the head of the watershed.

<sup>7</sup> As part of the EDF's Project of Technical Assistance to the Land and Water Use Unit of the Ministry of Agriculture.

An alternative to the construction of a dam is to increase the Roseau River's flow by transferring some of the flows available in the upper Troumasse basin. This alternative will be discussed in Section B.5.5.

### **B.5.3. Vieux Fort River basin**

Originating in a well preserved forest area that has one of the highest rainfall levels, over 150 inches per year, the Vieux Fort River basin is formed by two principal rivers, the Petit Riviere du Vieux Fort and the Grand Riviere du Vieux Fort, the latter carrying up to three times the flow of the former.

Recently, CWA increased its pumping capacity to 1 mgd at the headwaters of the Grande Riviere du Vieux Fort upstream from Chateau Bel Air. There are several intakes for domestic, industrial and agricultural use nearby at the junction of the Petite and Grande Riviere, drawing an estimated 1.3 mgd. <sup>8</sup> Because the minimum natural base flow estimated from existing data is 2.25 mgd, any growth in demand in the future will have to be met through regulation works or by transferring water from other watersheds.

<sup>8</sup> Great Northern Capital Corporation, "Water Resources Study for Vieux Fort Area," Castries, 1973; Madramootoo, C.A., and H. M. Sanchez, op. cit.

Future short-term demand for water will arise from the 40 acres of land to be irrigated as part of the development of the experimental livestock station at Beausejour, which will require 0.2 mgd.<sup>9</sup> A similar amount will be required for irrigation, livestock and the operation of boxing plants in the Laborie-Augier area. Tourism development in the area is expected to demand an additional 0.05 mgd.<sup>10</sup>

<sup>9</sup> Madramootoo, C.A., and H.M. Sanchez, op. cit.

<sup>10</sup> OAS, Tourism Development Program, op. cit.

Including water demands for new industries and the growth of population, new demands for water will amount to 0.5 mgd within the next five years. In the long term it is estimated that up to 6.0 mgd will be required in the area; however, this projection assumes high population targets for the area (nearly 80 000 persons) and sharp increases in tourism and industrial development.<sup>11</sup>

<sup>11</sup> Underwood, McLellen and Associates, Ltd. - UMA, 1973.

Construction of a reservoir on the Vieux Fort River upstream from Tourney is under consideration; it would supply between 6 and 7 mgd. At present, there is no justification for building such a facility. Instead, it is recommended that transferring water flows from the headwaters of the Canelles and/or Troumasse be studied as a viable low cost alternative. There is an urgent need to have flow control upstream from the existing intakes of the lower reach of the Vieux Fort or, alternatively, on the Petite and Grande Riviere du Vieux Fort.

## B.5.4. Canelles River basin

Like the Vieux Fort, the Canelles River originates in one of the areas with highest rainfall in the country. Indeed, 36 percent of the total area of the Canelles basin is above 600 feet above sea level and receives nearly half of the watershed's inflow, equivalent to 3 510 mm (20.5 hm<sup>3</sup>).

According to the available background information, the forest cover of the headwaters area above the Grande Riviere du Vieux Fort at Woodlands has the same characteristics as exist over the 600 feet level in the Canelles basin. It seems that the geological characteristics are also the same.

A specific base flow at Woodland has been estimated at 11 l/s/km using flow data from 1975. This value is lower than the lowest value detected in 1971. From this figure, available flows of 1.25 mgd (66 l/s) can be estimated. Discounting the installed intake capacity by CWA, the availability is still 1 mgd.

To irrigate 250 acres of suitable land using the Canelles watershed, an estimated 1.25 mgd will be required. Other competitive demands on the waters of this watershed may arise from the need to supplement the flows of the Grande Riviere du Vieux Fort. There is the alternative of drawing 0.5 mgd (26 l/s) at an altitude of about 500 feet above sea level, diverting this flow by a pipeline or canal of 3 km to another branch of the Canelles river, and from there through a tunnel of 1.5 km (4 900 feet) to the Grande Riviere du Vieux Fort. Under these conditions it is probable that at least 0.5 mgd will be available to irrigate the 250 acres identified downstream.

No hydrological information is available for the Canelles basin. To obtain realistic figures it is recommended that a flow control be installed at the Canelles River near 200 feet asl, or close to the bridge which connects De Mailly with Desruisseau. Additionally, strict control is required to maintain the forest cover over 500 feet asl.

## B.5.5. Troumasse River basin

According to the scarce background information available on this river basin, which records one of the highest specific flows during the low water period, the water resources of this basin are not being utilized at this time. Only recently has 0.09 mgd (5 l/s) been extracted from one of the branches of the Canelles River for irrigation purposes. According to the estimate shown in Table B-6, approximately 299 acres can be irrigated, requiring 1.5 mgd.

This basin has extremely favourable headwaters conditions for resource development. The area above 600 feet comprises 53 percent of the basin and receives 64 percent of the average yearly rainfall - 3 645 mm (50 hm<sup>3</sup>). Applying a rationale similar to the one used in Section B.5.4, it is possible to estimate an available base flow of 3.5 mgd or 185 l/s.

This allocation would be sufficient to cover the future demands envisioned by CWA for the Roseau at Sarot and also the requirements for the "Saint Lucia Model Farms" irrigation project. These requirements fluctuate between 2.1 and 3.6 mgd. Another alternative is to make use of all or part of these resources in the Vieux Fort River basin, which could double the available water upstream from Resource. A third alternative is for the two basins to share the resources in accordance with their requirements and priorities.

Water could be transferred from the Troumasse River basin to the Roseau River basin through a 1.9 km

(6 200 feet) tunnel starting at 650 feet asl at the junction of the Quillesse Ravine and the Troumasse or through a combination of a canal or pipeline and a tunnel at a slightly higher elevation.

To transfer the water flow from the Troumasse to the Vieux Fort, the intake work should be located 650 feet asl. The flow would be transported through a canal or pipeline for 3-4 km to Ravine Noel, another branch of the Troumasse, and then through a tunnel of 9 km (3 000 feet) to the Canelles. This would increase the flow of the Canelles, which would then be diverted at 500-plus feet, as indicated previously (Section B.5.4).

It is recommended that a water measurement control be installed on the Troumasse River at Mahaut near the bridge and that the forest resources of the Troumasse headwaters, which at present are threatened with destruction, be preserved.

## **B.5.6. Fond d'Or River basin**

This river basin is formed by the Derniere Riviere and Grande Riviere subbasins of the Mabouya River. Currently, the CWA is diverting 0.16 mgd of the Ravine Couchon and Ravine Basin Noir for domestic and industrial uses. Additionally, other intakes for irrigation are known to exist but neither the number nor the amount drawn is currently known. From the flow measurements for the dry season of the years 1979, 1980 and 1981, it is estimated that the available base flow in the Derniere Riviere subbasin is approximately 1.8 mgd and that the base flow of the Mabouya between the Bona Vista and Bosquet D'Or rivers varies between 3.4 and 5.4 mgd.

Together with the Roseau and Cul de Sac basins, the Fond D'Or basin contains the best agricultural lands in the country. It is estimated that up to 1 170 acres could be irrigated, demanding 5.8 mgd.

A reservoir fed with diversions located at 160 feet asl on the Ravine Coauchon and Derniere Riviere, with a capacity of 1.2 hm<sup>3</sup> near the Grande Ravine, has been proposed to provide for future water demands.<sup>12</sup>

<sup>12</sup> Bannie and Partners; Water Resources Development..., *op. cit.*

An alternative solution would be to consider construction of a 12 km collector canal on the left bank of the river at 50 feet asl starting at Mabouya near Thomazo. The canal could divert the flow of the Derniere Riviere after its junction with the Ravine Basin Noir and other creeks, before it arrives at the last branch of the Fond D'Or northeast of the Dennery Factory. This canal could be constructed in stages, starting at an intermediate point that could attend to the development of most of the favourable irrigation areas. This would permit amortizing the investments in shorter periods.

It is recommended that the following flow measurement stations be installed: Mabouya after its junction with the Thomazo river and the Derniere Riviere after its junction with the Petite Riviere. It will also be necessary to make a survey of all the existing irrigation intakes and to expand the defined protection limits of the tributary river basins, which are adequate but not ideal. It might be advisable to include some of the land situated between 200 and 800 feet.

## B.5.7. Cul de Sac River basin

This river basin contains the largest single area of irrigable lands, 1 443 acres, which will demand approximately 7.0 mgd of water. Currently, the CWA has in operation an installed pump capacity capable of diverting 0.8 mgd at the headwaters, (13 percent of the basin area) of the Cul de Sac at Ravine Poisson. Taking this into consideration, it is evident that the available base flow can only meet 20 percent of the potential water demand. To fully develop the potentially irrigable land, one or more reservoirs will be required.<sup>13</sup>

<sup>13</sup> Ibid.

### [TABLE B-7. FLOW MEASUREMENTS](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 1\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 2\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 3\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 4\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 5\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 6\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 7\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 8\)](#)

### [TABLE B-7. FLOW MEASUREMENTS \(cont. 9\)](#)



N° RIVER BASIN or AREA	DRAINAGE AREA		RAINFALL		VOLUME		LAND CAPABILITY CLASS (ACRES)							
	km	acres	in	mm	hm	I	II	III	IV	V	VI	VII	VIII	
1.0 SALLEE	5.03	1242.90	60.23	1530	7.69	-	-	32.42	208.44	208.44	157.48	603.72	32.40	
1.1 LAPINS AREA	1.53	378.28	60.00	1520	2.27	-	-	-	-	-	-	378.28	-	
2.0 ESPERANCE	9.40	2323.71	70.00	1775	16.70	-	-	89.55	29.34	140.50	335.04	1729.28	-	
2.1 TROU GRAUVAL AREA	4.00	988.16	60.00	1520	5.90	-	-	-	-	-	154.40	833.76	-	
3.0 DAUPHIN	5.65	1395.77	69.68	1770	10.00	-	-	-	-	84.92	101.90	1208.95	-	
4.0 MARQUIS	30.96	7650.12	88.18	2240	69.35	256.30	49.41	72.57	-	24.70	2178.58	4784.46	284.10	
4.1 LOUVET - GRAND ANSE AREA	28.37	7008.22	75.00	1905	53.00	-	38.60	-	-	284.10	211.53	6270.18	203.81	
5.0 FOND D'OR	40.45	9992.76	97.24	2470	100.00	646.94	231.60	245.50	78.74	81.83	2336.07	6069.46	302.62	
5.1 RAVINE TROU A L'EAU AREA	1.62	401.44	72.00	1830	2.93	-	-	-	-	-	18.53	382.91	-	
6.0 DENNERY	19.35	4760.54	90.55	2300	44.53	165.21	-	77.20	-	32.42	800.95	3484.04	200.72	
6.1 RIVIERE DES TROIS ISLETS AREA	10.19	2518.26	72.00	1830	18.50	44.78	-	-	-	40.14	545.03	1755.53	132.78	
7.0 PRASLIN	7.91	1954.70	85.43	2170	17.16	12.35	-	-	-	13.90	180.65	1514.66	233.14	
7.1 PATIENCE AREA	7.62	1883.67	70.00	1650	12.57	12.35	-	-	-	163.66	611.42	1094.70	1.54	
8.0 FOND	17.78	4392.68	106.69	2710	51.33	186.82	-	-	-	131.24	515.70	3060.21	498.71	
8.1 LUC POINT AREA	0.19	46.32	60.00	1520	0.28	-	-	-	-	-	-	46.32	-	
9.0 VOLET	7.64	1886.77	79.13	2010	15.35	-	-	46.32	-	49.41	903.24	860.01	27.79	
10.0 TROMASSE	30.45	7525.66	119.68	3040	118.00	400.00	-	55.50	84.60	277.90	1901.20	4152.20	654.26	
11.0 MICOUD	9.06	2238.60	76.77	1950	23.29	46.32	-	-	-	69.48	648.48	1440.35	33.97	
11.1 RAVINE BETHEL AREA	2.88	711.78	65.48	1663	4.79	-	-	-	-	12.35	58.67	640.76	-	
12.0 CANELLES	16.95	4188.87	101.18	2570	43.57	240.86	-	-	-	15.44	631.50	3301.07	-	
12.1 SAVANNES BAY - VIEUX FORT	21.25	5249.60	7.72	1553	33.00	7.72	-	-	-	656.20	378.28	2640.24	1567.16	
13.0 VIEUX FORT	29.17	7205.85	91.33	2320	67.67	208.44	-	-	29.34	805.97	1347.91	4781.77	32.42	
14.0 BLACK BAY	14.92	3685.23	74.01	1880	28.05	67.94	-	58.67	-	656.20	208.14	2688.77	35.51	
14.1 LABORIE BAY AREA	3.01	744.21	66.44	1688	5.08	-	-	4.63	-	38.60	38.60	660.84	1.54	
15.0 PIAYE	14.53	2847.14	82.91	2360	27.21	-	-	6.17	30.88	335.05	154.40	2291.30	29.34	
16.0 BALEMBOUCHE	4.46	1100.88	83.46	2120	9.46	-	-	-	46.32	271.75	532.68	250.13	-	
17.0 DOREE	10.31	2547.60	111.85	2840	29.25	-	-	177.56	88.00	259.39	220.79	1588.79	213.07	
17.1 LA FARGUE AREA	1.46	362.84	69.30	1760	2.57	-	-	-	-	223.88	-	138.96	-	
18.0 CHOISEUL	19.30	4767.87	89.36	2270	43.81	-	-	125.06	33.97	120.43	1455.99	3030.88	1.54	
19.0 L'IVROGNE	5.45	1347.55	87.00	2210	12.08	-	-	123.52	152.86	-	177.56	553.93	339.68	
19.1 ANSE DES PITONS AREA	6.41	1582.60	96.18	2440	15.64	-	-	58.67	15.44	10.81	460.11	579.00	458.57	
20.0 SOUFRIERE	15.70	3878.54	109.84	2790	43.80	-	-	121.98	154.40	-	543.49	2342.25	716.42	
20.1 MAHAUT	13.21	3264.03	81.89	2080	27.50	-	-	-	67.94	-	307.27	2703.54	185.28	
21.0 CANARIES	14.49	3558.14	108.26	2750	39.85	40.14	-	-	-	-	-	2018.78	1499.22	
21.1 ANSE COCHON - ANSE GALET	12.48	3134.32	80.44	2040	25.50	23.16	-	-	-	-	186.82	2669.58	254.76	
22.0 GRAND RIVIERE DE L'ANSE LA RAYE	9.03	2231.08	106.69	2710	24.47	98.82	-	-	-	-	248.58	1482.24	401.44	
23.0 PETITE REVIERE DE L'ANSE LA RAYE	4.85	1198.15	88.18	2240	10.86	13.90	-	13.90	-	20.07	393.72	756.56	-	
23.1 ANSE PILORI AREA	0.71	174.47	65.75	1670	1.19	-	-	-	-	-	7.72	166.75	-	
24.0 ROSEAU	48.53	11989.17	120.47	3060	148.50	753.47	404.53	121.99	27.79	3.09	1440.55	7923.81	1313.94	
24.1 MARIGOT AREA	4.59	1134.84	74.62	1895	8.70	-	7.72	30.88	-	23.16	123.52	949.56	-	
25.0 CUL DE SAC	45.34	11200.14	111.02	2820	127.86	776.63	594.44	-	98.82	75.16	1232.11	8376.66	46.32	
25.1 COUBARIL ESTATE AREA	3.25	720.00	71.23	1800	5.88	-	-	-	-	-	225.00	466.00	29.00	
26.0 CASTRIES	5.19	780.68	90.94	2310	11.82	-	-	-	-	13.90	200.13	566.65	-	
26.1 VIGIE AREA	3.81	942.00	80.94	2055	9.37	-	-	39.50	-	87.50	79.00	701.50	34.50	
27.0 CHOC	13.59	3358.20	87.79	2230	30.30	114.26	-	94.18	33.97	140.50	1006.69	1858.98	109.62	
28.0 BOIS D'ORANGE	11.03	2730.16	72.04	1830	24.60	-	49.41	169.84	-	172.93	599.07	1738.91	-	
28.1 REDUIT - CAP AREA	15.15	3742.65	60.00	1520	22.70	-	46.32	69.48	-	265.57	634.58	2428.71	297.99	
Total	602.87	148967.15				4116.41	1422.03	1835.09	1180.85	5810.59	24493.08	99935.94	10173.16	
Percentage of total area	100					2.76%	0.94%	1.23%	0.79%	3.90%	16.44%	67.08%	6.83%	

Name of River Basin or Area	Land Capability Class	Percentage of Total River Basin Area	Soil Characteristics					Slope Range (%)	Rainfall
			Fertility	Stoniness	Drainage	Depth	Erosion Hazard		
Roseau River Basin	I	6.3%	High	Low	Good	Deep	Low	0- 5	Moderate
Fond D'Or River Basin	I	6.5%	Medium	Low	Moderate	Deep	Low	0- 5	Moderate
Fond D'Or River Basin	II	2.3%	Medium	Low	Poor	Deep	Low	5-10	Moderate
Bois D'Orange River Basin	III	6.2%	High	Low	Poor	Shallow	Low	0- 5	Moderate
Doree River Basin	III	7.0%	Medium	Low	Good	Deep	Moderate	10-15	Moderate
Piaye River Basin	IV	1.1%	Medium	Moderate	Good	Shallow	Moderate	10-15	Low
Soufriere River Basin	IV	4.1%	Medium	Moderate	Good	Deep	Moderate	10-15	Moderate
Patience River Basin	V	9.1%	Medium	Low	Poor	Shallow	Moderate	10-15	Moderate
Balambouche River Basin	V	24.7%	Medium	Moderate	Poor	Shallow	High	10-15	Low
Choiseul River Basin	VI	30.5%	Medium	Low	Moderate	Deep	High	15-20	Moderate
Fond D'Or River Basin	VI	23.4%	Medium	Low	Poor	Deep	High	20-25	Moderate
Roseau River Basin	VII	66.1%	Low	Low	Moderate	Deep	High	25-30	High
Mahaut Area	VII	82.8%	Low	Low	Moderate	Shallow	Low	25-30	Low
Canaries Area	VIII	42.1%	Low	High	Moderate	Shallow	High	30-Above	Moderate
Roseau River Basin	VIII	11.0%	Low	High	Moderate	Shallow	High	30-Above	High



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# Annex C. Environmental prospective

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[C.1. Objectives and strategy for environmental planning](#)

[C.2. Methodology for determining environmental units](#)

[C.3. Procedure for determining environmental impact](#)

[C.4. Environmental assessment of Marigot Bay](#)

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## C.1. Objectives and strategy for environmental planning

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[C.1.1. Protection of mangroves and coastal ecosystems \(Objective 1\)](#)

[C.1.2. Linkage with the Ministry of Agriculture \(Objective 2\)](#)

[C.1.3. Strategy for environmental planning](#)

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A preliminary assessment of the environmental problems of Saint Lucia was done in 1981 with the following objectives:

### C.1.1. Protection of mangroves and coastal ecosystems (Objective 1)

Since immediate development pressures exist in the coastal zone, the Ministry of Planning and Ministry of Agriculture agreed to investigate the mangrove and surrounding areas of Marigot Bay and use the ecosystem analysis procedure as an example in environmental planning and management. The emphasis was not only to focus on the ecological importance of the mangrove forest but to quantify the physical processes (natural drainage, run-off, sedimentation, contamination sources, etc.), with a view to the siting of the proposed facilities and to the potential consequences of altering existing ecological processes. Maps and documents were gathered, government officials consulted, a field trip organized, and a brief analysis presented. The data sources, steps in the ecosystem analysis, and overall methodology for determining environmental units used in environmental management were discussed with counterpart agencies and presented as part of the OAS Tourism Planning Seminar (section C.7).

## C.1.2. Linkage with the Ministry of Agriculture (Objective 2)

An environmental consultant is needed to define national land use zoning in relation to settlement patterns in order to 1) determine priorities for production and land transformation on a spatial basis (Rojas, 1980), and 2) identify natural resources management issues important to the Land Transformation Programme.

Information related to a quantitative and spatial analysis of the natural and scenic resources (soils, water, geology, forestry, natural features) will be required to identify the basic issues of agricultural development, define environmental units, and develop the related zoning recommendations. Initial studies will include definition of environmental units based on the available information concerning the island's environment (climate, topography, land capability, erosion, surface drainage patterns, forest cover, etc.). Environmental management criteria should be defined for each unit. This spatial disaggregation will provide the basis for land use and crop allocation zoning proposals to be made in future stages of programme implementation.

The environmental units, urban and tourism development areas and protected areas and areas that can be devoted to intensive agriculture should be identified. Crop allocation zoning should be outlined for all existing agricultural development areas in the different environmental units so as to guide decision making and extension work respecting the agricultural sector.

## C.1.3. Strategy for environmental planning

There are three basic reasons why attempts at environmental planning in Saint Lucia have failed:

- a) There is no political awareness concerning the future effects of development.
- b) The ideas presented for structural and institutional change have never fitted well into existing government operations and could not be implemented without causing considerable disruption to normal procedure (Charles, 1978 a and b; and Charles and Butler, 1980).
- c) The existing institutional structure never had sufficient decision-making powers to be effective.

The Development Control Authority established by law within the Ministry of Planning has the responsibilities of environmental evaluation.

However, it is apparent that agencies with authority do not necessarily worry about environmental problems, whereas other agencies (particularly the Forestry and Fisheries Division of the MOA), which have more direct responsibility for conservation of natural resources, do not have the powers to evaluate the impact of development projects or officially designate specific area for restricted use.

A successful environmental planning strategy would be to reinforce existing institutional structures (DCA) and involve both Government and non-Government groups having a particular interest in environmental management (Chart C-1). The environmental planning officer of DCA would work in permanent consultation with the following agencies in the following areas of concern:

Agency	Area of Concern

Forestry Division	Water catchment, habitat conservation for rare and endangered species, timber concessions
Fisheries	Coastal fisheries
MOA Technical Unit	Land use zoning
Tourist Board	Scenic resources, coastal development
Non-Government interests	Public issues

### **CHART C-1. Institutional Organization for Environmental Planning**

Source: Pool, D., 'Environmental Prospective: Natural Resource and Agricultural Development', O.A.S. Technical Report, Saint Lucia: November, 1980

The candidate for the position of environmental planning officer should have a scientific or technical background with experience in the environmental sciences. If candidates with these qualifications do not exist, then an experienced ecologist or scientist provided by a donor agency should help train the person and serve as senior adviser for two years or so.

The basic work plan should be located within the MOA Technical Unit, whereas the basic information for preparing environmental units would be based on environmental management criteria generated primarily by the DCA and the environmental planning officer.

## **C.2. Methodology for determining environmental units**

[C.2.1. Inventory of physical resources](#)

[C.2.2. Quantification of ecological processes](#)

[C.2.3. Definition of environmental units](#)

### **C.2.1. Inventory of physical resources**

To define the environmental units and develop related zoning recommendations, basic data concerning the quantitative and spatial analysis of the natural resources should be collected from existing sources. The initial inventory of physical resources will utilize the following sources of information:

- a) Aerial photos: most recent island-wide coverage in 1954.
- b) Topographic maps (scale 1:25 000 and 1:50 000).
- c) Climatic data: precipitation distribution and frequency (data available for approximately 20 stations).
- d) Watersheds (approximately 20 major ones) determine flow, erosional features and quantity of human intervention data available. Water Authority.

- e) Coastal erosion maps: Port Authority.
- f) Forest cover and forest reserve boundaries: Ministry of Agriculture.
- g) Habitat of rare and endangered species. Ministry of Agriculture, Forestry Division.
- h) Topography, erosion, land capability, OAS study.
- i) Scenic and natural areas: Tourism Board, Eastern Caribbean Natural Area Management Program.
- j) Geology and geomorphological maps, UN study.
- k) Mineral deposits (pumice, other), OAS study.

Other helpful sources of background information on physical parameters are reviewed in section C.6 and referenced at the end of this annex.

## **C.2.2. Quantification of ecological processes**

The physical units of the landscape are all connected by common processes or ecosystem functions such as water flow, erosion, run-off, sedimentation and nutrient cycling and productivity. For example, mangroves, estuaries, beaches, and coral reefs are all connected to terrestrial ecosystems by water run-off. Likewise, streams and rivers connect upland forested watersheds to intensively cultivated valleys and floodplains. Many of these coupling mechanisms involve the timing or behaviour of biological life cycles and the net movement of nutrients and organic materials.

The occurrences of these regional couplings are relevant socioeconomic phenomena. Man, his actions, and his dependence on natural ecosystems are all related to the ability of regions to maintain a livable environment where agriculture, forestry, industry, and urbanization are compatible at low costs to society. Island ecosystems cannot subsidize a completely artificial environment, therefore natural undisturbed ecosystems are needed to maintain regional homeostasis. For these reasons we must understand and protect those ecosystem couplings that are essential for attainment of the proper balance between anthropic and natural ecosystems.

Quantification of ecological processes facilitates assessment of the impact of developments such as sand extraction, dredge and fill operations, waste disposal, and mining.

## **C.2.3. Definition of environmental units**

On the basis of the physical parameters and quantification of the ecological processes, homogeneous units will be mapped and subsequently managed by environmental criteria used in land use zoning.

Areas for conservation of water catchments, valuable natural features, national parks, forest reserves and preservation of historical and archaeological sites should be mapped, as should areas appropriate for intensive agriculture and forestry. The overall purpose in defining environmental units is to combine resource quality and quantity with management considerations.

On the basis of recommended national strategies for balanced development and of the identified natural resource values, a number of geographic sub-regions of the island have been identified (UNDP, 1975).

These will be evaluated as potential development areas based on the management criteria outlined for each environmental unit. For example, rural areas that have a high capability to absorb additional development and public works must be evaluated in terms of environmental management criteria and include:

- a) Prime agricultural development lands, first priority areas. Agricultural activities should be further rationalized and intensified in the Choc-Ti Rocher-Babonneau area, in the Cul de Sac-Roseau area, in Rich Fond Valley, and in the quarters of Micoud, Vieux Fort, Laborie and Choiseul.
- b) Forest development areas. Possibilities for lumber or charcoal production could be encouraged on private lands under careful management if marginal lands are reforested. The area identified as the Central Forest Reserve should be surveyed and its boundaries marked. Extraction of timber should be allowed only under careful management by the Forestry Division. Measures of protection should be applied to Crown and private lands surrounding the Central Forest Reserve which, because of their land capability and ecological value, should come under the control of the Forestry Division.
- c) Water catchment areas. Within the defined water catchment areas, various protection measures, development controls and management policies are required. Deforestation should be stopped immediately. Catchment areas should be protected against human, animal, and chemical contamination.
- d) Conservation of natural areas. There are several natural areas (pitons, volcanic sulfur springs, Mt. Gimie, mangroves, coral reefs, canyon, Saint Lucian parrot habitat, etc.), that require protection through legislative and development control measures.
- e) Tourism development areas. Castries-Gros Islet axis, Soufriere Valley, Vieux Fort and other areas defined in the OAS Tourism Plan should be designated as tourism development areas. Plans should incorporate environmental management criteria and address land use constraints to preserve the qualities that makes Saint Lucia attractive.

## **C.3. Procedure for determining environmental impact**

In environmental planning, identification, through the assessment of potential impact, of the hazards to ecosystems associated with specific types of land utilization is necessary. At the core of impact assessment is a presumption of adverse effects for certain identified development activities. The term "adverse effect" may be defined as follows:

Effects are considered adverse if environmental change or stress causes some biotic population or non-viable resource to be less safe, less healthy, less abundant, less productive, less esthetically or culturally pleasing, or if the change or stress reduces the diversity and variety of individual choice, the standard of living or the extent of sharing of life's amenities; or if change or stress tends to lower the quality of renewable resources or to impair the recycling of depletable resources (Clark, 1974).

According to this definition, environmental impact assessment is the evaluation of adverse and positive

ecological effects and the determination of their impact on human needs.

The prediction of ecological disturbances such as change in run-off, loss of vegetation, or discharge of toxic substances is possible but their quantification is sometimes difficult. A system of impact prediction and an analysis of the consequences of ecological disturbance are critical in the determination of necessary constraints to siting and design of development projects in upland forested watersheds, agricultural regions, coastal zones, urban and industrialized areas and recreational sites. Impact assessment must not only consider one important species, but rather focus on the entire ecosystem. An ecosystem consists of a functional assemblage of plants, animals, decomposed organisms, non-living substances, a climatic regime and man. A list of major land use activities and agents causing adverse impacts is found in Table C-1 (adapted from McEachern and Towle, 1974).

There are two basic steps in environmental impact evaluation: a) information gathering and b) analysis of potential problems associated with a specific site based on broad management guidelines. The information needs can be summarized as follows (Island Resources Foundation, 1973):

- a) A complete written description of the proposed site, including maps, aerial photographs, physical parameters, hydrogeology, drainage patterns, topography, vegetation cover, geomorphology, etc.
- b) A detailed description of the project proposal, including design plans, construction methods, movement of earth materials for project activity. The report should detail work accomplished and should describe final site geometry, the movement of materials, and the environmental conditions of the site and adjacent lands after the project is completed.

**TABLE C-1. MAJOR LAND USE ACTIVITIES CAUSING ADVERSE IMPACTS IN DEVELOPING ISLANDS**

Major land use activities		Subactivities
Energy and Natural Resources		1. Excavation, earth moving
A.	Power Generation	2. Dredging
B.	Mining	3. Channels, cuts and fills
C.	Reclaimed Land	4. Wetland landfill
D.	Logging	5. Vegetation clearing
Industrial and Residential		6. Structures: hotels, residential
E.	Oil Storage	7. Utilities
F.	Residential	8. Marinas, docks, piers
G.	Commercial	9. Landfills, garbage and solid waste
Transportation		10. Sewage outfall, treatment
H.	Airpots	11. Waste water
I.	Ports	12. Oil spills
J.	Highways	13. Open burning
K.	Pipelines	14. Collecting flora and fauna and historic objects
Recreation		15. Access by activities inappropriate to the area

L.	Marine-oriented	
M.	Land-oriented	
Waste Emplacement		
N.	Disposal	
O.	Ocean dumping	

Source: Pool, D. "Environmental prospective", OAS Technical report Castries 1980, (mimeo).

By combining the basic data gathered above with environmental management guidelines, an analysis can be made of the proposed activity. Broad guidelines (Odlum, 1976) and questions to be reviewed for each project include the following categories:

1. Protection and wise utilization of valuable ecosystems:

a) Wherever destruction or severe alteration of areas of naturally high primary productivity (e.g., well developed forests, coastal estuaries) is contemplated, benefits and costs should be carefully compared.

b) Loss of productive agricultural land through urbanization or other development activities should be carefully analyzed. Is land of comparable quality available for cultivation in nearby areas? Will food imports be increased as a result of taking agricultural lands out of production?

c) Is recreational land going to be destroyed? Are there sufficient alternative recreational areas for future generations?

d) Are aesthetic or scenic values going to be degraded or destroyed? Will the tourism or other sectors be affected?

e) Is the natural recovery process (ecological succession) Likely to be disrupted? Will it be possible for natural processes to repair damage caused by development activity?

f) Will critical wildlife habitat (feeding areas, spawning and breeding grounds, nesting and nursery areas) be destroyed?

g) Will pests or disease vectors such as mosquitoes and snails become more common?

h) Are endangered species dependent on the proposed development area?

i) Is the impact area significant to commercial fisheries?

j) Will the proposed development limit or preclude uses of surrounding land?

k) If the carrying capacity (human) is to be increased, will there be sufficient water supply and disposal facilities?

l) Does the area to be developed contain archaeological or historic sites?

## 2. Prevention of adverse alterations of air and water quality:

- a) Will the proposed development increase the presence of heavy metals, toxic chemicals and industrial and human wastes, increasing pressure on present disposal system?
- b) Will there be activity which increases water turbidity to such high levels for extended periods of time that aquatic life will be destroyed?
- c) Will there be increased danger of accidental oil spills?
- d) Will the project endanger acceptable air quality? This should be maintained, since degraded air can lead to respiratory diseases.

## 3. Attention of physical parameters:

- a) Will the proposed development cause accelerated soil erosion?
- b) Are surface drainage patterns or run-off rates going to be altered? If so, the consequences must be anticipated. When large areas are paved with asphalt, infiltration rates are greatly reduced and the rate of run-off accelerated. For example, a small stream which prior to construction might be adequate to handle run-off from even the heaviest rains would become a dangerous flood threat after construction due to inability to accommodate a more sudden and greater flow.
- c) Does the project contemplate the construction of jetties, causeways, etc.? Inshore currents and patterns of sediment deposition in coastal waters can be seriously affected by such construction, which can lead to accelerated beach erosion. If structures are absolutely necessary, then they should be designed so that little resistance to currents is offered and sedimentation transport and deposition are not affected. Natural beach erosion patterns should be understood before development is attempted.

# C.4. Environmental assessment of Marigot Bay

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[C.4.1. Background](#)

[C.4.2. Development proposals](#)

[C.4.3. Physical environment](#)

[C.4.4. Development](#)

[C.4.5. Analysis for environmental management](#)

[C.4.6. Alternatives](#)

[C.4.7. An outline of the OAS Tourism Planning Seminar](#)

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## C.4.1. Background

As an example of the type of environmental analysis required for decision making, this section provide an evaluation of the status of the mangrove forest ecosystem in terms of future proposed development plans for Marigot Bay and present guidelines to avoid short- and long-term conflict in land use and environmental degradation. The ideas and data included are based upon field observations, proposed development plans, governmental and international donor agency documents, and discussions with Robert Devaux (National Trust), Gabriel Charles and Paul Butler (Forestry Division, Ministry of Agriculture), John Rickards (Naturalists Society), Paul Hippolyte (Central Planning Unit) and Nick Bowden (Hurricane Hole Hotel).

Marigot is a small, protected bay surrounded by coastal hills on the west coast of Saint Lucia about 6 miles south of the capital, Castries. Historically, the bay was a favorite hiding place for pirates and also provided a secluded anchorage when the British Navy escaped the French. Today, the bay has a marina, Dr. Doolittles Restaurant, Hurricane Hole Hotel, and several private residences, and is a popular picturesque location for visiting yachts and exploring tourists. Because of the protection offered by the natural setting, over 50 boats anchored there during Hurricane Alien in 1980.

## C.4.2. Development proposals

Besides the existing facilities, the following development projects are proposed for Marigot Bay:

Project	Activity
1) Flamboyant Park, Ltd.	57 houses constructed on 16 acres
2) The Moorings	Hotel, yacht base chartering
3) Mr. Gold and Partners	i) 13 housing units as indicated
	ii) gradual expansion of Doolittles complex
	iii) pumping of sand as indicated
	iv) donation of about 70 acres of the steep upper slope to the ridge top and access via ravine to the National Trust as a nature reserve
4) Mr. Maraj	Proposed development at eastern end of bay

The exact locations of these developments are not fully known, and therefore only approximate placement is attempted in map C-1.

## C.4.3. Physical environment

The eastern end of Marigot Bay is bordered with fringing mangroves (principally red and white) that extend approximately the length of the Queen's Chain (186 feet) landward, changing abruptly to a thin strip of brackish water species such as acrosticum fern, hibiscus, and then subtropical dry forest on the hill slopes. Evidence of human intervention includes small garden plots, forest clearings, and mangrove deforestation. The upland forest age is dependent on past and present land ownership and use patterns. For example, most of the forested land on the north side of Marigot Bay is an even-aged natural stand with little or no recent disturbance, whereas the natural vegetation has been cleared for grazing at the

extreme eastern end of the bay.

Two small streams, one intermittent and the other spring-fed, drain into the bay, forming the only natural waterways with visible flow. Overland flows and seepages probably occur throughout the watershed (Map C-2), depending on rainfall and local vegetation cover. Erosion and sedimentation processes tend to be more accelerated in areas of recent soil disturbance or vegetation removal as compared to forested areas, although no quantitative data exist for detailed comparisons.

i. Importance of natural drainage patterns

The basic processes that are critical, particularly in Marigot Bay, are those pathways which link terrestrial and aquatic ecosystems. In any development scheme, normal precautions are required to prevent interference with the natural pattern of drainage and to prevent contamination of run-off water. Water in the form of streams, run-off and sewerage causes erosion, sedimentation, and pollution, resulting in environmental degradation and a reduction of touristic and social values. Increased bare surface areas such as roads, parking lots and housing units will increase run-off. All proposed development projects for Marigot Bay jointly need to consider erosion and eventually sedimentation of the bay.

**Map C-1. Saint Lucia. Existing Facilities and Proposed Development Activities for Marigot Bay**

Source: Pool, D., 'Environmental Prospective: Natural Resources and Agricultural Development', O.A.S. Technical Report. Saint Lucia: November, 1980

**Map C-2. Saint Lucia. Physical Environment of Marigot Bay**

Source: Pool, D., 'Environmental Prospective: Natural Resource and Agricultural Development', O.A.S. Technical Report, Saint Lucia: November, 1960

ii. Relevance of the mangrove forest

The mangrove forest ecosystem is uniquely adapted to changes in soil salinity and tidal fluctuations and consequently serves as a buffer between terrestrial and marine ecosystems. Not only are mangroves important as a source of detritus used as a basis for fish production, but also stabilized sediment, transported from upland areas, traps nutrients and filters contaminants from fresh water run-off, and provides nurseries for shrimp and fisheries and habitat for wildlife.

With increased development on all sides of Marigot Bay, the elimination of the mangrove forest will result in increased run-off, an increasing rate of sedimentation and nutrient input into the bay and a diminution of fisheries and wildlife habitats.

## **C.4.4. Development**

From a developer's viewpoint, the mangroves provide a visual obstacle and a physical barrier to entering the bay, besides serving as breeding sites for sand flies and mosquitoes. The future touristic, cultural, historical and natural values of Marigot Bay will depend not on the elimination of the two acre mangrove forest, but on implementation of a closely coordinated development plan that considers several high-density facilities spatially arranged with adequate green belt areas so as not to physically crowd or exceed the carrying capacity of Marigot Bay.

In the short term it seems likely that the mangroves will be removed from around the eastern end of the bay along the frontage controlled by Flamboyant Park, Ltd., and Mr. Maraj. Mr. Gold has indicated that he will not disturb the mangroves controlled by him.

### **C.4.5. Analysis for environmental management**

The framework for the management analysis of an ecosystem must include not only the important biota, but the major physical factors, their interaction and how in combination they affect the life of the system. In other words, environmental management must encompass entire ecosystems. Any attempt to manage separately one of the many interdependent components of an ecosystem will very likely fail. The following general environmental management rules should be considered in the preparation of a development plan for Marigot Bay:

- a) Drainage ways: Alteration of any drainage by realignment, bulkhead ing, filling or any other process that shortcuts the natural rate or pattern of flow or blocks or impedes its passage, is unacceptable.
- b) Basin circulation: Any significant change from the natural rate of water flows of a coastal watershed is presumed to be detrimental.
- c) Run-off contamination: Any significant discharge of suspended solids, nutrients, or toxic chemicals is presumed to be adverse.
- d) Buffer areas are to be provided between shoreland residences and coastal waters of a size to correlate with the extent and density of shoreline development.
- e) Water collected by storm drains is to be cleansed by treatment and its discharge regulated.
- f) Water basins with poor flushing are to be avoided as marina sites.

More specifically, environmental managers of Marigot Bay, e.g., government planners, private developers, the Tourism Board and the Naturalists Society, should evaluate the following specific parameters which influence natural processes in order to provide an integrated management approach:

- a) Determine natural drainage patterns and quantity and frequency of run-off and sedimentation. Altered drainages and run-off due to road construction and earth movement may result in increased sedimentation of the bay.
- b) Determine carrying capacity of the area in terms of future water consumption, sewage disposal, touristic, cultural and historical values.
- c) Determine the impact of removal of natural vegetation in terms of increased erosion and sedimentation.
- d) Determine impact of coastline alteration including proposed dredge and fill for increased beach areas. Before construction of jetties or marinas, request detailed study of basin circulation patterns.

## **C.4.6. Alternatives**

The fact that no definite management or development plan is available for Marigot Bay means there is still time to consider all the development alternatives which will include well-planned projects and provide for natural vegetation or buffer areas. It has been mentioned that a possible land exchange might offer the opportunity to establish a national park or national historic site which includes approximately 70 acres of land in the upper watershed. These proposals should be carefully considered, since the permanent establishment of a national park would insure long-term homeostasis in the area. Without this stability the very factors that make the bay so attractive an area for investment in tourism could be destroyed.

## **C.4.7. An outline of the OAS Tourism Planning Seminar**

On October 30, 1980, the Tourism Planning Seminar took place at the Halcyon Sands Hotel, in Castries. Part of the seminar discussion focused on natural resources in terms of environmental planning. Following is a brief outline of the topics and problems discussed:

### **I. Definition of Environmental Planning**

- A. Centers on an integrated approach to regional development scheme that insures long-term island stability.
- B. Growth and expansion policy of Saint Lucia needs to be evaluated in terms of social, cultural and economic needs.
- C. Environmental management involves more than air and water pollution control.

### **II. Institutional Concept**

#### **A. Present situation:**

- 1. No central source of environmental data.
- 2. No government authority to assess environmental impact of proposed development projects.
- 3. Definite need to exchange information, reports, ideas and appraisals on all proposed projects.

#### **B. Strategy:**

- 1. Name an environmental planning officer in the Development Control Authority (Ministry of Planning) to prepare an assessment of all proposed projects.
- 2. Should have the authority to request more baseline ecological data from the private sector or government depending who is doing the development.
- 3. The position requires someone with general knowledge of various aspects of environmental management and could possibly be trained by a senior advisor financed by a donor agency for a period of two years.

4. The office of the environmental planner would also require close liaison with other ministries such as Agriculture and Foreign Affairs, Trade, Commerce and Tourism as well as non-government interests.

### III. Methodology for Obtaining Data Base

#### A. Inventory of physical resources:

1. Aerial photos (no recent ones with forest coverage)
2. Topographic maps (scale 1:25 000, 1:50 000)
3. Climatic data
4. Watersheds
5. Coastal erosion maps (Port Authority)
6. Forest cover
7. Forest reserve boundaries
8. Mining deposits
9. Other helpful documents

- Eastern Caribbean Coastal Investigation (Deane, Thom & Edmonds, BDD, 1970-73).

- Soil and Land Use Survey N° 20, Saint Lucia Regional Research Centre of the British Caribbean, U.W.I.

- UNDP Physical Planning Project

- land capability, water catchment areas, etc.

- Agricultural Census (1973-74).

- Cadastre (1973-74)

- Eastern Caribbean Natural Area Management Program-Survey of Conservation Priorities in the Lesser Antilles (resource data, maps)

#### B. Identification and quantification of ecological processes:

##### 1. Processes which should be studied include:

- a) erosion
- b) run-off
- c) sedimentation
- d) nutrient cycling
- e) productivity

##### 2. Data which can be used as basis for evaluating development impact:

- a) sand extraction
- b) dredge and fill
- c) marina or hotel construction
- d) black coral priating
- e) waste disposal
- f) mining

#### IV. Description and Function of Environmental Units

A. Purpose is to combine resource quality and quantity with management considerations.

B. Resource capability is based on:

1. Water availability
2. Sewage treatment and disposal
3. Population density
4. Ecosystem carrying capacity
5. Land capability
6. Climatic, topographic characteristics
7. Natural and man-made hazards (e.g., floods, hurricanes, mud slides, oil spills)

C. Areas of environmental concern:

Critical area	Value
Beaches	Tourism, shoreline protection
Forest	Wildlife habitat, tourism, potable water supply
Volcano	Tourism
Coral reefs	Black coral, tourism, shoreline protection

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Barre de L'Isle</b>												
Max	22.2	12.8	11.1	18.6	22.2	22.8	28.5	21.2	29.8	28.6	55.2	24.6
Min	1.5	0.78	0.88	1.2	2.0	2.4	3.0	5.7	6.4	5.6	4.6	3.1
Normal	5.85	4.4	3.8	4.7	5.5	9.4	11.6	11.1	11.5	14.9	12.0	8.5
<b>Troumasse</b>												
Max	14.8	7.1	9.0	10.3	16.6	20.0	22.5	17.4	21.5	21.0	25.2	15.6
Min	0.52	0.15	0.15	0.06	0.30	1.3	1.5	2.3	2.8	2.5	2.7	0.97
Normal	2.6	2.2	1.9	2.6	4.5	5.8	8.2	7.2	8.6	9.3	8.6	4.5
<b>Marquis</b>												
Max	9.8	9.5	6.7	5.0	12.1	18.4	10.9	17.7	22.8	24.0	33.0	15.4
Min	1.3	0.88	1.0	1.2	1.6	1.0	1.9	2.2	3.2	3.2	1.5	1.8
Normal	3.4	2.4	2.0	2.6	4.0	5.8	7.4	7.4	7.9	9.5	8.9	5.4
<b>Quillesse</b>												
Max	22.6	18.5	13.4	18.2	23.4	21.2	28.5	25.7	25.7	29.2	63.1	24.4
Min	2.4	0.51	1.1	3.0	2.5	4.5	5.2	6.2	6.0	7.4	3.0	6.8
Normal	8.01	6.7	6.7	7.5	9.7	11.6	14.7	13.5	14.8	17.8	16.2	12.5
<b>Roseau</b>												
Max	11.8	8.6	7.1	14.8	14.3	19.2	28.2	15.3	18.6	22.6	29.4	12.0
Min	0.70	0.38	0.46	0.61	1.1	1.7	4.0	4.7	3.9	4.7	2.9	2.6
Normal	4.5	1.8	3.2	2.7	4.8	7.8	10.4	9.3	9.1	10.8	9.1	5.9
<b>La Fargue</b>												
Max	9.9	7.9	6.2	8.2	10.0	11.7	15.5	12.5	15.5	17.5	15.5	10.5
Min	0.45	0.25	0.48	0.20	0.56	1.3	1.2	2.2	3.1	2.9	2.3	0.54
Normal	3.8	2.0	1.8	2.4	3.7	5.0	7.0	6.8	7.2	9.0	6.0	4.1

Note: Rainfall in dry season (January-May) is approximately 1/5 of yearly amount.

Basin No. Name	River	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage	Probability of recurrences %	Remarks
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
4	Marquis	Vergailles	Above Jct. Marquis	358	1.45	12.	3.81	0.28	0.53	15	0	0	0	0.28	0.53	15		OAS-LWUV
		Marquis	CWA weir with pump intake	691	2.8	12.	3.81	1.96	3.64	103	0	0	0	1.96	3.64	103		"
		Sorciere 1	CWA Gravity intake	55	0.22	1	23.10.60	0.229	0.425	12	0	0	0	0.029	0.425	12		Theobald, CWA
						2	26. 5.60	0.058	0.108	3	0	0	0	0.109	0.202	6		83 PN "
						3	2.10.61	0.109	0.202	6	0	0	0	0.109	0.202	6		98 PN-1 "
						4	27. 4.61	0.046	0.085	2	0	0	0	0.046	0.085	2		81 PN "
						5	6. 9.63	0.174	0.330	9	0	0	0	0.174	0.330	9		92 PN-1 "
						6	17. 4.63	0.039	0.072	2	0	0	0	0.039	0.072	2		65 PN "
						7	17. 8.64	0.092	0.171	5	0	0	0	0.092	0.171	5		39 PN "
						8	19. 2.64	0.062	0.115	3	0	0	0	0.062	0.115	3		83 PN "
		Sorciere 2	CWA Gravity intake	155	0.63	1	23.10.60	0.099	0.184	5	0	0	0	0.099	0.184	5		47 PN "
						2	26. 5.60	0.005	0.009	0.3	0	0	0	0.005	0.009	0.3		83 PN "
						3	2.10.61	0.049	0.091	2	0	0	0	0.049	0.091	2		98 PN-1 "
						4	27. 4.61	0.041	0.076	2	0	0	0	0.041	0.076	2		81 PN "
						5	6. 9.63	0.130	0.241	7	0	0	0	0.130	0.241	7		92 PN-1 "
						6	17. 4.63	0.027	0.050	1	0	0	0	0.027	0.050	1		65 PN "
						7	17. 8.64	0.026	0.048	1	0	0	0	0.026	0.048	1		39 PN "
						8	19. 2.64	0.011	0.020	0.6	0	0	0	0.011	0.020	0.6		83 PN "
		Piton	CWA Gravity intake	78	0.32	1	23.10.60	0.210	0.390	11	0	0	0	0.210	0.390	11		47 PN "
						2	26. 5.60	0.029	0.054	2	0	0	0	0.029	0.054	2		83 PN "
						3	2.10.61	0.098	0.182	5	0	0	0	0.098	0.182	5		98 PN-1 "
						4	27. 4.61	0.033	0.061	2	0	0	0	0.033	0.061	2		81 PN "
						5	6. 9.63	0.136	0.252	7	0	0	0	0.136	0.252	7		92 PN-1 "
						6	17. 4.63	0.017	0.032	0.9	0	0	0	0.017	0.032	0.9		65 PN "
						7	17. 8.64	0.069	0.128	4	0	0	0	0.069	0.128	4		39 PN "
						8	19. 2.64	0.046	0.085	2	0	0	0	0.046	0.085	2		83 PN "

Basin No.	River Name	Location of measuring station	Drainage area a km	No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrence %	Remarks
						mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)						
Joseph	CWA Gravity intake	48	0.19	1	23.10.60	0.109	0.202	6	0	0	0	0.109	0.202	6	47	PN	"
				2	25. 5.60	0.027	0.050	1	0	0	0	0.027	0.050	1	83	PN	"
				3	2.10.61	0.057	0.106	3	0	0	0	0.057	0.106	3	98	PN-1	"
				4	27. 4.61	0.019	0.035	1	0	0	0	0.019	0.035	1	81	PN	"
				5	6. 9.63	0.098	0.182	5	0	0	0	0.098	0.182	5	92	PN-1	"
				6	17. 4.63	0.010	0.018	0.5	0	0	0	0.010	0.018	0.5	65	PN	"
				7	17. 8.64	0.049	0.091	2	0	0	0	0.049	0.091	2	39	PN	"
				8	19. 2.64	0.017	0.032	0.9	0	0	0	0.017	0.032	0.9	83	PN	"
Louisie	CWA Gravity intake	83	0.34	1	23.10.60	0.080	0.148	4	0	0	0	0.080	0.148	4	47	PN	Theobald, CWA
				2	25. 5.60	0.017	0.032	0.9	0	0	0	0.017	0.032	0.9	83	PN	"
				3	2.10.61	0.043	0.080	2	0	0	0	0.043	0.080	2	98	PN-1	"
				4	27. 4.61	0.036	0.067	2	0	0	0	0.036	0.067	2	81	PN	"
				5	6. 9.63	0.080	0.148	4	0	0	0	0.080	0.148	4	92	PN-1	"
				6	17. 4.63	0.011	0.020	0.6	0	0	0	0.011	0.020	0.6	65	PN	"
				7	17. 8.64	0.032	0.059	2	0	0	0	0.032	0.059	2	39	PN	"
				8	19. 2.64	0.013	0.024	0.7	0	0	0	0.013	0.024	0.7	83	PN	"
Marquis	CWA Gravity pumping St.	691	2.8	1	23.10.60	1.65	3.06	87	0	0	0	1.65	3.06	87	47	PN	"
				2	23. 5.60	0.216	0.401	11	0	0	0	0.216	0.401	11	83	PN	"
				3	2.10.61	1.72	3.19	90	0	0	0	1.72	3.19	90	98	PN-1	"
				4	27. 4.61	0.195	0.362	10	0	0	0	0.195	0.362	10	81	PN	"
				5	6. 9.63	1.50	2.78	79	0	0	0	1.50	2.78	79	92	PN-1	"
				6	17. 4.63	0.195	0.362	10	0	0	0	0.195	0.362	10	65	PN	"
				7	17. 8.64	1.00	1.86	52	0	0	0	1.00	1.86	52	39	PN	"
				8	19. 2.64	0.345	0.640	18	0	0	0	0.345	0.640	18	83	PN	"
Babonneau	CWA pump- ing St.	754	3.0	1	23.10.60	1.62	3.01	85	0	0	0	1.62	3.01	85	47	PN	"
				2	25. 5.60	0.028	0.052	1	0	0	0	0.028	0.052	1	83	PN	"
				3	2.10.61	1.23	2.28	65	0	0	0	1.23	2.28	65	98	PN-1	"
				4	27. 4.61	0.304	0.564	65	0	0	0	0.304	0.564	65	81	PN	"
				5	6. 9.63	1.35	2.50	71	0	0	0	1.35	2.50	71	92	PN-1	"
				6	17. 4.63	0.210	0.390	11	0	0	0	0.210	0.390	11	65	PN	"
				7	17. 8.64	1.000	1.86	52	0	0	0	1.000	1.86	52	39	PN	"
				8	19. 2.64	0.210	0.390	11	0	0	0	0.210	0.390	11	83	PN	"

Basin No. Name	River	Location of measuring station	Drainage area km	No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrences %	Remarks
						mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(5)	(6)	(7)			(8)			(9)		(10)	(11)	(12)	
5 Fond D'Or	Derniere Riviere	La Ressource at bridge	3039 12.3		13. 1.79	1.82	3.38	96	0.16	0.30	8	1.98	3.68	104	98 PN	G.B. Mayes	
	Gran Riv. du Mabouya	Bonavista bridge	2619 10.6		13. 1.79	3.44	6.38	181	0	0	0	3.44	6.38	181	98 PN	" " " Seems at Mabouya Rainfall Dec.78 = 4.39 in	
	Fond D'Or	Bosque D'Or	7734 31.3		13. 1.79	5.36	9.95	282	0	0	0	5.36	9.95	282	98 PN	G.B. Mayes	
	Gran Riv. du Mabouya	Main road bridge	3534 14.3		13. 1.79	3.96	7.35	208	0	0	0	3.96	7.35	208	98 PN	" " "	
	Gran Riv. du Mabouya	Mabouya bridge	3534 14.3		13. 3.81	4.94	9.18	260	0	0	0	4.94	9.18	262		OAS-LWUU	
	Fond D'Or	Dennerly Factory bridge	8574 34.7		13. 3.81	7.38	13.70	388	0.15	0.28	8	7.35	13.98	396		OAS-LWUU	
	Derniere	After jct. Rav. Basin Noir	1334 5.4		17. 3.81	1.10	2.05	58	0.17	0.32	9	1.27	2.37	67		OAS-LWUU	
6 Dennerly	Dennerly	St. Joseph Estate	3188 12.9	1	13. 3.79	2.56	4.75	135	0.085	0.16	4	2.72	4.91	139	32 PN	Winban	
				2	17. 5.79	1.30	2.41	68	0.067	0.12	4	1.37	2.53	72	86 PN-1	Winban	
				3	30. 4.80	1.57	2.91	82	0.057	0.10	3	1.63	3.01	85	75 PN	Winban	
	Dennerly	Above Coast Rd. bridge (50 ft asl)	3904 15.8		17. 3.81	2.26	4.20	119	0.076	0.14	4	2.34	4.34	123		OAS-LWUU	

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage	Probability of recurrences %	Remarks	
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s				ft
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)		
7	Praslin	Praslin Mamiku	1779	7.2	1	16. 3.79	1.12	2.08	59	0	0	0	1.12	2.08	59	32	PN	Winban	
					2	12. 5.79	0.85	1.58	45	0	0	0	0.85	1.58	45	86	PN	Winban	
					3	30. 4.80	0.90	1.67	52	0	0	0	0.90	1.67	52	75	PN-1	Winban	
8	Fond	250 yd up-stream bridge	3830	15.5	1	18. 5.79	2.50	4.64	132	0.04	0.07	2	2.54	4.71	134	52	PN	Winban	
					2	2. 5.80	1.82	3.38	95	0.04	0.07	2	1.86	3.45	97	75	PN-1	Winban	
10	Troumasse	Upstream pumping plant Micoud boxing plant	6672	27.0		2. 5.80	4.73	8.78	248	0.09	0.17	5	4.82	3.95	253	75	PN-1	Winban	
		Troumasse Mahaut bridge			3410	13.8		17. 3.81	7.06	13.10	371	0	0	0	7.06	13.10	371		OAS-LWUU
12	Canelles	Coast Road bridge	3756	15.2		17. 3.81	3.21	5.97	169	0.080	0.14	4	3.29	4.11	173		OAS-LWUU		
13	Vieux Fort	Fort Tourney	6040	24.4	1	2. 2.71	10.10	18.74	531	0.93	1.73	49	11.93	20.47	580	6.10	26	PN-1	Ref 3: UMA
					2	11. 2.71	9.66	17.93	508	0.93	1.73	49	10.59	19.66	557	6.10	26	PN-1	
					3	13. 5.71	2.44	4.53	128	0.93	1.73	49	3.37	6.26	177	5.80	20	PN	Abstraction for
					4	18. 5.71	3.60	6.68	189	0.93	1.73	49	4.53	8.41	238	5.76	20	PN	domestic and indus-
					5	26. 5.71	4.76	8.83	250	0.93	1.73	49	5.69	10.56	299	5.90	20	PN	trial use at Re
					6	15. 6.71	4.39	8.14	230	0.93	1.73	49	5.32	9.87	279	5.82	20	PN-1	source 21 l/s.
					7	16. 6.71	5.91	10.29	311	0.93	1.73	49	6.84	12.70	360	5.88	20	PN-1	During 1971 1cfs or
					8	17. 6.71	5.50	10.20	289	0.93	1.73	49	6.43	11.93	338	5.81	20	PN-1	28 l/s have been
					9	9. 8.71	4.88	9.05	256	0.93	1.73	49	5.81	10.78	305	6.00	No data	abstracted upstream	
					10	11. 8.71	1.57	2.92	83	0.93	1.73	49	2.50	4.65	132	5.58	available	for irrigation and	
					11	16. 8.71	6.26	11.62	329	0.93	1.73	49	7.19	13.35	378	6.16	"	21 l/s for domestic	
					12	17. 8.71	6.64	12.32	349	0.93	1.73	49	7.57	14.05	398	6.17	"	and industrial use.	
					13	18. 8.71	3.33	6.18	175	0.93	1.73	49	4.26	7.91	224	6.02	"	Total 49 l/s or 1.73	
					14	1. 9.71	4.65	8.63	244	0.93	1.73	49	5.58	10.36	293	6.20	"	cfs 1 ately CWA	
					15	23. 8.71	7.41	13.75	389	0.93	1.73	49	8.34	15.48	438	6.25	"	installed at Belair	
					16	24. 8.71	7.81	14.50	410	0.93	1.73	49	8.74	16.23	459	6.34	"	1 mgd pumping	
					17	25. 8.71	6.19	11.49	325	0.93	1.73	49	7.12	13.22	374	6.45	"	capacity	
					18	26. 8.71	6.29	11.67	330	0.93	1.73	49	7.22	13.40	379	6.30	"		

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage	Probability of recurrence %	Remarks					
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s				ft				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)												
13	Vieux Fort	Fort Tourney			19	1. 9.71	4.91	9.12	258	0.93	1.73	49	5.84	10.85	307	6.00	No data available						
					20	6. 9.71	3.45	6.41	182	0.93	1.73	49	4.38	8.14	231	6.05							
					21	6.10.71	11.95	22.17	628	0.93	1.73	49	12.88	23.90	677	6.10							
					22	11.10.71	7.19	13.35	378	0.93	1.73	49	8.12	15.08	427	5.95							
					23	12.10.71	6.09	11.30	320	0.93	1.73	49	7.02	13.03	369	5.85							
					24	12.10.71	6.56	12.18	345	0.93	1.73	49	7.49	13.91	394	5.83							
					25	14.10.71	6.14	11.40	323	0.93	1.73	49	7.07	13.13	372	5.86							
					26	18.10.71	5.08	9.41	267	0.93	1.73	49	6.01	11.16	316	5.90							
					27	29.10.71	3.68	6.82	193	0.93	1.73	49	4.61	8.55	242	5.91							
					28	20.10.71	2.71	5.08	143	0.93	1.73	49	3.64	6.76	191	5.98							
					29	21.10.71	1.63	3.03	86	0.93	1.73	49	2.56	4.76	116	5.90							
					30	25.10.71	13.45	25.17	713	0.93	1.73	49	14.38	26.90	762	6.00							
					31	26.10.71	6.16	11.43	324	0.93	1.73	49	7.09	12.16	373	6.05							
					32	27.10.71	5.88	10.92	309	0.93	1.73	49	6.81	12.65	358	5.93							
					33	4.11.71	5.38	9.90	283	0.93	1.73	49	6.31	11.72	332	6.00							
					34	9.11.71	4.75	8.82	250	0.93	1.73	49	5.68	10.55	299	5.96							
					35	10.11.71	10.81	20.07	568	0.93	1.73	49	11.74	21.80	17	6.02							
					36	10.11.71	8.77	16.27	461	0.93	1.73	49	9.70	18.00	519	6.02							
					37	10.11.71	7.52	13.95	395	0.93	1.73	49	8.45	15.68	444	6.01							
					38	22.11.71	54.96	102.00	2890	0.93	1.73	49	5.589	103.73	2939	7.17							
					39	22.11.71	84.33	156.50	4430	0.93	1.73	49	85.26	158.23	4479	7.63							
					40	22.11.71	114.24	212.00	6000	0.93	1.73	49	115.17	213.73	6049	8.04							
					41	24.11.71	23.76	44.09	1250	0.93	1.73	49	24.69	45.82	1299	6.23							
					42	25.11.71	14.50	26.90	1250	0.93	1.73	49	15.43	28.63	811	6.00							
					43	2.12.71	3.87	7.18	203	0.93	1.73	49	4.80	8.91	252	5.86							
					44	9.12.71	3.10	5.76	163	0.93	1.73	49	4.03	7.49	212	5.90							
					45	15.12.71	75.82	140.70	3980	0.93	1.73	49	76.75	142.43	4029	7.42							
					46	15.12.71	65.04	120.70	3420	0.93	1.73	49	69.97	122.43	3469	7.35							
					47	15.12.71	10.88	20.20	572	0.93	1.73	49	11.81	21.93	621	6.65							
					48	17. 3.81	3.33	6.18	175	1.40	2.60	74	4.73	8.78	249	"							
				Vieux Fort	Fort Woodlands (790 ft asl)	1150	4.65	1	5. 5.71	1.32	2.45	69	0	0	0	1.32			2.45	69	1.53	96 PN-1	
								2	10. 5.71	1.94	3.61	102	0	0	0	1.94			3.61	102	1.51	65 PN-1	
								3	19. 5.71	1.86	3.45	98	0	0	0	1.86			3.45	98	1.52	65 PN	
								4	27. 5.71	2.20	4.09	116	0	0	0	2.20			4.09	116	1.24	65 PN	Ref. 3: UMA
								5	8. 6.71	3.99	7.40	209	0	0	0	3.99			7.40	209	1.36	18 PN	
								6	15. 6.71	3.84	7.13	202	0	0	0	3.84			7.13	202	1.45	18 PN	
								7	9. 8.71	1.68	3.12	88	0	0	0	1.68			3.12	88	1.19	No data available	
								8	17. 8.71	2.64	4.89	138	0	0	0	2.64			4.89	138	1.28	available	
								9	18. 8.71	2.23	4.14	117	0	0	0	2.23			4.14	117	1.25	"	
								10	25. 8.71	4.03	7.48	212	0	0	0	4.03			7.48	212	1.48	"	

OAS-LWUU

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrences %	Remarks
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)							
	Vieux Fort	Fort Woodlands (790 ft asl)			11	26. 8.71	4.20	7.79	220	0	0	0	4.20	7.79	220	1.36	No data available	
					12	1. 9.71	1.89	3.50	99	0	0	0	1.89	3.50	99	1.21	"	
					13	6. 9.71	3.65	6.77	192	0	0	0	3.65	6.77	192	1.25	"	
					14	5.10.71	7.74	14.36	406	0	0	0	7.74	14.36	406	1.24	"	
					15	12.10.71	6.38	11.85	335	0	0	0	6.38	11.85	335	1.22	"	
					16	13.10.71	6.96	12.91	365	0	0	0	6.96	12.91	365	1.20	"	
					17	18.10.71	5.96	11.07	313	0	0	0	5.96	11.07	313	1.24	"	
					18	20.10.71	5.46	10.13	287	0	0	0	5.46	10.13	287	1.11	"	
					19	25.10.71	12.38	22.98	650	0	0	0	12.38	22.98	650	1.68	"	
					20	26.10.71	9.76	18.12	513	0	0	0	9.76	18.12	513	1.68	"	
					21	27.10.71	10.47	19.43	550	0	0	0	10.47	19.43	550	1.69	"	
					22	9.11.71	4.66	8.65	245	0	0	0	4.66	8.65	245	0.87	"	
	Gran Riv. du Vieux Fort	Plut (100 ft asl)	3800	15.4	1	1. 2.71	9.07	16.84	476	0	0	0	9.07	16.84	476	7.12	21 PN-1	
					2	11. 2.71	8.51	15.74	447	0	0	0	8.51	15.74	447	7.11	21 PN-1	
					3	19. 4.71	2.94	5.45	154	0	0	0	2.94	5.45	154	6.94	76 PN	
					4	5. 5.71	2.87	5.33	151	0	0	0	2.87	5.33	151	6.90	76 PN-1	
					5	19. 5.71	3.63	6.73	190	0	0	0	3.63	6.73	190	6.85	65 PN	
					6	8. 5.71	4.63	8.60	243	0	0	0	4.63	8.60	243	7.05	18 PN	
					7	9. 5.71	3.38	6.28	178	0	0	0	3.38	6.28	178	6.84	No data available	
					8	17. 6.71	4.09	7.59	215	0	0	0	4.09	7.59	215	6.94	"	
					9	18. 6.71	4.36	8.09	229	0	0	0	4.36	8.09	229	6.88	"	
					10	19. 8.71	4.97	9.22	261	0	0	0	4.97	9.22	261	6.93	"	
					11	23. 8.71	3.81	7.07	200	0	0	0	3.81	7.07	200	6.90	"	
					12	24. 8.71	6.80	12.63	357	0	0	0	6.80	12.63	357	7.17	"	
					13	25. 8.71	5.27	9.78	277	0	0	0	5.27	9.78	277	7.25	"	
					14	1. 8.71	3.80	7.06	200	0	0	0	3.80	7.06	200	6.93	"	
					15	2. 9.71	7.12	13.21	373	0	0	0	7.12	13.21	373	7.50	"	Ref 3: UMA
					16	6. 9.71	5.44	10.10	286	0	0	0	5.44	10.10	286	7.45	"	
					17	5.10.71	4.15	7.70	218	0	0	0	4.15	7.70	218	7.02	"	
					18	13.10.71	4.40	8.16	231	0	0	0	4.40	8.16	231	7.12	"	
					19	18.10.71	5.57	10.33	292	0	0	0	5.57	10.33	292	6.98	"	
					20	25.10.71	17.36	32.22	912	0	0	0	17.36	32.22	912	7.41	"	
					21	26.10.71	10.99	20.40	577	0	0	0	10.99	20.40	577	7.02	"	
					22	27.10.71	9.14	16.97	480	0	0	0	9.14	16.97	480	7.45	"	
					23	4. 11.71	5.29	9.81	278	0	0	0	5.29	9.81	278	6.92	"	
					24	9. 11.71	4.64	9.61	244	0	0	0	4.64	9.61	244	7.11	"	
					25	2. 12.71	5.31	9.86	279	0	0	0	5.31	9.86	279	7.07	"	
					26	9. 12.71	3.92	7.27	206	0	0	0	3.92	7.27	206	7.07	"	
					27	15.12.71	4.62	8.58	243	0	0	0	4.62	8.58	243	7.53	"	
					28	16.12.71	10.01	18.57	526	0	0	0	10.01	18.57	526	7.35	"	

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrence %	Remarks
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)							
		Petit Riv. Retraite du Vieux Fort				30. 5.75	2.49	4.64	131	0	0	0	2.49	4.64	131	78	PN	
14	Black Bay	Black Bay	Coast Road bridge	2323	9.4	18. 3.81	0.93	1.73	49	0	0	0	0.93	1.73	49			OAS-LWUU
15	Piaye	Piaye	Sappire Estate bridge	2125	8.6	18. 3.81	1.54	2.86	81	-	-	0	1.54	2.86	81			OAS-LWUU
16	Balem-bouche	Balem-bouche	La Perle Estate (850 ft asl)	766	3.1	18. 3.81	0.38	0.71	20	0	0	0	0.38	0.71	20			OAS-LWUU
17	Doree	Dorée	Coast Road bridge	2520	10.2	18. 3.81	2.22	4.13	117	0.02	0.04	1	2.24	4.17	118			OAS-LWUU
19		Deville	Upstream Delcer French Canal Int.	319	1.29	18. 3.81	1.27	2.37	67	0	0	0	1.27	2.37	67			OAS-LWUU
21	Canaries	Canaries	Upstream CWA intake	2669	10.8	6. 3.81	3.77	6.99	198	0	0	0	3.77	6.99	198			OAS-LWUU
24	Roseau	Roseau	Above jct. Millet (700 asl)	3509	14.2	1. 11.74	4.80	8.90	252	0	0	0	4.80	8.90	252	20	PN-1	Section PP + 100
						2. 10.11.74	1.95	14.78	418	0	0	0	1.95	14.78	418	20	PN-1	"
						3. 23.11.74	18.18	33.79	956	0	0	0	18.18	33.79	956	79	PN	" Ref. CWA
						4. 24.11.74	11.41	21.20	600	0	0	0	11.41	21.20	600	79	PN	"
						5. 26.11.74	10.35	19.25	545	0	0	0	10.35	19.25	545	79	PN	"
						6. 8.12.74	5.52	10.74	304	0	0	0	5.52	10.74	304	79	PN-1	"
						7. 12.12.74	13.94	25.90	733	0	0	0	13.94	25.90	733	79	PN-1	"
						8. 13.12.74	11.48	21.32	603	0	0	0	11.48	21.32	603	79	PN-1	"

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrences %	Remarks
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)							
24	Roseau	Roseau	Above jct. Millet (700 as1)															
					9	27.12.74	2.74	5.09	144	0	0	0	2.74	5.09	144	84	PN	Section PP + 100
					10	30.12.74	2.86	5.30	150	0	0	0	2.86	5.30	150	84	PN	"
					11	2.1.75	1.82	3.37	95	0	0	0	1.82	3.37	95	84	PN-1	"
					12	11.1.75	2.11	3.91	111	0	0	0	2.11	3.91	111	84	PN-1	"
					13	13.1.75	2.26	4.19	118	0	0	0	2.26	4.19	118	84	PN-1	"
					14	14.1.75	2.53	4.70	133	0	0	0	2.53	4.70	133	84	PN-1	PP + 60
					15	14.1.75	0.98	1.83	52	0	0	0	0.98	1.83	52	84	PN-1	PP + 100
					16	16.1.75	2.87	5.34	151	0	0	0	2.87	5.34	151	84	PN-1	PP + 60
					17	16.1.75	1.50	2.79	79	0	0	0	1.50	2.79	79	84	PN-1	PP + 100
					18	17.1.75	5.00	9.30	263	0	0	0	5.00	9.30	263	44	PN	PP + 60
					19	17.1.75	2.07	3.85	109	0	0	0	2.07	3.85	109	44	PN	PP + 100
					20	19.1.75	10.07	18.71	529	0	0	0	10.07	18.71	529	44	PN	PP + 60
					21	19.1.75	7.82	14.50	410	0	0	0	7.82	14.50	410	44	PN	PP + 100
					22	20.1.75	5.54	10.29	291	0	0	0	5.54	10.29	291	44	PN	PP + 60
					23	20.1.75	3.19	5.92	168	0	0	0	3.19	5.92	168	44	PN	PP + 100
					24	21.1.75	9.85	18.30	518	0	0	0	9.85	18.30	518	44	PN	PP + 60
					25	21.1.75	9.43	17.53	496	0	0	0	9.43	17.53	496	44	PN	PP + 100
					26	23.1.75	5.59	10.40	294	0	0	0	5.59	10.40	294	44	PN	PP + 60
					27	23.1.75	3.61	6.70	190	0	0	0	3.61	6.70	190	44	PN	PP + 100
24	Roseau	Roseau	Above jct. Millet		4448	18.0												
					1	9.4.80	11.32	21.00	590	0	0	0	11.32	21.00	590	48	PN-1	Ref CWA
					2	12.4.80	6.77	12.56	350	0	0	0	6.77	12.56	350	1.90	90	PN
					3	23.4.80	5.45	10.11	290	0	0	0	5.45	10.11	290	1.94	90	PN
					4	2.5.80	3.30	6.13	170	0	0	0	3.30	6.13	170	1.87	90	PN-1
					5	9.5.80	3.12	5.80	160	0	0	0	3.12	5.80	160	1.84	90	PN-1
					6	16.5.80	2.93	5.43	150	0	0	0	2.93	5.43	150	1.80	90	PN
					7	30.5.80	3.53	6.55	180	0	0	0	3.53	6.55	180	1.94	90	PN
					8	6.6.80	2.93	5.44	150	0	0	0	2.93	5.44	150	1.90	90	PN-1
					9	13.6.80	3.49	6.48	180	0	0	0	3.49	6.48	180	2.23	90	PN-1
					10	20.6.80	8.19	15.12	430	0	0	0	8.19	15.12	430	2.79	62	PN
					11	6.3.81	8.46	15.71	445	0	0	0	8.46	15.71	445			OAS-LWUU

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrence %	Remarks	
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)								
	Millet	Above jct. Roseau	2100	8.5	1	9. 4.80	1.23	2.28	54	0	0	0	1.23	2.28	54	90	PN		
					2	17. 4.80	2.37	4.40	140	0	0	0	2.37	4.40	140	90	PN		
					3	23. 4.80	1.57	2.91	69	0	0	0	1.57	2.91	69	90	PN		
					4	2. 5.80	1.06	1.97	46	0	0	0	1.06	1.97	46	90	PN-1		
					5	9. 5.80	1.12	2.08	49	0	0	0	1.12	2.08	49	90	PN-1		
					6	16. 5.80	1.55	2.88	68	0	0	0	1.55	2.88	68	90	PN		
					7	30. 5.80	1.46	2.71	64	0	0	0	1.46	2.71	64	90	PN		
					8	6. 5.80	0.98	1.82	43	0	0	0	0.98	1.82	43	90	PN-1		
					9	13. 6.80	1.31	2.43	57	0	0	0	1.31	2.43	57	90	PN-1		
					10	20. 6.80	2.78	5.16	122	0	0	0	2.78	5.16	122	62	PN		
	Roseau	Sarot downstream CWA intake	7981	32.3	1	3. 4.80	7.08	13.14	310	0.54	0.99	28	7.62	14.13	338	90	PN-1	2 STA	
					2	3. 4.80	5.38	9.98	236	0.54	0.99	28	5.92	10.97	264	90	PN-1		
					3	9. 4.80	7.22	13.40	316	0.54	0.99	28	7.62	14.39	344	90	PN-1	2 STA	
					4	9. 4.80	5.38	9.98	236	0.54	0.99	28	5.92	10.97	264	90	PN-1		
					5	23. 4.80	5.37	9.97	235	0.54	0.99	28	5.91	10.96	263	90	PN		
					6	2. 5.80	4.59	8.52	201	0.54	0.99	28	5.13	9.51	229	0.59	90	PN-1	
					7	9. 5.80	3.81	7.07	167	0.54	0.99	28	4.35	8.06	195	0.56	90	PN-1	
					8	16. 5.80	4.15	7.70	182	0.54	0.99	28	4.69	8.69	210	0.56	90	PN	
					9	30. 5.80	4.10	7.61	180	0.54	0.99	28	4.64	8.60	208	0.59	90	PN	
					10	6. 6.80	3.08	5.72	135	0.54	0.99	28	3.62	6.71	163	0.62	90	PN-1	
					11	13. 6.80	3.52	6.53	154	0.54	0.99	28	4.06	7.52	182	0.64	90	PN-1	
					12	20. 6.80	11.07	20.54	485	0.54	0.99	28	11.61	21.53	513	0.92	62	PN	
	Roseau	Downstream of main Soufriere/ Castries Rd. Bridge near Winban	9686	39.2	1	13. 3.79	7.94	14.74	418	0	0	0	7.94	14.74	418	70		CWA is planning extraction of 2 mgd	
					2	20. 4.79	4.95	9.19	260	0	0	0	4.95	9.19	260	63	PN	Ref. Winban	
					3	29. 4.79	5.85	10.86	309	0	0	0	5.85	10.86	309	63	PN		
					4	16. 5.80	3.90	7.24	205	0.54	0.99	28	4.44	8.23	233	89	PN		
					5	6. 6.80	4.36	8.09	229	0.54	0.99	28	4.90	9.08	257	89	PN-1		
	Roseau	Downstream jct. Millet	6548	26.5	6.	3.81	8.46	15.71	445	0	0	0	8.46	15.71	445			OAS-LWUU	

Basin No.	River Name	Location of measuring station	Drainage area		No.	Date of measurement	Metered discharge			Intake upstream			Natural discharge			Stage ft	Probability of recurrences %	Remarks
			a	km			mgd	cfs	l/s	mgd	cfs	l/s	mgd	cfs	l/s			
(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)	(7)	(7)	(8)	(8)	(8)	(9)	(9)	(9)	(10)	(11)	(12)
25	Cul de Sac	200 yd upstream Castries-Roseau Rd. bridge above Geest pump	7784	31.5	1	17. 5.79	1.55	2.88	82	0.70	1.30	37	2.25	4.18	119	68 PN	Winban	
						29. 4.80	1.89	3.51	100	0.60	1.11	32	2.49	4.62	132		75 PN	Winban
	Cul de Sac	Ravin Poison upstream CWA intake	1236	5.0	8.	5.80	0.26	0.097	2.7	0	0	0	0.26	0.097	2.7	75 PN-1		
		Ravin Poison downstream both CWA intakes	1651	6.68	11.	3.81	1.69	3.14	89	0.80	1.48	42	2.49	4.62	131		OAS-LWUU	
27	Choc	Ravin Poison upstream CWA emergency pump	1236	5.0	13.	3.81	0.82	1.52	43	0.80	1.48	42	1.62	3.00	85		OAS-LWUU	
		Upstream CWA Union pumps	2011	8.14	29.	4.80	0.29	0.53	15	0	0	0	0.29	0.53	15	90 PN	Winban	
		Upstream CWA Union pumps	2011	8.14	9.	3.81	0.68	1.27	36	0	0	-	0.68	1.27	36		OAS-LWUU	



# Annex D. Population and land distribution in Saint Lucia: Basic information

**TABLE D-1. POPULATION AGE STRUCTURE, BY QUARTER AND AREA, 1970**

Source: 1970 Population Census.

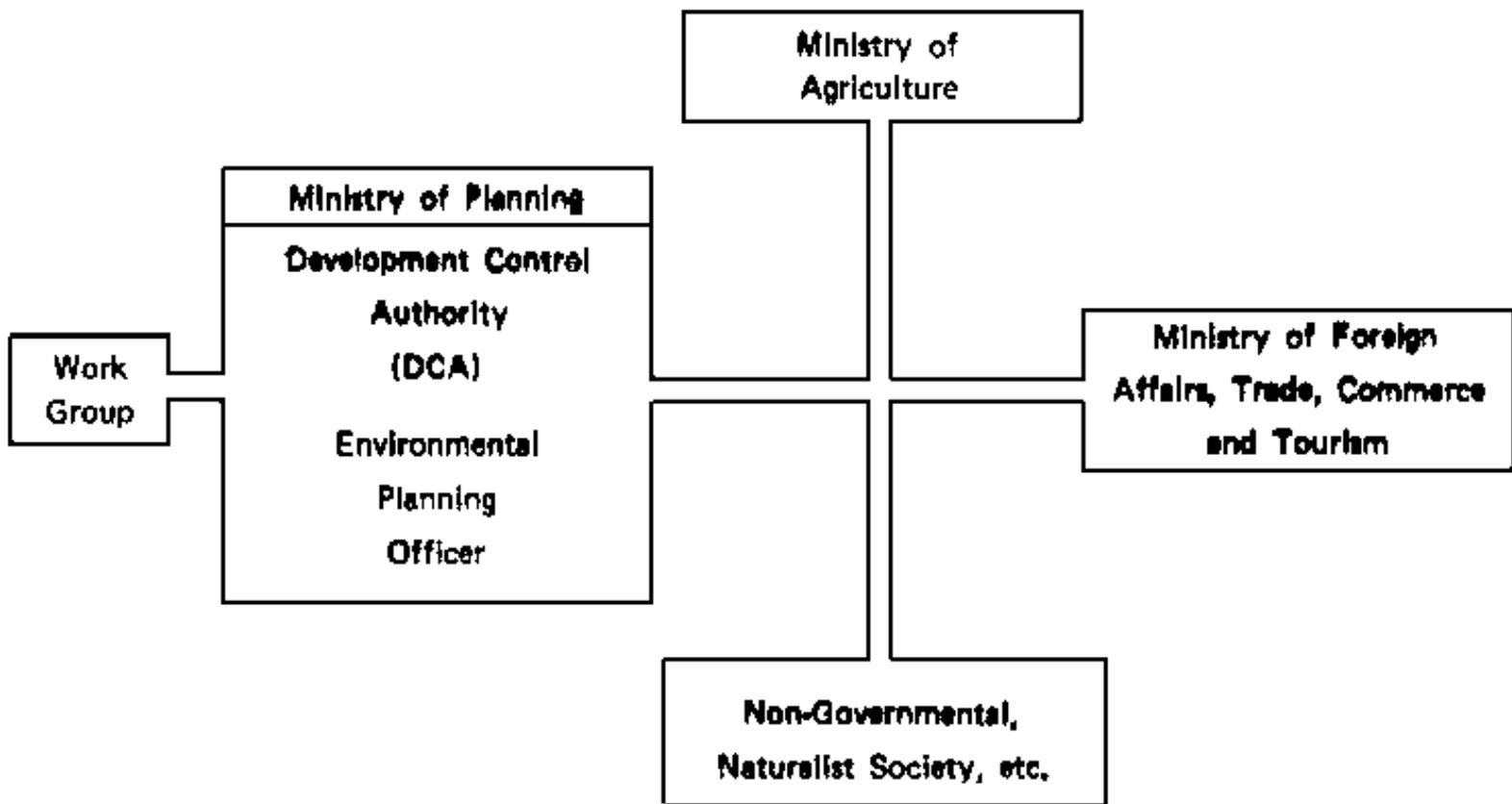
**TABLE D-2. WORKING POPULATION IN AGRICULTURE, FORESTRY AND FISHING, BY QUARTER AND AREA ENGAGED, 1970**

Quarter	Area	Total working population	Agriculture, forestry, fishing	
			N°	%
Castries	1	1 280	22	1.7
	2	84	6	7.1
	3	4 105	226	5.5
	4	10	2	20.0
	5	1 285	59	4.6
	6	584	38	6.5
	7	493	11	2.2
	8	3 946	1 930	48.9
Anse La Raye	1	530	261	49.2
	2	781	253	32.4
Canaries	1	285	145	50.8
	2	165	122	73.9
Soufriere	1	877	225	25.6
	2	1 009	651	67.5
Choiseul	1	129	33	25.6
	2	77	66	85.7
	3	1 162	656	56.4
Laborie	1	573	162	28.2
	2	137	109	73.5
	3	541	409	75.6

Vieux Fort	1	1 078	356	23.0
	2	476	166	34.8
	3	525	424	80.7
Micoud	1	677	352	51.9
	2	508	369	72.6
	3	576	422	73.2
	4	664	561	87.5
Dennery	1	667	303	45.4
	2	1 569	1 270	80.9
Gros Islet	1	310	49	15.8
	2	1 276	738	59.7
Total		26 379	10 426	39.56

Source: 1970 Population Census.

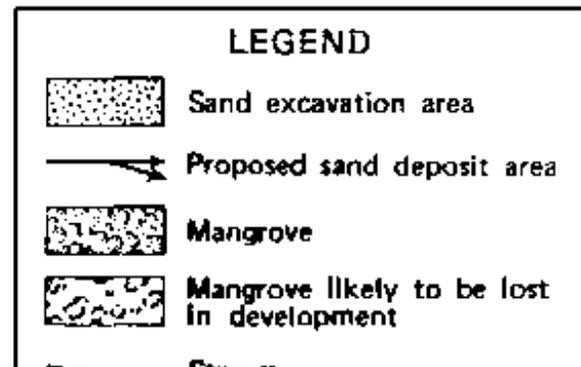
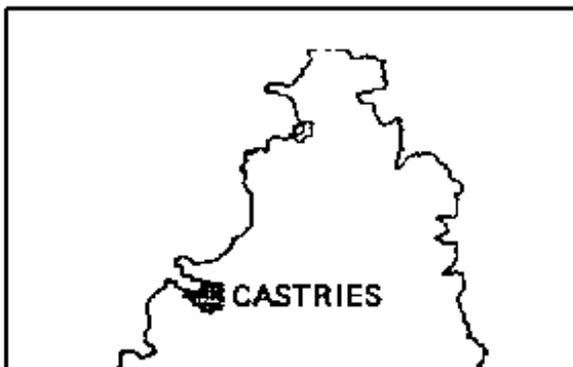
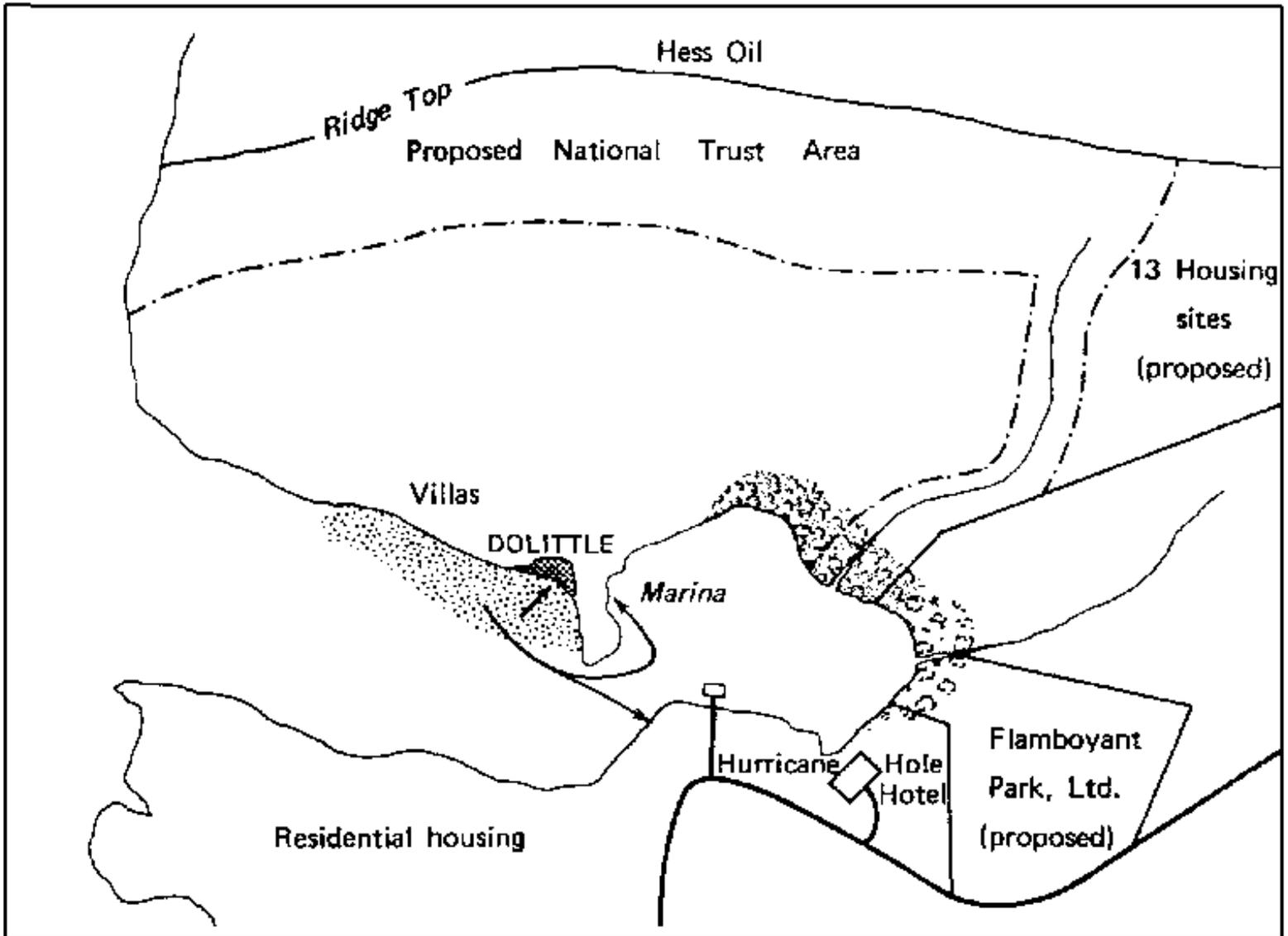




# SAINT LUCIA

## Existing Facilities and Proposed Development Activities for Marigot Bay

0 200 meters

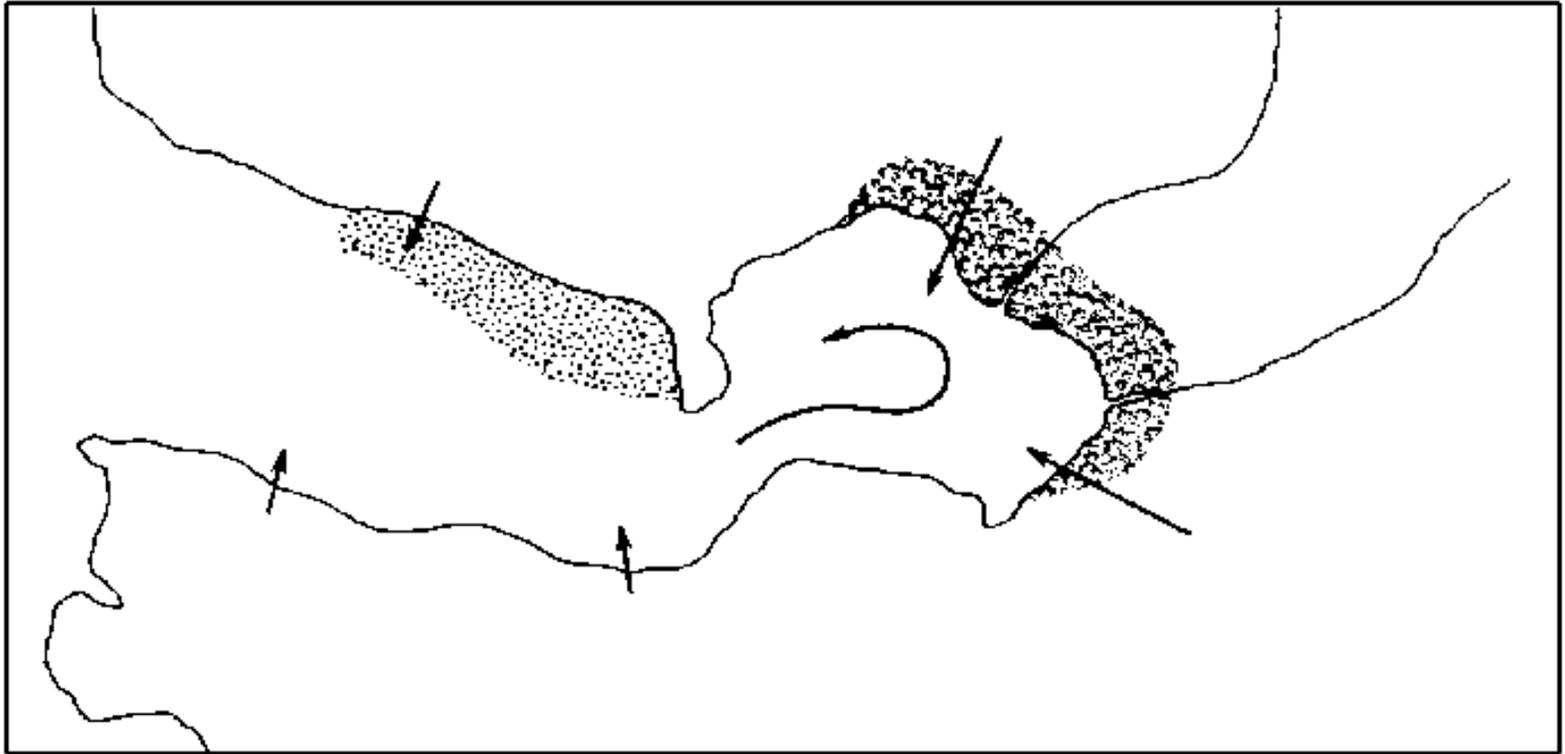




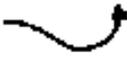
# SAINT LUCIA

## Physical Environment of Marigot Bay

0 200 meters



### LEGEND

-  Sand
-  Fresh water runoff
-  Circulation pattern of bay
-  Mangrove
-  Stream



# Annex E. Characteristics of landholding patterns in Saint Lucia: Basic information

**TABLE E-1. NUMBER OF HOLDINGS BY QUARTER AND SIZE CATEGORY, 1973/74**

Source: Ministry of Agriculture and Lands, Agricultural Statistics, Census Data 1973/74, Castries, 1975.

**TABLE E-2. AREA OF HOLDINGS BY QUARTER AND SIZE CATEGORY, 1973/74**

Source: Ministry of Agriculture and Lands, Agricultural Statistics, Census Data 1973/74, Castries, 1975.

**TABLE E-3. LANDHOLDER OCCUPATION BY FARM SIZE, 1973/74**

Occupation <sup>A</sup>	Size category (acres)						
	Total	0.0-0.9	1.0-4.9	5.0-9.9	10.0-49.9	50.0-499.9	500.0
Agricultural self-employed	48.6	25.4	65.1	78.1	75.2	44.9	30.0
Agricultural hired employee	16.0	23.6	12.7	0.8	2.0	7.1	10.0
Non-agricultural	35.4	50.9	22.1	21.2	22.8	48.9	60.0
Total %	100.0	100.0	100.0	100.0	100.0	100.0	100.0

<sup>A</sup>. As percentage of the total number of holdings in each size category.

Source: Ministry of Agriculture and Lands, Agricultural Statistics, Census Data. 1973/74. Castries, 1975.

**TABLE E-4. NUMBER OF HOLDINGS BY REGION AND SIZE CATEGORY, 1980**

Region <sup>A</sup>	Size category (acres)											
	Total		1.0-0.9		1.0-4.9		5.0-9.9		10.0-49.9		50.00	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
NORTHERN	1 266	100.00	347	27.40	655	51.73	168	13.27	88	6.95	8	0.65
CENTRAL	2 581	100.00	577	22.35	1 330	51.55	452	17.51	216	8.36	6	0.23
EASTERN	1 126	100.00	181	16.07	621	55.15	231	20.51	86	7.63	7	0.62
SOUTHWESTERN	1 098	100.00	552	50.27	363	33.06	103	9.38	67	6.10	12	1.18
SOUTHERN	880	100.00	130	14.77	4 689	53.18	202	22.95	70	7.95	10	1.13

Total	6 951	100.00	1 787	25.70	3 437	49.44	1 156	16.63	527	7.58	44	0.63
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A. Subdivisions used by the Extension Division of the Ministry of Agriculture.

Source: Government of Saint Lucia, Ministry of Agriculture, 1980 Farmer Survey.

**TABLE E-5. NUMBER AND AREA OF HOLDINGS OVER 50 ACRES BY QUARTER AND SIZE CATEGORY, 1973/74**

Source: Special tabulation from the Agricultural Census, 1973/74, and List of Tax Holders, 1976.



Quarter	Area	0-14	Percentage	15-44	Percentage	45 & over	Percentage	Total
Castries	1	1 260	37.1	1 311	38.6	821	24.2	3 392
	2	80	36.0	83	37.4	59	26.6	222
	3	6 062	45.5	5 196	38.9	2 107	15.7	13 365
	4	14	42.4	10	30.3	9	27.2	33
	5	2 161	47.2	1 759	38.4	656	14.3	4 576
	6	881	45.5	746	38.6	306	15.8	1 402
	7	562	40.1	556	39.6	284	20.2	1 402
	8	8 037	51.7	5 024	32.3	2 466	15.9	15 527
Anse La Raye	1	866	47.7	479	26.4	470	25.9	1 815
	2	1 551	52.5	881	29.8	522	17.7	2 954
Canaries	1	576	47.1	351	28.7	294	24.1	1 221
	2	379	52.8	201	27.9	138	19.2	718
Soufriere	1	1 433	46.7	977	31.8	659	21.4	3 069
	2	2 155	51.5	1 213	29.0	813	19.4	4 181
Choiseul	1	188	45.4	141	34.0	85	20.5	414
	2	184	53.0	105	30.2	58	16.7	347
	3	2 874	53.1	1 453	26.8	1 079	19.9	5 406
Laborie	1	1 056	49.4	661	30.9	420	19.6	2 137
	2	402	51.8	230	29.6	144	18.5	776
	3	1 704	54.9	841	27.1	555	17.9	3 100
Vieux Fort	1	1 782	46.9	1 334	35.1	678	17.8	3 794
	2	1 073	50.9	725	34.4	309	14.6	2 107
	3	1 222	55.3	693	31.4	292	13.2	2 207
Micoud	1	1 191	49.0	781	32.1	458	18.8	2 430
	2	1 457	55.0	825	31.1	366	13.8	2 648
	3	1 364	53.4	812	31.8	378	14.8	2 554
Dennerly	1	1 372	52.2	747	28.4	510	19.4	2 629
	2	3 344	53.7	1 906	30.6	972	15.6	6 222
Gros Islet	1	526	41.8	437	34.8	293	23.3	1 256
	2	2 447	50.4	1 569	32.3	841	17.3	4 857
<b>Total</b>		<b>49 527</b>	<b>49.6</b>	<b>32 837</b>	<b>32.9</b>	<b>17 441</b>	<b>17.4</b>	<b>99 805</b>



# Annex F. List of technical reports on Saint Lucia prepared by OAS staff, GOSL technicians and consultants

## A. PRELIMINARY WORK

1. "Implementation of the National Agricultural Transformation and Land Reform Policy in St. Lucia," Eduardo Rojas, November 1980 (CPR No. 6264, OAS-PRD, GGI, 1980)
2. "Project for Technical Assistance to the Government of St. Lucia in Support of the Natural Resources and Agricultural Transformation Policies," Biennium 1980-1981

## B. ENVIRONMENTAL MANAGEMENT, NATURAL RESOURCES CONSERVATION AND DEVELOPMENT, AND LAND USE ZONING

3. "Environmental Prospective," Douglas Pool, November 1980 (CPR No. 6266, OAS-PRD, GGI, 1980)
4. "Water Resources," Juergen Oelsner, June 1981 (OAS-PRD, Headquarters)
5. "Flow Measurement," Juergen Oelsner, June 1981 (OAS-PRD, Headquarters)
6. "Land Capability Classification and Crop Allocation in Saint Lucia," Oscar Pretell (OAS-PRD, Headquarters) and Julius Polius (Ministry of Agriculture), October 1981
7. "The Feasibility of Pumice Stone Mining in Saint Lucia," Raymond Howard-Goldsmith, December 1980 (CPR No. 6265, OAS-PRD, GGI, 1980)
8. "Land Zoning in Saint Lucia: A Summary and Background Paper" (Draft), Oscar Pretell, (OAS-PRD Headquarters) and Douglas Pool, March 1981 (CPR No. 6331 OAS-PRD, GGI, 1981)
9. "Natural Resource Management", Douglas Pool, October 1981 (CPR No. 6331 OAS-PRD, GGI, 1981)
10. "Institutional and Legal Aspects of Agricultural Land Development Planning and Implementation in Saint Lucia," Eduardo Rojas, OAS Project Chief, November, 1981.

## C. RURAL HUMAN SETTLEMENTS

11. "Aspects of Spatial Variation in Human Settlements in Saint Lucia," Charles Carnegie, April 1981 (CPR No. 6330, OAS-PRD, GGI, 1981)
12. "Land Reformulation in Saint Lucia: Evaluation of the Need for Change and of Existing

Proposals to Bring it About," Lloyd Strachan, July 1981 (CPR No. 6387, OAS-PRD, GGI, 1981)

13. "The Rural Population of St. Lucia: A Preliminary Analysis" (Final Report), Charles V. Carnegie, September 1981 (CPR No. 6330 OAS-PRD, GGI, 1981)

14. "Report on the Progress of the Map Index of Land Parcels in Saint Lucia from Available Government Records," J.E. Serieux, B.A. (Ministry of Agriculture), November 1981

15. "Saint Lucia Land Market, A Brief Survey," Robert Rickman (Ministry of Agriculture), December 1981

#### D. ALTERNATIVE POLICIES FOR LAND REDISTRIBUTION

16. "Alternative Approaches to Land Redistribution in Saint Lucia," Robert Rickman (Ministry of Agriculture) and Eduardo Rojas, Project Chief, August 1981

17. "A Short-Term Strategy for Land Redistribution in Saint Lucia", Eduardo Rojas, OAS Project Chief and Lloyd Strachan (CPR No. 6387, OAS-PRD, GGI, 1981), September 1981

#### E. PILOT PROJECT

18. "Pilot Project of Land Redistribution in the Morne Panache Area; Project Profile," Lloyd Strachan, September 1981 (CPR No. 6387, OAS-PRD, GGI, 1981)

19. "Registration of Title to Land, Proposals for a General Cadastre-Pilot Project Morne Panache," Leslie B. Mae, November 1981 (CPR No. 6436, OAS-PRD, GGI, 1981)

20. "Land Titling and Registration; Pilot Project-Morne Panache Area," J.J. Castro-Chamberlain, December 1981 (OAS-PRD, Headquarters)

21. "Land Titling and Registration; Pilot Project-Morne Panache Area," Summary, December 1981.



Quarter	Size category (acres)													
	Total		0.1 - 0.9		1.0-4.9		5.0 - 9.9		10.0 - 49.9		50.0 - 499.9		500.0	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Castries	2 269	100.00	1 318	58.08	605	26.66	135	5.86	203	8.94	8	8.35	2	0.08
Anse La Raye	618	100.00	288	46.68	207	33.49	74	11.97	41	6.63	7	1.13	1	0.16
Canaries	343	100.00	189	55.12	90	26.23	33	10.20	18	5.24	11	9.20	-	-
Soufriere	977	100.00	416	42.57	370	37.87	105	10.74	58	5.93	26	2.66	2	0.20
Choiseul	1 004	100.00	469	46.71	463	46.11	56	5.57	12	1.19	4	0.39	-	-
Laborie	787	100.00	323	41.04	297	37.73	83	10.54	74	9.40	9	1.14	1	0.12
Vieux Fort	759	100.00	346	45.58	362	47.69	23	3.29	15	1.97	10	1.31	1	0.13
Micoud	1 086	100.00	222	20.44	506	46.59	270	24.86	78	7.18	7	0.64	3	0.27
Dennerly	1 553	100.00	610	39.27	561	36.12	238	15.32	129	8.30	12	0.77	3	0.19
Gros Islet	1 040	100.00	549	52.78	367	35.28	63	6.05	46	4.42	9	0.86	6	0.57
<b>Total</b>	<b>10 436</b>	<b>100.00</b>	<b>4 730</b>	<b>45.32</b>	<b>3 828</b>	<b>36.28</b>	<b>1 082</b>	<b>10.37</b>	<b>674</b>	<b>6.45</b>	<b>103</b>	<b>0.98</b>	<b>19</b>	<b>0.18</b>

Note: 1/ A total of 503 "Holdings Without Land" eliminated for purposes of comparison with Table E-2.

Quarter	Size category (acres)													
	Total		0.1 - 0.9		1.0 - 4.9		5.0 - 9.9		10.0 - 49.9		50.0 - 499.9		500	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Castries	10 659	100.00	392	3.67	1 232	11.55	868	8.14	4 323	40.55	1 144	10.73	2 700	25.33
Anse La Raye	5 796	100.00	67	1.15	536	9.24	439	7.57	683	11.78	1 121	19.34	2 950	50.89
Canaries	2 248	100.00	32	1.42	285	12.67	247	10.98	288	12.81	1 396	62.09	-	-
Soufriere	6 953	100.00	129	1.85	949	23.64	746	10.72	1 051	14.82	2 936	42.22	1 162	16.71
Choiseul	2 016	100.00	191	9.47	874	43.35	348	17.26	138	6.94	465	23.06	-	-
Laborie	5 832	100.00	125	8.14	667	11.43	519	8.89	1 681	28.82	2 281	39.11	559	9.58
Vieux Fort	4 692	100.00	152	3.23	728	15.51	170	3.62	214	4.56	1 123	23.93	2 305	49.12
Micoud	11 301	100.00	107	0.94	1 178	20.40	1 766	15.62	1 267	11.21	1 685	14.91	5 300	46.89
Dennerly	10 552	100.00	274	2.58	1 211	11.47	1 564	14.82	2 117	20.06	1 640	15.54	3 746	35.50
Gros Islet	11 952	100.00	264	2.27	813	6.80	401	3.35	953	7.97	1 341	11.21	8 180	68.44
<b>Total</b>	<b>72 001</b>	<b>100.00</b>	<b>1 735</b>	<b>2.41</b>	<b>8 471</b>	<b>11.76</b>	<b>7 068</b>	<b>9.81</b>	<b>12 695</b>	<b>17.63</b>	<b>15 132</b>	<b>21.01</b>	<b>26 902</b>	<b>37.36</b>

Quarter	Total		Size category (acres)																	
			50.0 - 99.9				100.0 - 199.9				200.0 - 499.9				500					
			No.	%	Area	%	No.	%	Area	%	No.	%	Area	%	No.	%	Area	%		
CASTRIES	17	100.00	5 287	100.00	10	58.82	599	11.31	2	11.76	250	4.72	3	17.64	978	18.49	2	11.76	3 460	65.44
ANSE LA RAYE	11	100.00	4 768	100.00	6	54.54	411	9.24	2	18.18	203	4.25	2	18.18	680	14.26	1	9.09	3 445	72.25
CANARIES	11	100.00	2 392	100.00	5	45.45	375	15.67	3	27.27	471	19.69	1	9.09	449	18.77	2	18.18	1 097	45.86
SOUFRIERE	56	100.00	5 447	100.00	18	50.00	1 300	23.86	8	22.22	1 030	18.90	8	22.22	1 967	36.11	2	5.55	1 150	21.11
CHOISEUL	5	100.00	405	100.00	4	80.00	247	60.98	1	20.00	158	39.01	-	-	-	-	-	-	-	-
LABORIE	10	100.00	2 868	100.00	2	20.00	131	4.56	1	10.00	127	4.41	6	60.00	2 010	70.08	1	10.00	600	20.92
VIEUX FORT	16	100.00	3 815	100.00	12	75.00	851	22.30	1	6.25	100	2.62	2	12.5	560	14.67	1	6.25	2 305	60.41
MICOU	14	100.00	7 379	100.00	4	28.57	295	3.99	2	14.28	285	3.86	4	28.57	1 064	14.11	4	28.57	3 735	77.72
DENNERY	15	100.00	5 510	100.00	4	26.66	291	5.28	5	33.33	651	11.81	3	20.00	905	16.42	3	20.00	3 663	66.47
GROS ISLET	14	100.00	9 640	100.00	4	28.57	256	2.65	5	21.42	425	4.40	3	21.42	1 120	11.61	4	28.57	7 839	81.31
<b>Total</b>	<b>149</b>	<b>100.00</b>	<b>47 511</b>	<b>100.00</b>	<b>69</b>	<b>46.30</b>	<b>4 786</b>	<b>30.07</b>	<b>28</b>	<b>18.79</b>	<b>700</b>	<b>7.78</b>	<b>32</b>	<b>21.47</b>	<b>9 733</b>	<b>20.48</b>	<b>20</b>	<b>13.42</b>	<b>29 294</b>	<b>61.65</b>



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# The Organization of American States

The purposes of the Organization of American States (OAS) are to strengthen the peace and security of the Hemisphere; to prevent possible causes of difficulties and to ensure the pacific settlement of disputes that may arise among the member states; to provide for common action on the part of those states in the event of aggression; to seek the solution of political, juridical, and economic problems that may arise among them; and to promote, by cooperative action, their economic, social, and cultural development.

To achieve these objectives, the OAS acts through the General Assembly; the Meeting of Consultation of Ministers of Foreign Affairs; the three Councils (the Permanent Council, the Inter-American Economic and Social Council, and the Inter-American Council for Education, Science, and Culture); the Inter-American Juridical Committee; the Inter-American Commission on Human Rights; the General Secretariat; the Specialized Conferences; and the Specialized Organizations.

The General Assembly holds regular sessions once a year and special sessions when circumstances warrant. The Meeting of Consultation is convened to consider urgent matters of common interest and to serve as Organ of Consultation in the application of the Inter-American Treaty of Reciprocal Assistance (known as the Rio Treaty), which is the main instrument for joint action in the event of aggression. The Permanent Council takes cognizance of matters referred to it by the General Assembly or the Meeting of Consultation and carries out the decisions of both when their implementation has not been assigned to any other body; monitors the maintenance of friendly relations among the member states and the observance of the standards governing General Secretariat operations; and, in certain instances specified in the Charter of the Organization, acts provisionally as Organ of Consultation under the Rio Treaty. The other two Councils, each of which has a Permanent Executive Committee, organize Inter-American action in their areas and hold regular meetings once a year. The General Secretariat is the central, permanent organ of the OAS. The headquarters of both the Permanent Council and the General Secretariat is in Washington, D.C.

The Organization of American States is the oldest regional society of nations in the world, dating back to the First International Conference of American States, held in Washington, D.C., which on April 14, 1890, established the International Union of American Republics. When the United Nations was established, the OAS joined it as a regional organization. The Charter governing the OAS was signed in Bogota in 1948 and amended by the Protocol of Buenos Aires, which entered into force in February 1970. Today the OAS is made up of thirty-two member states.

**MEMBER STATES:** Antigua and Barbuda, Argentina, The Bahamas, (*Commonwealth of*), Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, (*Commonwealth of*), Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States, Uruguay, Venezuela.

