

**A Socio-Economic Study of  
Community Based Management of  
Mangrove Resources in St. Lucia**

**By**

**Brett Hudson**

**A Practicum Submitted to the Faculty of Graduate Studies  
in Partial Fulfillment of the Requirements for the Degree,  
Masters of Natural Resources Management.**

**Natural Resources Institute  
University of Manitoba  
Winnipeg, Manitoba,  
R3T 2N2**

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**A SOCIO-BASED ECONOMIC STUDY OF COMMUNITY  
BASED MANAGEMENT OF MANGROVE RESOURCES IN ST. LUCIA**

**by**

**BRETT HUDSON**

**A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University  
of Manitoba in partial fulfillment of the requirements of the degree  
MASTER of NATURAL RESOURCES MANAGEMENT**

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## **Abstract**

**Mangrove forests occur at the interface between land and sea in areas with flat and protected shorelines throughout the tropics. Mangroves are unique ecosystems, which provide habitat for a wide diversity of plants and animals. They also provide many valuable products and services to human populations, many of which, such as shoreline protection and stabilization, are only recently being recognized. However, local communities the world over have long exploited mangroves for timber, fish, and the various other goods which the forest provides. The study presented here examines the socio-economic aspects of charcoal production from a mangrove in the Caribbean as a contribution to one project which seeks to fulfill the dual objectives of conserving a locally important mangrove forest while maintaining the production of forest resources by traditional users.**

**The primary purpose of the study is to demonstrate the value of this particular mangrove to the wide diversity of people who benefit from it. The focus of the research is on the group of resource users who exploit the forest for charcoal production. This group enjoys exclusive rights to harvest in the mangrove, and is partially responsible for its conservation. Informal individual and small group interviews were conducted over the summer of 1996 to determine the resource management system employed by this group, their perceptions of participation in managing the forest, and to document the importance of charcoal production from the mangrove to their socio - economic strategy. The study indicates that making charcoal is central to the livelihoods of these people, and they are anxious to ensure its continuation into the future.**

**In addition to the importance of the mangrove to individual users, the study attempts to document the value of the mangrove to the surrounding communities through its two main economic uses, charcoal production, and grazing cattle. It was found that the forest provides an essential supplementary pasture for some members of the local cattle industry during the dry season when their own pastures are unable to sustain the grazing pressure. The value of the charcoal harvest for**

several years was estimated, as was the contribution that this charcoal makes towards meeting domestic energy needs in the region. Charcoal remains an important fuel resource despite the increasing use of propane gas for cooking. From the data available, it is estimated that charcoal production in the mangrove provided as much as twenty to thirty per cent of the total charcoal consumption in Vieux Fort, and that the value of the charcoal harvest ranged between \$40,656 EC. and 56,196 EC during the study period.

This fuel resource also has value to the nation as a whole. If this source were to disappear, the country would be forced either to find an alternative to charcoal, likely in the form of imported propane gas, or to obtain charcoal from other locations which are not as productive as the mangrove. The foreign exchange savings realized by the National Government from not having to import greater quantities of propane gas were found to be \$18,900 EC./yr. The savings to the town residents of not having to bear the increased operating costs of cooking with this gas were estimated at \$23,500 EC/yr. In total, the annual value of cattle grazing, charcoal production, and the savings to the community of using charcoal rather than propane gas was estimated at \$79,900 EC./yr.

To this value must be added the values of the ecosystem services and untraded commodities which the mangrove provides. This study was unable to complete such a valuation, and is limited to a description of those values which should be examined. The mangrove is exploited by local residents for other resources, such as fishing, crab harvesting, and recreation. The nutrient rich sediment discharge which occurs during the rainy season is another important resource, which contributes to the productivity of the near shore waters. Other ecosystem services include bird habitat, fisheries nursery areas, water purification and coastal protection.

In sum, the study demonstrates that this small mangrove provides many valuable benefits to many members of the surrounding communities. The primary beneficiaries are the charcoal producers, but many others gain something from the existence of the forest as well. This indicates that there is a need to continue to

**protect the forest from conversion to other uses, and to strengthen the management capabilities of the charcoal producers' group to effectively conserve the resource.**

### **Acknowledgments**

This practicum is the result of the collaboration of a great many people, all of whom are deserving of my thanks for their assistance in its completion.

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## **Chapter 1: Introduction**

### **1.0 Preamble**

**Mangrove forests occur at the interface between land and sea in areas with flat and protected shorelines throughout the tropics. Although the exact extent of mangroves worldwide is not well known, in the Western hemisphere it is estimated that mangroves occupy over 5.8 million hectares (FAO 1994). Mangroves are unique ecosystems, which provide habitat for a wide diversity of plants and animals. They also provide many valuable products and services to human populations, many of which, such as shoreline protection and stabilization, are only recently being recognized. However, local communities the world over have long exploited mangroves for timber, fish, and various other goods which the forest provides. Mangroves have come under increasing pressure of late as the need to provide economic opportunities has grown along with expanding populations. Again, no exact figures are available, but some estimate that as much as one million hectares of mangrove are destroyed annually worldwide (Hutchings and Saenger 1987). The growth of the aquaculture industry, conversion for coastal development, and timber harvesting have contributed to this phenomenon (Pons and Fiselier 1991).**

**Increasing recognition of the value of the ecosystem services and timber and non timber goods that mangroves produce has led to conservation initiatives in many countries. However, as is the case with many environmental features, the preservation of these forests for their existence value alone is not a likely prospect (Thomas et al. 1991). Local people must continue to be able to access the resources which the forest provides. Mangroves are among the worlds' most productive ecosystems. Situated between the land and the sea, they receive nutrients and sediments from both tidal and freshwater systems, and in turn contribute nutrients to those systems downstream (Viles and Spencer 1994). The great productivity of the mangrove ecosystem offers the possibility that it can**

continue to be exploited for its renewable resources into the future if preserved from conversion to unsustainable uses. The study presented here examines the socio-economic aspects of charcoal production from a small mangrove in the Caribbean as a contribution to one project which seeks to fulfill the dual objectives of conserving a locally important mangrove forest while maintaining the production of forest resources by traditional users.

### **1.1 Background**

Mankòtè is a basin type mangrove occupying some 63 ha on the southeast coast of the island of St. Lucia in the eastern Caribbean, and is the largest such forest remaining on the island. The forest has a long history of exploitation by the population of the adjacent communities for a variety of uses, including timber harvesting, waste disposal, bathing, fishing and charcoal production. These activities were interrupted during World War Two and for some years thereafter by the presence of a U.S. Air Force base which used the mangrove to conceal aircraft. After the base was closed in 1960, local people began using the mangrove again, and presently it supplies much of the charcoal requirements of Vieux Fort (Smith and Berkes 1993). Charcoal is an important fuel resource due to its low cost, ease of transport and slow burning properties. Charcoal is also valued as part of the local culture and for the flavour it gives food prepared with it. The alternative to charcoal is bottled gas, but many residents continue to prefer charcoal, especially for longer cooking tasks (Smith and Berkes 1993). This applies particularly to lower income families, who in many cases cannot afford the initial capital investment of gas stoves (World Wildlife Fund 1988).

In 1981, the Caribbean Natural Resources Institute (CANARI) identified the Mankòtè area as a priority for conservation as part of a larger assessment of the development and conservation requirements of the country's southeast coast conducted for the St. Lucia National Trust and the Government (Walters and Burt 1991). Descriptive surveys conducted subsequently revealed that the mangrove resource was under pressure from over harvesting by charcoal producers, and from

the use of the area as a waste disposal site for the local population. CANARI subsequently began a dialogue with the charcoal producers and others to identify possible solutions. In 1986, the mangrove was declared a marine reserve area, and waste dumping has been curtailed, although not eliminated altogether (Smith and Berkes 1993).

As part of its ongoing conservation and development program in Mankòtè, CANARI has aided in the establishment of a communal resource users group, based on the previously existing loose coalition of charcoal producers who acted to regulate charcoal production in the mangrove to some degree. Working in collaboration with various Government agencies, CANARI has sought to implement an integrated rural development project which incorporates both improved management of the mangrove itself and the use of government owned land for a combined fuelwood plantation and farm managed by the group. The intent of the farm and woodlot has been to provide an alternative revenue source for group members and thereby to reduce harvest pressure on the mangrove. Now the farm, woodlot, and mangrove form an interrelated revenue source for group members which supplements individuals' incomes.

The group, known as the Aupicon Charcoal and Agricultural Producers' Group (ACAPG) is now the sole agent authorized by the Department of Fisheries to extract resources from the mangrove, and they are able to prevent open access to the resource to some extent (Smith and Berkes 1993). Surveys conducted in 1992 revealed an increase in the amount of timber available in the mangrove. This is most remarkable given that, as discussed later, this increase was coincident with intensified harvesting activities (CANARI Report on Activities 1993). Researchers have attributed this improvement largely to the adoption of less destructive harvest methods by the Aupicon Charcoal and Agricultural Producers' Group (Smith and Berkes 1993). As part of its involvement with Mankòtè Mangrove, the ACAPG has been active in the development of the mangrove as part of the Pointe Sables National Park, with the expectation that they will lead tourist excursions in the area (CANARI Research Programme 1995).

Previous research in the Mankòtè has identified the granting of exclusive rights and responsibilities to the ACAPG as a critical factor in the conservation of the resource. By controlling access and assuring that the group will benefit in the future from the continued existence of the forest, a clear motivation for preserving the resource has been established (Smith and Berkes 1993). The Aupicon Charcoal and Agricultural Producers' Group is currently engaged in the development of a co-management agreement with CANARI and the Government of St. Lucia which will formalize the producers rights of access to resources exploited in Mankòtè Mangrove. In return, the producers will be partially responsible for management of the resource (CANARI 1995). This is being done as part of a nationwide management initiative for the management of beaches and mangals (a term for the community of mangrove species) which seeks to establish local management authorities (LMAs) under the authority of the Fisheries Act. These LMAs are intended to provide local control over coastal resource use and to involve communities in the integrated management of those resources (K. Nichols, Deputy Director, Department of Fisheries, pers. comm. 1996)

## **1.2. Issue Statement**

Mangroves, like many other environmental features, are frequently destroyed to permit their conversion to purposes considered more economically productive. Such decisions are facilitated by the fact that the true significance and value of the forest, both in terms of directly measurable economic benefits and less tangible, but nevertheless important, ecosystem functions, is not recognized by the usual accounting procedures employed by planners. In the context of developing economies, improved conservation of these wetland resources may depend on augmenting the understanding among decision makers of the economic and ecological importance of intact wetland ecosystems (Turner 1991). In many parts of the world conversion of mangroves to commercial development has frequently led to the destruction of the forest and the elimination of traditional uses of the resources which it contains. Such actions of course threaten to displace those who

traditionally made their livelihoods from the mangrove (Kunstadter 1985). In many areas of the tropics, much of the value of mangroves stems from their sustainable utilization by local communities for the timber, fish and other resources available in the forest (Pons and Fiselier 1991). In many cases, a choice is made between pursuing a single economic use such as aquaculture, and preserving the forest for the multiple uses which it supports (Kunstadter 1985).

The Aupicon Charcoal and Agricultural Producers' Group has collectively acted as both stewards and exploiters of the timber resources found in Mankòtè Mangrove for over a decade. They have done so through the institution of a community based common property resource management system. To date, their rights and responsibilities in this regard have been largely a matter of custom and tacit agreement on the part of the Government. The Producers' Group, CANARI, and Government officials all believe it is desirable that this arrangement be given some firmer legal status in the form of a co - management agreement in order to legitimize the Group's management authority in the eyes of both the State agencies responsible in law for the management of the mangrove and those of the surrounding community who customarily use the forest. This process is now underway under the auspices of the interagency Government Beaches and Mangals Subcommittee. For such an agreement to be effective, it must be designed and implemented in a manner which both builds on existing management activities, and establishes where appropriate, new structures which are congruent with the abilities and requirements of the Aupicon Charcoal and Agricultural Producers' Group. As part of this process, CANARI feels that further research into the current management regime employed by the producers, and the socio-economic significance of charcoal production, both to the charcoal producers and to the wider community, would be useful.

### **1. 3 Purpose and Objectives**

This study has two interrelated purposes. The first of these is to add to the growing body of case studies of common property resource management systems,

intended to discover the institutional strengths and weaknesses which attend this form of economic organization. The second is to document more fully, although not exhaustively, the role of the mangrove in the socio-economic system of both the Aupicon Charcoal and Agricultural Producers' Group and the various other beneficiaries in the surrounding community. This is done as part of an ongoing research programme on participatory resource management and development methods conducted by CANARI (CANARI Research Programme 1995). The information gathered in this study concerning the strengths and weaknesses of the present management regime may be used to facilitate the design of an appropriate co-management agreement between the resource users, the Government, and other stakeholders. Accordingly, the following research objectives were formulated and pursued:

- to describe the current resource management regime employed by charcoal producers in the mangrove
- to describe the perceptions of the resource users group regarding both their experiences in the participatory management of the mangrove over the past several years and their ability and willingness to continue to participate in the management of the forest
- to estimate the value to the community and the country of the direct economic uses of the mangrove; charcoal production and cattle grazing
- to conduct an economic analysis of the charcoal industry in Mankôtè, and to describe its impact on the households involved, and
- to derive recommendations suggesting the functions which might usefully be assumed by a co-management board to assist the Charcoal Producers' Group in managing the mangrove.

#### **1. 4 Limitations of the Study**

It must be noted at the outset that this study is limited to an assessment of social and economic parameters only. A biophysical assessment of the mangrove is urgently required to determine whether the current rate of harvest continues to

be sustainable, but such research was not attempted in this study. The sole indicator of the sustainability of the harvest this research provides is a comparison of current levels of production with those of other years. However, fluctuations in production need not be associated with long term changes in the resource base, and production figures are not a good proxy for a scientific measurement of the volume of standing timber. Secondly, this research makes no attempt to document and quantify the many other, untraded, products of the mangrove such as bathing, fishing, and hunting. Nor does it attempt to quantify the contribution the mangrove makes to the productivity of the inshore fishery and aquaculture industry. While only those resources solely and directly attributable to the mangrove are included in the economic analysis, it must be remembered that these represent only a part of the total value of the mangrove. However, the matter of where the ecological, and therefore the economic influence of mangrove functions cease is difficult to determine. Thus, caution dictates that only those uses directly dependent on the existence of the mangrove be included, leaving the study of more indirect linkages to the future. Such measurement is essential to the complete documentation of the value of the mangrove to the economy and environment of the area, and these omissions in no way reflect the importance of these goods and services provided by the mangrove. Rather they reflect only the qualifications of the researcher and the limited time and resources available.

## **Chapter 2: Study Area and Methods**

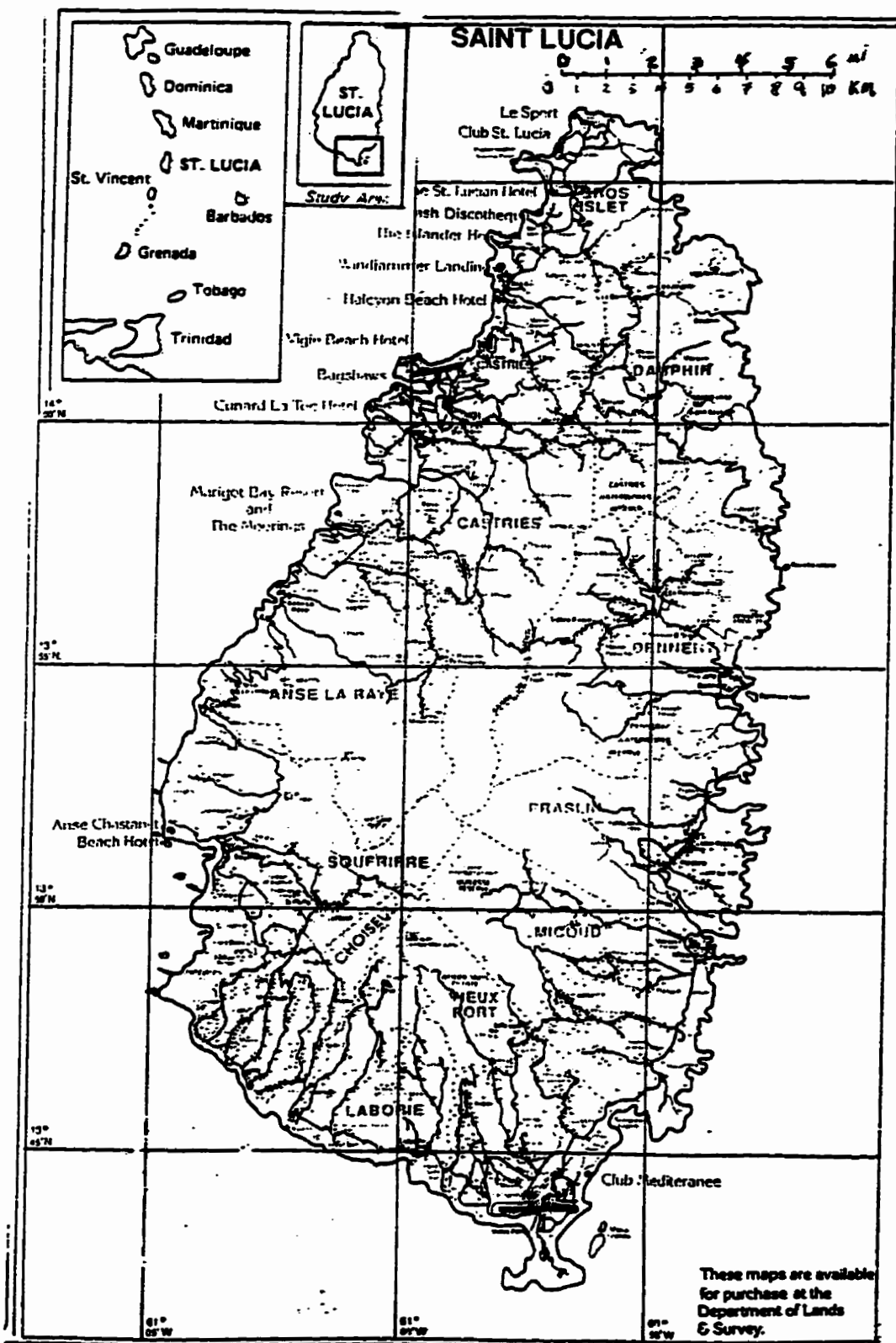
### **2.1 Study Area**

St. Lucia is a small island country in the southern half of the Lesser Antilles in the eastern Caribbean (Fig. 1). It is a mountainous country of volcanic origin which supports luxuriant rain forests at higher elevations. Annual rainfall in the interior averages 345 cm, while the coast receives 150 cm, most of which falls between June and December. The total area of the island itself is 616 square kilometers, which contains a population of 157,000 people.

St. Lucia is a former colony of both France and Britain, the latter gaining control of the island in 1814. Independence from Britain was won in 1979, but the nation continues to be a member of the Commonwealth. One legacy of the colonial age is the economic predominance of export oriented monoculture. In the colonial period, sugar was the main product, and the remains of old sugar plantations dot the island still. Now, however, it is bananas which are the mainstay of the island economy. Banana cultivation accounts for 60% of the agricultural sector, which remains the largest employer on the island, providing a livelihood for 21.6% of the economically active population. The vast majority of this production is exported to Europe, which provides St. Lucia and other Windward Island banana exporters with a protected market. In 1993 export revenues from bananas totaled approximately \$ 136 million E.C. (\$71.6 million CAD)(Government of St. Lucia 1994).

However, the economy is currently undergoing a major transition. Banana export earnings declined significantly in 1993, falling over 25% from 1992. The decline is due to falling prices, changes in exchange rates against the pound sterling, and the intrusion of other suppliers into the European market (Government of St. Lucia 1994). Tourism has replaced bananas as the most dynamic growth industry in St. Lucia. Visitors to the island spent an estimated \$ 569 million E.C. in 1993 (\$299.5 million CAD), far exceeding the agricultural

Figure 1: Map of St. Lucia.



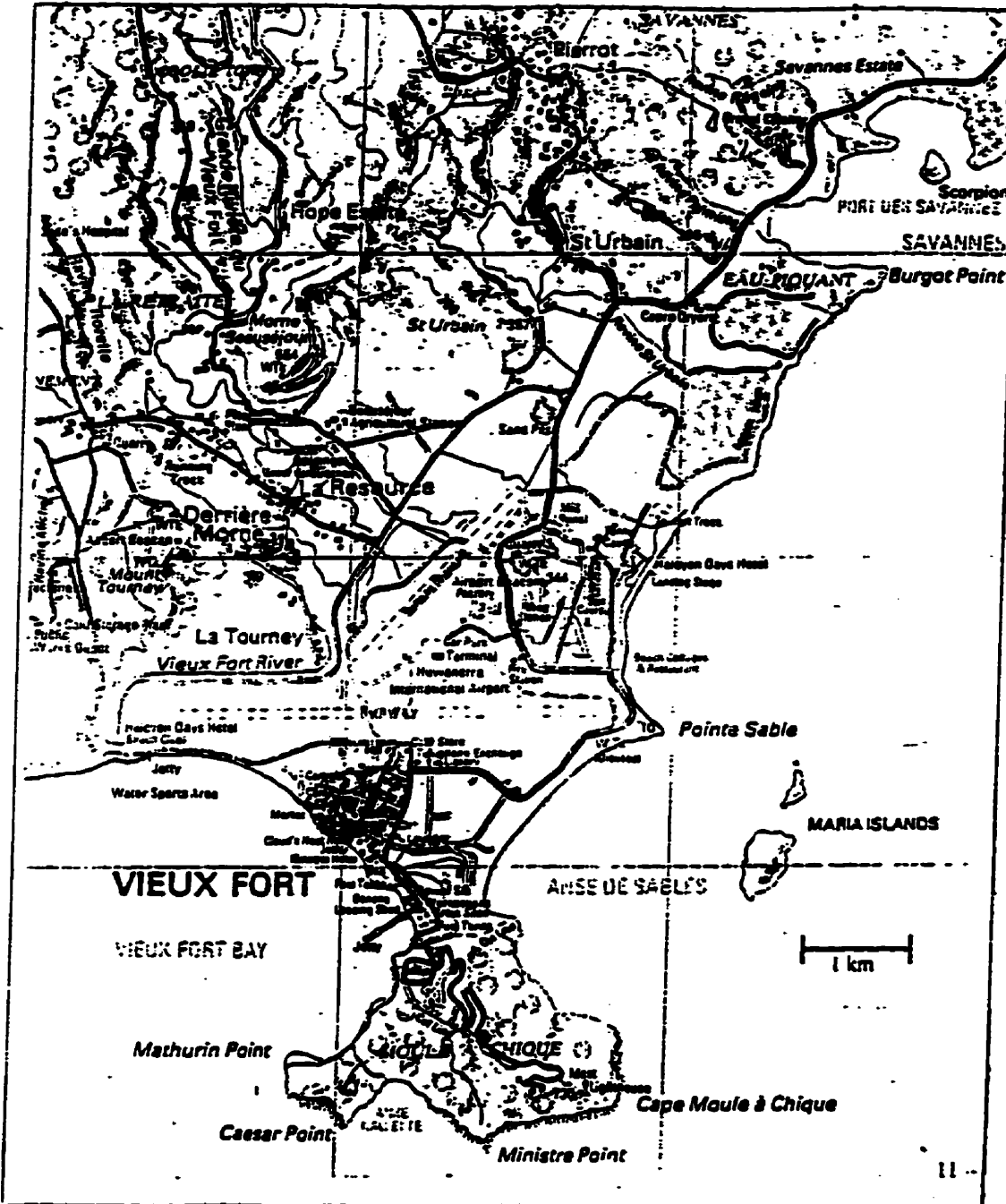
sector in value, but not in terms of employment generated. The hotel and restaurant sector accounted for only 9.9% of total employment in the same year (Government of St. Lucia 1994).

Despite the expanding tourism industry and the presence of light industry and manufacturing, the national unemployment rate is 16.7% of the labour force. Unemployment is particularly high among young people. Persons between the age of fifteen and thirty accounted for 70% of the unemployed (Government of St. Lucia 1994). In Vieux Fort, with a total population estimated at 14000 persons, 8971, or 68% are under the age of thirty and the national population continues to expand at a rate of 2.1 per cent per year. (Government of St. Lucia 1997; 1994). Tourism development is concentrated in the Northern half of the island, centering on the area between the capital, Castries, and the town of Gros Islet. The southern part of the Island, including Vieux Fort, the country's second largest town, has not participated equally in tourism development, and agriculture remains one of the main activities in this region. Other important employers in the Vieux Fort area are the airport and sea port, the Winera box factory, the Windward and Leeward Brewery, B and D construction, fishing, and the light manufacturing industries located in the duty free industrial parks. Vieux Fort serves as the commercial hub for the surrounding towns such as Peirrot, Aupicon, La Resource, Black Bay, and La Tourney.

## **2.2 Study Methods**

Mankòtè Mangrove is located on the southeast coast of the Island a short distance to the north of Vieux Fort (Fig. 2). It is a basin mangrove, cut off from the sea for much of the year by a sandbar. Much of the freshwater input to the mangrove comes from the St. Urbain Ravine, which flows down from the hills west of the mangrove, through agricultural lands, a land fill, and cattle pastures before emptying into the forest. To the south and southeast, the mangrove is bounded by the property of a tourist resort and by the Atlantic ocean. To the north are some low cliffs which separate the mangrove from Savannes Bay.

Figure 2: Study Area.



This research encompasses a diversity of investigative topics, including descriptions of land uses and management systems, basic economic analysis, and social impact analysis. However, the focus of the study was on the members of the Aupicon Charcoal and Agricultural Producers' Group, the management regime they employed, and their perceptions of the costs and benefits of participatory management. The nature of the information sought inevitably placed a heavy reliance on information obtained from local people, particularly members of the Group, many of whom have little in the way of formal education. Furthermore, the study was conducted by a single researcher, unfamiliar with the area and language, over the period of a mere fourteen weeks. Thus a methodological framework was sought which was suitable these conditions. The methods applied in the study are a few of the suite of techniques which have been developed to carry out Rapid Rural Appraisal studies by Robert Chambers and researchers at the International Institute for Development Studies in Brighton, England (Chambers 1985).

Rapid Rural Appraisal (RRA) was developed in response to the many perceived inadequacies of much development research as it has traditionally been conducted. The two dominant research paradigms which had been employed most often prior to the development of RRA were long, in depth survey interviews which cost a great deal of money to produce and were intensive in terms of both human resources and time. Due to the large time commitment represented by these surveys, the resulting reports were often produced only months after the research was done, too late for the information to be of any use, even if someone bothered to read them ( a trap which unfortunately this study has fallen into as well). The polar opposite of these surveys is the brief site visit by the development professional, derisively termed "development tourism", which was both fast and inexpensive, but frequently produced misleading information (Chambers 1983). RRA is intended to provide a framework which allows the collection of much the same type of information gathered in an in depth survey in much less time, and with greater accuracy than that of the brief field excursion. More importantly,

RRA, and the more recently developed Participatory Rural Appraisal is intended to facilitate the participation of the local people in the research process. Survey questionnaires are held to be a unidirectional transfer of information where the content of that information is solely the decision of the researcher. In RRA/PRA, information is still solicited, but it is done in a manner which hopefully allows respondents a greater latitude in controlling the direction of the research, which issues are investigated, and how that information is collected (Chambers 1985).

A key characteristic of RRA which also differentiates it from the more rigid framework of the scheduled survey is that RRA is expected to be an iterative process. It is recognized that not all questions of importance can be determined before the researcher arrives in the field. It is essential for the proper conduct of RRA that the researcher be prepared and able to learn from respondents quickly, and to change the direction of the study should unforeseen issues of importance arise. Furthermore, as part of the process of facilitating local participation in the research exercise, RRA practitioners place a high premium on the behaviour of the researcher in the field. This is part of an effort to reverse traditional authority roles in which the outsider is considered the expert, who is there to find out some facts and advise the locals on the basis of this information combined with his or her expertise (Chambers 1983). RRA is ideally conducted in as unassuming and informal a manner as possible, in which a good rapport with the respondents, and an unhurried, patient and attentive demeanor are paramount (Chambers 1994).

A number of different techniques have been applied which are intended to be congruent with the informality of the RRA approach. The primary tool of researchers applying this framework is the semi structured, informal interview. This has been described as being the core of good RRA, and entails using checklists rather than questionnaires, asking open ended questions, and being able to follow up on unexpected responses. Other principal techniques used in RRA analyses are the review of existing secondary materials about the study area or project, transect walks, direct observation, group interviews, diagramming, seasonal calendars, focus groups, learning by doing, and residence in the field

(Chambers 1994 ; 1985; Gow 1990). Because these methods are not often subject to the same statistical rigour which applies to quantitatively analyzed surveys, cross checking of information obtained in informal interviews or other means is essential in establishing the reliability of the data. In RRA this is done by the use of triangulation, which involves checking all information with more than one, and preferably three, independent sources of information. This may involve, for example, the use of different methods, seeking the opinions of individuals from different groups, or data collection at different times (Chambers 1994b).

Some of the methods associated with RRA were used to solicit information about the resource management system of the Aupicon Charcoal and Agricultural Producer's Group for the mangrove. As this is a common pool resource, the subjects of interest for this investigation were derived from the work of Oakerson (1992) and Ostrom (1990), who have developed frameworks for the analysis of common property systems. Oakerson recommends that four principal areas must be investigated when analyzing common property systems. These are the physical and technical attributes of the resource in question, the decision making arrangements which govern resource appropriation, the patterns of interaction which these rules result in, and the overall consequences or outcomes of the management regime. Within this framework, the system of management devised by the producers was also examined for the presence or absence of the seven factors identified by Ostrom (1990) as being common to enduring and robust common property management regimes, which include clearly defined boundaries of the resource and the group, congruence between appropriation rules and the local conditions, collective choice arrangements, monitoring, graduated sanctions, conflict resolution mechanisms, and the minimal recognition of the right to organize (Ostrom 1990). The preceding section summarized the theoretical methodological constructs which formed the basis for the field research. The next section will describe more precisely how these were applied on the ground to satisfy the objectives of the study.

The information presented here was gathered during the field study period which took place between May and August of 1996. During this time, the researcher resided in the village of Pierrot, the same community as the majority of the charcoal producers active in the mangrove. Pierrot is located a few kilometers north east of the town of Vieux Fort, the nearest commercial center, and a half hour's walk from the edge of the mangrove. The timing of the research was such that part of both the rainy season and the dry season were included, thus allowing any changes in occupations and harvest patterns which were the result of seasonal fluctuations to be observed, at least to some extent.

The initial week to ten days of the study period were devoted to conducting a review of secondary materials concerning the history of the project. This included previous research studies focused on the Aupicon Charcoal and Agricultural Producers' Group as well as primary documentation such as correspondence between Government agencies and CANARI regarding the management of the mangrove, and the farm and woodlot. This review provided greater richness of detail concerning the evolution of the Group than had been available before arriving in the field. At this time, consultations with CANARI staff resulted in the generation of a list of Government personnel with whom it would be useful to speak. Simultaneously, introductions to the members of the Aupicon Charcoal and Agricultural Producers' Group were made through the good offices of CANARI's Rural Development Coordinator, the person on staff who maintains closest contact with the Group. During these introductions, the purpose of the research was explained, and permission of the individuals to conduct the study was obtained.

The primary instruments of data collection in attempting a description of the management regime employed by the ACAPG were informal, unstructured interviews with Group members, and direct observation. For the most part, these interviews were conducted while the producers were working in the mangrove or while they were relaxing in the early afternoon on the farm nearby. This allowed observations in the field to direct the content of the interviews, giving Group

members an opportunity to describe the various aspects of their work in the forest. The small number of producers working on any given day, and the relatively small size of the mangrove made it possible to speak with more than one producer in a day, and to return to the same informant for further discussions and clarifications many times over the research period.

Triangulation of information collected in these interviews was obtained by asking every member of the ACAPG similar questions about the same issues. Where relevant the information provided by informants was also checked with knowledgeable government officials and CANARI staff. Small group informal interviews were also used whenever the opportunity presented itself, such as when some of the producers gathered after a day's work at the farm, or when they were taking a break from their work in the mangrove. In addition to these informal discussions, a more formal focus group was held as well. A single group discussion which brought together several members of the Producers' Group to discuss management issues in their own language using an interpreter was held in mid August. Government personnel were vital sources of information regarding the legal and policy context in which the Charcoal Producers' Group operates. Also, many Government staff had been personally involved in the development of the integrated farm - woodlot project and were able to clarify and expand on information provided by the Group members themselves.

The estimation of the value of the two direct economic uses of the mangrove, charcoal production and grazing, was straightforward. For charcoal production, data concerning the volume of charcoal production is collected on an ongoing basis by one of the ACAPG members. Although three different sizes of bags are used to transport and store the charcoal after it is produced, the various sizes are standardized to the equivalent of a small bag at the time of data collection. A small bag is known to hold four tins of charcoal. Each tin is sold at the market for \$7.00 E. C.<sup>1</sup>, giving a value of \$28.00/small bag. Production data from October of 1994 to September of 1996 were used to estimate the value of

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<sup>1</sup> \$1.00 Canadian = \$1.90 EC (Eastern Caribbean Dollars) in 1996

the harvest over those years. The quantity of charcoal was estimated by weighing a sample of small bags to establish a mean weight, which was then simply multiplied by the quantity of production. For the purposes of comparing that years' production levels with previous years, production data from 1989-1991 were used.

Calculation of the value of grazing was similarly simple. Informal interviews were conducted with the stockmen who grazed their cattle in the mangrove to gather data on the number of head which utilized the mangrove, for how long and the value of the animals on the market. This information was again triangulated with information obtained from government officials responsible for the management of cattle in the area, and with other residents knowledgeable about the cattle industry in the region. Again, market values were simply multiplied by the number of head grazing in the mangrove, and weighted by the amount of time the cattle spent in the forest as opposed to other grazing locations.

One of the central elements of the study was an economic analysis of charcoal production at the household level. Such an analysis requires, first of all, that the costs of production be obtained and then compared with the revenue received from the sale of the charcoal. This information was obtained through the informal interviews and direct observation. Every active producer was accompanied through at least one complete production cycle, from the harvesting of the trees, to converting it to charcoal, to the sale of the final product. This was necessary to gain a complete picture of the process, the types of equipment used, methods employed, and the time required to harvest, convert and market the charcoal.

However, a simple input - output analysis of this kind would not have provided a complete description of the economic importance of charcoal production at the household level. For many group members, charcoal production is a part time or occasional occupation, which is merely one of several sources of income pursued throughout the year such as agriculture and construction. In addition to the financial analysis, the contribution of the cash received from

charcoal production must be located within the context of its contribution to the overall household economy. This information, again, was collected through informal interview techniques. Respondents were asked to provide information on the nature of other employment, the amount of time devoted to each throughout the year, and the importance of each to the household economy. Absolute figures would have been preferable for accuracy's sake, however, many respondents were either unable or unwilling to provide such personal information. It was sufficient for the purpose of this study that each respondent simply provide a relative ranking of which occupations occupied most of their time, and which provided the greatest share of their income.

In addition to the impact of charcoal production at the household level, the importance of the mangrove to the local and national economy was also estimated. The premise of the estimation of importance to the local economy was that the value of the mangrove is reflected in the contribution charcoal produced there makes to the satisfaction of energy requirements in the community. This was approximated by estimating the percentage of all charcoal consumed in the town of Vieux Fort which was produced in Mankôtè. Data for this part of the study were collected by either the researcher or a Group member, one of whom was present for several days at the charcoal market, spread over the three months of the research period. There, all charcoal sellers present were asked where they made their charcoal and what quantity they had brought to market. This information was compared with the monthly production figures of the Aupicon Charcoal and Agricultural Producers' Group in order to estimate the relative contributions of each category.

For the national economy, a rudimentary ecological economics approach was used (Richards 1994; Ruitenbeek and Cartier 1993), in which the value of the charcoal from Mankôtè to the nation as a whole was taken to be its indirect substitution value. This is the market cost of the most immediately available substitutes for the good under consideration. In this case, the best available substitutes were charcoal imported from abroad or liquefied propane gas (LPG),

which is widely used for cooking. To make this estimation, the per unit price of charcoal from both Mankôtè and abroad were compared based on import figures obtained from the Government and an average weight of a tin of charcoal produced in the mangrove. In the case of LPG, it was also necessary to make a conversion into heat energy per unit to standardize the energy output of the two fuels. It was then possible to calculate the quantity of LPG that would be required to replace the charcoal produced in Mankôtè, and what the cost of importing that fuel would be based again on Government figures.

Finally, any assessment of a collective activity, such as common property resource management, must investigate the relative costs and benefits of acting as a collective rather than as individuals. It has been previously found that one of the benefits which might be attributed to group action is that of an enhanced confidence and capability of dealing with other challenges (Walters and Burt 1991). To investigate this further, the perceptions of the Aupicon Charcoal and Agricultural Producers' Group concerning the costs and benefits, particularly socially, of their participation in managing the forest were obtained. As with the earlier data on the resource management system, this information was collected through the use of informal interviews with both individuals and small groups. The issue of social benefits accruing from being members of a participatory management project was also discussed during the single focus group held towards the end of the research period. During both the informal interviews and the focus group, Group members were simply asked to express in their own terms how they evaluated the experience of being a member of a group, and whether they felt that the project was a worthwhile exercise.

This information, and indeed all the information collected during the research period was recorded on hand written field notes. These notes were usually written from memory immediately after the interview took place or as soon thereafter as was possible. These notes were not divided into any particular categories except to distinguish between information relating to the economic analysis and that pertaining to items of a social or management nature.

Of the menu of techniques described in the preceding discussion of RRA, not all were used in this research. Indeed, in some respects there were significant deviations from the methodological strictures of RRA. Principal among these is that RRA places great importance on the use of a multidisciplinary team in the field. The learning between the team members is considered only slightly less important than that which occurs between the team and the objects of the study (Chambers 1985). This element of the methodology was absent from this study, which was conducted by only one person. It will be for others to decide if this is a significant omission or not.

## **Chapter 3: Review of the Related Literature**

### **3.1 Introduction**

The study presented in the pages that follow is one small part of an ongoing research and documentation programme which is one component of the Caribbean Natural Resources Institute's (CANARI) work in the southeast coast of St. Lucia. Efforts by CANARI to engage the local resource users in the management and conservation of Mankòtè Mangrove, as with the rest of the projects which form the southeast coast project, can be described as an integrated and participatory coastal development program (CANARI 1993). Essentially, the project entails rural development and conservation based on people's participation in resource management. The present research focuses on the social and economic impacts of this project from the perspective of the Aupicon Charcoal and Agricultural Producers' Group.

To effectively conduct such a study, the researcher must be familiar with both social research techniques and economic analysis. In addition to these technical requirements, one must be cognizant of a broad spectrum of issues concerning the theory and application of rural development strategies in general, and community participation and common property resource management in particular. The following literature review will therefore follow a progression from a discussion of the debate surrounding common property, to the most general theories of rural development to the development and implementation of community management strategies. All of these issues represent different means of arriving at a common goal, that of sustainable development, in particular sustainable livelihoods. Therefore, this literature review will begin with a very brief discussion of sustainable development and sustainability. .

### **3.2 Sustainable Development**

The effort at international development has favored different paradigms at different points during its more than forty years of evolution. At the earliest stage,

centered in the 1950s, development was defined merely as economic growth. The goal of development was to provide less developed countries with the expertise and assistance required for industrialization to facilitate their integration into the global market. In many cases, these developments took the form of large mega projects which relied heavily on inputs and expertise from industrialized nations (Shiva 1993). As it became clear that this strategy was doing little to foster development, and worse, entailed large human and environmental costs, it was somewhat revised to address the worst consequences of the model. Development professionals recognized that the pursuit of economic growth was likely to worsen the level of absolute poverty among one to two fifths of the worlds population, and the Basic Needs strategy was conceived to reduce this imbalance (Esteva 1992).

In the emphasis on local participation, and in the fact that it attempts to improve the productivity and income of poor rural people (Curry 1989), the project under study here shares some characteristics of a basic needs approach to development. Therefore, the central tenets of this theory, and the reasons for its demise will be briefly reviewed. The basic needs approach was initially sponsored by the International Labor Office in 1976 (Weigel 1986). In opposition to the urban industrial emphasis of earlier development theories, the basic needs approach placed priority on providing basic human needs such as food, clothing, shelter, education, and health care to the very poorest, most often in rural communities and invoking local participation in development initiatives (Mehmet 1995). In essence, the basic needs approach required that some part of the resources which were being used for industrial development be diverted into current consumption by poor people. It also required a much expanded role for central governments in developing countries for the provision of public goods such as sanitation, education and health care (Weigel 1986).

These requirements proved sufficiently problematic that, in combination with technical implementation issues and changes in the global economic environment, the basic needs approach has been relegated to the history books. In the first place, there was much concern among conventional development

economists that diverting resources towards consumption, and away from capital formation, would inevitably retard the industry led development process, and therefore, development overall (Afentiu 1990). Secondly, there were thorny implementation issues. The greatest of these was that there was no operationally useful definition of what constituted a basic need. Needs are defined on the basis of economic and social status as well as cultural environment, and thus defy a universally applicable standard. A related question was the matter of who was to determine basic needs. A proposed solution was to solicit local peoples' participation in the definition and satisfaction of basic needs, but this encountered technocratic opposition on the basis that people may not always know what they need. Furthermore, there was no consensus on what form that participation should take or how it was to be engineered (Streeter 1984), problems which persist, as will be seen below.

Notwithstanding these issues, the real fatal flaw of the basic needs approach was that it required large scale public investment, which had to be provided by the central government. During the late 1970s, when developing countries were being encouraged by western financial institutions to borrow vast sums of money at low or negative real interest rates, such an investment could be contemplated by policy makers (Singer 1992). However, in the early 1980s the international economy was seized in the grip of the debt crisis, which resulted from the loose credit policies of major international lenders awash in money generated by the OPEC countries. This money was loaned to developing countries for industrial development, which largely failed to generate the expected employment and income benefits. In the early 1980's a convergence of events, including the second oil shock, the rise in interest rates in the United States and Europe initiated in an attempt to control inflation, and drastically falling terms of trade for commodity exports left the developing countries with a debt load which exceeded their ability to repay (Singer 1992; Mehmet 1995). The creditor countries and institutions such as the International Monetary Fund responded to the crisis by imposing structural adjustment measures, which called for a dramatic reduction in

government expenditures, especially in the social sector (Mehmet 1995). Such measures are fundamentally at odds with the requirements of a basic needs approach, and since future credit was conditional upon adopting such adjustments, the basic needs approach was abandoned.

The most recent incarnation of the development enterprise is that of sustainable development (Esteva 1992). It remains to be seen whether this latest paradigm will be any more successful than its predecessors. Nonetheless, the goals embodied in the concept of sustainable development are a central foundation of the project to which this study contributes, and the end it seeks to achieve. Thus the topic warrants some brief discussion.

The report of the World Commission on the Environment and Development defined sustainable development as that which permitted the current generation to meet its needs, without compromising the ability of future generations to meet their needs. To achieve this objective, social and economic development must proceed hand in hand with the maintenance of the resource base which sustains us all (WCED 1987). In the opinion of the Commission, real development must afford to all the opportunity to fulfill their aspirations for a better life, an objective particularly relevant to the impoverished populations of much of the world. Poverty was seen by the Commission as both a cause and a consequence of environmental degradation, and it was concluded that ecological catastrophes were inevitable in a world of endemic poverty. These beliefs led the Commission to issue a call for continued economic growth to relieve poverty, while the more affluent simultaneously were called on to restrain their disproportionate consumption of the world's resources. Such equity, the commission felt, would be best achieved by, among other things establishing a greater role for effective citizen participation in decision making, a topic central to this study, and to which we will return our attention later (WCED 1987).

Since the publication of *Our Common Future*, academics and development professionals have flocked to the banner of sustainable development, each seeking to make a contribution towards this noble goal. However, the very

number of people using the term has caused some debate over the value of the term and the goals it embodies. To some, sustainable development is merely the latest in a long line of efforts to impose a western industrial model of economic growth through the market driven development of industrialization on the rest of the world. For such critics, what may have been a call for a radical restructuring of the global political economy has been hijacked by some and transformed into an instrument for the preservation of the status quo (Singh 1996; Redclift 1993). This has led to the development of the alternative term of sustainability, rather than sustainable development. This newer term eschews the perceived emphasis on anthropogenic concerns contained in the Bruntland report, and instead puts priority on the preservation of intact, functioning ecosystems, regardless of how humans are affected by such actions. The argument is that we rely on these systems for essential life support functions without which human welfare in other respects ceases to be a relevant consideration (Anderson 1997).

It is beyond doubt that the term sustainable development has come to mean all things to all people. However, it is also true that the World Commission has made clear that the status quo is unacceptable, both for the environmental havoc which has been created and for the human misery which is all too often the result (WCED 1987). Therefore, critics are more accurate in opposing the misappropriation of the term by self interested parties, rather than the in dismissing it altogether. Furthermore, sustainability of a kind which does not allow for the primacy of human needs is an idea of limited value in the context of developing countries, where people face pressing issues of livelihood itself, which may preclude longer term considerations of maintaining ecological integrity. Therefore, in developing countries it is unrealistic to expect that people forego opportunities to make a living in order to preserve ecosystems (Thomas et al. 1991; Tobias and Mendelsohn 1991). This must not be taken as supporting the argument advanced by some that poor people are the primary agents of ecological destruction. Clearly, other actors, especially wealthy people and nations, and the activities which generate that wealth are at least equally, if not more responsible. It is

merely a recognition that for many people, conservation at the expense of income is not a luxury they can afford (Broad 1994). Therefore, the premise underlying this study is that people who have come to depend on resource extraction must not be excluded from access to those resources, but rather should become partners in its care and preservation while still reaping the benefits of those resources. It is in this context that the concept of sustainable development continues to have relevance in natural resources management in developing countries.

As a region, the Caribbean has not paid particular attention to the sustainability of its development in the past, and it has now become a critical issue for policy makers. The various interrelated pressures on the environment and the economy are discussed in *Sustainable Development in the Caribbean: Public Policy Implications of Sustainable Development in the Caribbean Region Conference* (1990). Therein it is noted that past export oriented development initiatives, such as banana monoculture, have wreaked havoc on the resource endowment of the region. The Caribbean is particularly vulnerable to such destruction because so much of its revenue generating activity, such as tourism, fishing, and agriculture are dependent on the maintenance of the resource base (Cox and Embree 1990). In particular, the authors argue the need for greater attention to the forestry sector in the Caribbean. For example, there is an urgent need to quantify the non timber benefits produced by forests, including mangroves, such as soil conservation, protection from the erosive action of waves along the coastline, and the prevention of sediment loading of inshore coral reefs. Failure to do so has tended to encourage raw materials oriented uses over more preservationist strategies (Cox and Embree 1990). Mangroves in particular are vulnerable in the Caribbean due to their location on the coast, which is an area of great economic importance in the region (Bacon and Alleng 1992).

Despite an increasing recognition of the economic and ecological values of mangrove forests, there has been little systematic study of these ecosystems in the Caribbean. Mangroves have traditionally been neglected by foresters, so there are minimal data on mangroves among national government professionals. Most

studies conducted to date have been rather generic, focusing on mangrove forests primarily in terms of areas, species present and wildlife. The generality of the literature, particularly the popular conservation literature, has meant that all mangrove areas are treated similarly, and are assumed to possess similar values for fisheries, coastal protection, and wildlife habitat. Consequently, there is little available information for making scientific management decisions about specific mangrove forests in the Caribbean (Bacon 1993).

A recent study has assessed the conservation status of mangroves in the Caribbean and Latin America. The authors found that fully seventy per cent of the mangrove shoreline could be classified as vulnerable, endangered or critical. The mangroves of the Lesser Antilles, of which St. Lucia is a part, were listed as endangered. It is predicted that the Lesser Antilles is one of the regions which will experience the most significant conversion and degradation over the next ten to twenty years, mostly due to urban and tourist development (Olson et al. 1996). The conversion of mangroves to these types of uses is often facilitated by the failure of decision makers to consider the economic value of the resources which mangroves are capable of providing on a continuing basis, including forestry and fisheries products and the less readily quantifiable benefits such as shoreline protection and water quality control (Pons and Fiselier 1991).

If the protection of mangroves and their continued utilization by local peoples at a sustainable level is accepted as a desirable policy goal, the question then becomes how best to achieve that objective. This question relates to the ownership of the resource, since to a great extent, ownership will determine how and for what purposes the resource will be managed. Broadly speaking four categories of ownership of natural resources are recognized. These are private property, state property, common property, and open access (Gibbs and Bromley 1989 ). However, there are many instances in which more than one of these modes overlap in practice because both formal legal structures exist together with informal, customary use rights. For instance, state ownership of a resource can coincide with *de facto* property rights over that same resource by a collective

(Schlaeger and Ostrom 1993). This is the case in Mankôté, where the National Government owns the marine reserve of which the mangrove is a part, but charcoal producers continue to exercise customary use rights in a common property arrangement (Burt and Walters 1991). In the past, influential theoretical models of human behavior have forcefully advocated private or state control of resources as the only forms of organization capable of providing for the conservation of the resource over the long term. However, more recently, extensive empirical investigations have revealed that this is not always the case, and that common property institutions have been proven equally capable of sustainable resource use. The controversy between these two camps continues, and is outlined briefly in the discussion which follows.

### **3.3 The Tragedy of the Commons**

In an article carrying the above title, Garrett Hardin authored perhaps the most widely quoted and influential argument positing that resources managed in common were doomed to degradation. His central conclusion was that in an environment of common property resource management,

each man is locked into a system which compels him to increase his herd without limit, in a world that is limited. Ruin is the destination to which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons (Hardin 1968).

Hardin used the example of a hypothetical medieval grazing pasture held in common by local villagers to illustrate the logic which supposedly inexorably leads to the tragedy of the commons. In a commonly managed pasture, each herder, assumed to be an economically rational benefit maximizer, reaps individually the entire value of the benefits of increasing his or her herd by one animal. However, the total costs, in this case overgrazing of the pasture, are borne by the entire collective. Thus the cost to the individual herder is a mere fraction of the overall cost. A rational comparison of costs and benefits will lead the herder to increase the number of animals on the pasture. The tragedy occurs because the same logic applies to each and every herder for each and every animal until the individually

felt costs equal the individually realized gain. Unfortunately, by the time this occurs, the pasture has been destroyed (Hardin 1968).

Hardin was not the first to hypothesize this relationship between goods held in common and private gain. H. Scott Gordon used the example of fisheries to argue that

everybody's property is nobody's property. Wealth that is free for all is valued by no one because he who is foolhardy enough to wait for its proper time of use will only find that it has been taken by another (Gordon 1954).

Thus, there are two components of this model of human behavior which discount the possibilities for managing resources in common. The first is that the total costs of extraction are not internalized by the individual, and the second is that the individual has no assurance that practicing restraint will be rewarded by similar behavior by others in the commons. A corollary to this second attribute of common pool resources is known as the free rider problem. Again assuming a rational maximizing individual, it is held that there is no incentive for individuals to refrain from extracting the maximum possible from the resource base even in the presence of an agreement among the remaining individuals to do so. In this case, individuals may benefit from the cooperative actions of others while avoiding the costs of cooperation themselves. Since each individual faces the same set of incentives, agreements to cooperate in restricting the use of the commons are highly unstable and likely to disintegrate into a tragedy of the commons (Ostrom 1990; Runge 1986).

Taken together, these and similar arguments have been used to argue that common property resource management is not congruent with the long term preservation of the resource in question. Such logic assumes both that people will always act to maximize personal gain based on rational choices, and that there are no socially constructed value systems other than that of benefit maximization which might induce an individual to act differently. An increasing body of empirical evidence has demonstrated that these assumptions do not hold in many cases. Nevertheless, the ideas of Hardin and like minded experts have led to some

very specific policy prescriptions in resource management, particularly in developing countries. Before examining the body of common property theory which runs counter to the propositions of the tragedy of the commons, it is useful to briefly outline the kind of resource management regimes which have been implemented on the assumption that the tragedy holds true, the consequences of which have led to a reassertion by many in the resource management and development fields of the value of common property management institutions.

We have seen that the tragedy of the commons is believed to be the inevitable result when resources are held in common by a community or other group. If such communal arrangements inevitably lead to the destruction of resources, then there are only two responses available to managers who wish to preserve the resource stocks. These are state ownership and management or privatization. Hardin argued that managing resources in the face of increasing population pressure was an impossible task without very strong state controls to prevent people from helping themselves to the common pool of resources (Hardin 1968). Many in the development field in the last decade, including officials of multilateral lending institutions, inspired by the theories of public choice, decried state management as mismanagement, and vigorously argued that only the market, as a conglomeration of rational individual actors could function to efficiently allocate resources, and that only private owners have an incentive to consider the long term productivity and therefore profitability, of the resource base. In their view, privatization is the best solution, and state ownership is a poor alternative to be resorted to only when full definition of private property rights is not possible. Nevertheless, either system is held to be far superior to that of common property (Blair and Olpadwala 1988; Mendelsohn and Balick 1995).

In fact, many examples of environmental degradation have been attributed to the existence of collective control over resources. This was the case with common grazing management regimes in the Sahel and southern Africa, as well as deforestation in southeast Asia (Runge 1986; Blair and Olpadwala 1988). Since a tragedy of the commons was perceived to be the result, indeed, the inevitable

outcome of common property resource management institutions, the only solution offered was the privatization or state appropriation of lands held in common.

The results of such programmes have been mixed, some resulting in disaster, others faring much as predicted by tragedy of the commons theorists . A wealth of examples of the implementation of this type of program is available from experiences in the Indian subcontinent, where there has been substantial repossession of common lands by the State, sometimes for redistribution as private property, and sometimes for state management. In Nepal, for instance, the National Government expropriated all communal woodlots in 1957. While prior to this action, these lots had been fairly effectively managed by the local village government, subsequent to their repossession by the State, rapid deforestation became evident. The cause of this deforestation was that because the local people felt that the forest resources no longer belonged to them as a collective, but to the State, traditional restraints were no longer applicable. In 1978, the Nepalese Government was forced to concede that state control was ineffective, and transferred ownership of the woodlots back to the villagers (Blair and Olpadwala 1988). Examples such as these add credibility to the advocates of privatization. Clearly, state management had failed to safeguard effectively the forests under its care. Similar results were experienced in India, where inadequate enforcement resources and corruption by forest service officers led to the rapid decline of forest resources in Bihar (Blair and Olpadwala 1988).

Where the state had failed as an agent of conservation, private citizens had succeeded. Agarwal and Narain (1989) observe that some of the most successful afforestation programs in India have been based on granting private property rights to all or some of the forest resources such as timber and fodder to individuals or small family groups. Similarly in the Sahel, transformation of communal lands to private property for crop production succeeded in increasing output (Blair and Olpadwala 1988). As predicted by private property advocates, careful husbandry of resources was achieved by establishing well defined private property rights.

Nevertheless, such initiatives are not without their costs, which often are borne by the poorest members of society. Reallocating lands formerly held in common to private property dispossess many community members of the resources upon which they have traditionally depended. In many cases, common property resources are disproportionately exploited by the poorer segments of society. Activities such as grazing and wild food collection on the commons are ideally suited to poor households because there are no costs for use, and the relatively low return to effort is not a factor in circumstances of endemic underemployment or where some household members are not employable. In India, it was found that common property resources accounted for one fifth of total family income in poor households (Jodha 1994). Thus, in many cases the extension of private property systems has exacerbated the dichotomy between the rich and the poor in many rural societies, depriving the poorest of the few resources at their disposal (Ralston et al. 1983). This frequently occurs because the common resources are often allocated to local elites who are in a position to exercise influence in the political process which determines the distribution of these resources to private hands (Runge 1986). The result is often increased social conflict as the victims of this reallocation resist in various ways their sudden exclusion from these traditional sources of sustenance. This resistance can take many forms, from the dramatic example of people chaining themselves to trees in the Chipko movement to the often invisible individual acts of resistance such as petty vandalism or social ostracism (Davidson-Hunt 1995; Agarwal and Narain 1989; Blair and Olpadwala 1988).

Furthermore, as well as engendering social conflict, the conversion of common lands to private property has not always succeeded in curbing overuse of resources (Runge 1986). The long term perspective which private property advocates presume to exist where resources are owned individually has not always materialized in practice. An example from the Gulf of Fonseca in the Caribbean illustrates this point. In Honduras, a boom in the aquaculture industry prompted the government to grant lands along the coast which were previously exploited by

local communities to private shrimp farm concessions. Far from managing their lands with the utmost care, many of these operations have fouled the water upon which they depend for their profitability with the effluent from their own shrimp ponds (Dewalt et al. 1996). Such practice is hardly consistent with the theoretical outcomes posited by private property enthusiasts.

### **3.4 Common Property Resource Management**

Given such evidence that private and state based solutions to resource management problems are not as efficient as one might like, and the social unrest which such actions have generated, there has been a renewed search for more sustainable alternatives. One alternative which has been the object of considerable empirical investigation has been a rehabilitation of the idea of common property resources management. Efforts on the part of social scientists such as anthropologists to describe the varieties of ways in which people interact with each other and with the environment revealed that in reality, there are many instances in which the dire predictions of the tragedy of the commons have not come to pass (Brox 1990). Netting (1972) described a system of common pasture in the Swiss Alps which has endured for centuries without suffering from the tragedy of the commons. Similarly, Ostrom (1990) has compiled examples from North America, Europe and the Philippines of common property management regimes, some of which have arisen only in the recent past, some of which date from medieval times. The growing body of literature such as this which describes instances where people have successfully managed resources ranging from coastal fisheries to forests to irrigation systems (Kurien 1995) has made possible a refutation of the inevitability of ruin for societies which believe in the freedom of the commons. These empirical studies have demonstrated that, in many cases, common property institutions are well suited to the economic and environmental conditions in which they exist, and are often superior subsistence strategies to that of state controlled or private property.

Among the features of common property systems which make them well suited to certain environments are that the social organization which makes them possible is frequently much less complex than that which governs private property arrangements. The latter requires an extensive and expensive superstructure of legislation and codified regulations and enforcement for its proper operation. These transaction costs are far greater than those which prevail in communal management systems, which makes them well suited to subsistence economies which could not possibly support such a superstructure (Runge 1986). Common property systems are also useful in environments where the distribution of critical resources such as rainfall are unpredictable and frequently insufficient. In grazing systems private pasture exposes one to the risk that rainfall on that particular parcel of land will be either nonexistent or inadequate to support the herd. Common property grazing systems, on the other hand, spread that risk over a much larger area, thereby reducing the risk experienced by each individual (Wilson and Thompson 1993).

Such empirical evidence that in fact common property institutions can be successful in effectively managing resources sustainably has engendered a search for theoretical explanations of why this is so, and what are the conditions in which the observed outcome is possible. The starting point for the theoretical foundation of common property research is to take exception to Hardin's use of the term common property, when the situation he was describing might be more aptly termed open access. The distinction is a critical one. Open access refers to resources, typically exemplified by high seas fisheries, which are owned by no person, group, or organization, and thus from which no person can be excluded. Common property resources on the other hand, are defined as those which are owned jointly by a group of users who collectively exercise restrictions on the use of that resource (Swaney 1990). The laxity of terminology employed by both Gordon and Hardin has become entrenched in the economic literature and has perpetuated the advocacy of policies aimed at eradicating common property institutions to avoid the tragedy of the commons (Quiggin 1988; Swaney 1990).

Scholars who work in the common property field are at pains to point out that where there exist social institutions of some kind which govern resource use, conditions of open access do not apply, and therefore, what has been termed the tragedy of the commons is in fact the tragedy of open access, and is not applicable to common property situations (Brox 1990).

Given that it is the existence of institutions governing resource use which differentiates common property from open access, the nature of institutions in common property management regimes has been the subject of substantial investigation. The management of common property resources poses particular challenges to its users. Common property is characterized by the fact that it is difficult to exclude people from appropriating the resource, and such appropriation makes some quantity of the resource unavailable to others. In other words, common property resources suffer from problems of excludability and subtractability. This means that common property management requires restraint on the part of the user group, which is in turn dependent on the quality and quantity of coordination amongst them. Without such coordination, over exploitation of the resource is a likely result, much as predicted by Hardin (Oakerson 1992).

Therefore, the study of common property resource management is largely a study of the institutions and institutional variations which function to induce resource users to practice restraint. Seven characteristics thought to be common to long enduring common property institutions have been identified. These are: clear definition of boundaries, both physical boundaries and the delineation of who is and who is not permitted to use the resource; appropriation and provision rules which are appropriate to local conditions; the ability of group members to participate in the changing the operational rules governing resource use; monitoring carried out either by persons directly accountable to the user group, or by group members themselves; graduated sanctions reliably applied against violators; the availability of low cost conflict resolution mechanisms to resolve conflict both among group members and between the group and outsiders, and

finally, the recognition of the rights of the group to manage resources as they see fit by central authorities (Ostrom 1990).

The preceding list of institutional characteristics of strong common property institutions begs the question, however, of how such institutions come to exist in the first place. Theoretically, this problem is similar to the free rider problem of resource appropriation. In the context of a common pool resource, where each person is faced with incentives to appropriate as much as possible, no person has an incentive to invest resources in the creation of institutions which limit his or her appropriation rights. Despite increasing costs of resource extraction which indicate degradation of the resource, each person is reluctant to assume the burden of creating new institutions of governance. Rather, the greatest incentive is to free ride on the institutional investment of others, and since each person faces similar incentives, nothing will be done. Empirically, however, people do in some cases overcome these disincentives and craft institutions of collective action (Ostrom 1990).

These institutions have been found to arise in one of two ways. In some cases, the resource appropriators themselves establish these new institutions. This is believed to occur in an incremental fashion, in which small, low cost initiatives prove themselves to be sufficiently beneficial to overcome existing disincentives. The accumulation of such improvements eventually convinces enough of the appropriators that the benefits of cooperating outweigh the benefits of continuing not to, and the institution becomes widely adopted (Ostrom 1990). Similarly, people may initiate action in response to a clearly perceived threat. For example, a study of a poor people's organization in the Philippines found that local organizations mobilized to block large scale development such as commercial logging which threatened their own resource base (Broad 1994). The other way in which these institutions arise, which is more common in the international development arena, is that development agencies actively seek to create common property management institutions in order to better manage resources that for a variety of reasons, are not readily adaptable to other management regimes (Kurien

1995; White and Runge 1994). Indeed, this is the context of the Mankòtè case. Here, the existing resource users group did not establish itself through the collective will of its members. Rather, an external agency, in this case CANARI, intervened to organize the charcoal producers into an association and successfully worked to gain recognition for their rights to exploit the timber resources of the forest from the central government (Smith and Berkes 1993).

Furthermore, case studies have shown that community resource management systems may be successful even when there exists no previous relationship between community members. In Thailand, similar resource management schemes were initiated in two villages composed extensively of people resettled from other areas. A comparative study between the villages concluded that where the community contributed to resource management improved management of fuel wood and water resources resulted, although the sustainability of the communities themselves remained in question (Perry and Dixon 1986). This is important to note, since the adoption of restraint in a common property management regime is thought to be highly dependent on each individual's expectations that others will behave in a similar manner. Benefits of cooperating will only exist if the vast majority of other users agree to cooperate as well. Furthermore, this reciprocity must be maintained over the long term. This is known as the assurance problem (Oakerson 1992). Reasonable expectations of the behavior of others are formulated with a much greater degree of confidence when individuals have a long history of interaction and expect such interaction to continue into the future (Ostrom 1990). In the case of Mankòtè, the individuals who originally joined the user group were, like the Thai villagers, relatively recent immigrants to the area, and did not have a strong tradition of cooperation between them (Burt and Walters 1991). Thus, both the Thai cases and the Mankòtè case run counter to the theoretical expectations, and demonstrate that at least over the relatively short term, it may be possible to overcome the obstacles to mutual cooperation and restraint which arise from the absence of a history of interaction.

Regardless of whether common property resource management institutions were developed by an organic process on the initiative of the community of users, or facilitated by the intervention of an external agency, one feature is central to any common property institution. It requires that resource users actively engage not just in the appropriation of resources, but in the information gathering and organizational activities which are inherent in any management regime. For instance, appropriators must be prepared to monitor the activities of others, engage in conflict resolution, and devote time to the assessment and if necessary, change of operational rules. Undertaking all of these activities imposes costs on the individual, and provides benefits to the collective, and thus represents another problem of incentive (Ostrom 1990). Thus, it is critical for the continued operation of any common property institution that the group members be prepared to assume these costs. The key question then becomes how to initiate and maintain the participation of resource users in the management of the resources upon which they depend. This has been a central dilemma not just for common property theorists, but for development professionals generally for many years. Development professionals have long advocated popular participation in the design, delivery, and maintenance of projects and programs, but there has been little consensus about how to achieve it, and the record of success in doing so has been mixed (Gow and Vansant 1983). The following discussion draws on the development literature to examine why popular participation is considered so important, and some of the reasons success in achieving it has been so elusive. Such evidence will prove useful in the analysis of the common property management regime which was initiated as a component of an integrated rural development and conservation project.

### **3. 5 Participation in Development**

Perhaps the single most significant feature of rural development is a concern for engaging the rural population in the development process rather than them being merely passive consumers of development "goods". Many social

benefits are claimed to accrue to participants in such projects. Some have even hypothesized that participation will improve the person's mental frame of mind and make it more likely they will contribute to society (Kuhn 1990). More generally, it is believed that local participation in the development process results in greater project efficiency and longevity. The many years of accumulated development experience has shown that local people, whether as targets, or participants, are central to the development enterprise. Therefore, where the project does not reflect their needs, priorities and capabilities, it is far more likely to encounter serious difficulty (Chambers 1985). The principal reasons for this outcome are that in general, people organize best around the problems which they feel are the most pressing, local people are capable of making rational economic decisions for their particular circumstances, the voluntary commitment of money or labor is essential in breaking patterns of dependency and passivity, and local control over the distribution of benefits is essential in making the program self sustaining (Gow and Vansant 1983). The view that it is essential to consult with the target community and engage their participation is widely recognized among those working in the development field. In a set of guidelines for field workers, the Food and Agriculture Organization (FAO) has emphasized the importance of viewing the target population as partners in the planning and implementation of projects, rather than as the objects of field workers assistance and expertise (FAO 1993). This view is advocated even more forcefully by Gamman (1994). After examining case studies of environmental decisions in three Caribbean nations, including St. Lucia, the author hypothesizes that the adoption of a framework based on mediation techniques, in which all stakeholders are consulted and encouraged to develop solutions to a common problem will result in superior environmental decisions. Such decisions will be achieved in part by the capture of local knowledge which will issue from a consultative process

While virtually all the literature surrounding rural development acknowledges the vital importance of gaining peoples participation in development and resource management projects, there is no comprehensive and

agreed upon set of project characteristics which facilitate doing so. The single factor which is widely believed to be essential to initiating and maintaining meaningful involvement of local peoples is that the project participants must be reasonably sure that they will in fact benefit from such participation. Usually these benefits are of a material nature (Perry and Dixon 1986; Lacuna-Richman et al. 1993; West 1983), but may also be social or cultural improvements. Indeed, this is felt to be the case in Mankòtè, where direct economic benefits have been minimal, but where some group members feel that important opportunities for social development have been afforded them by virtue of their activity in managing the mangrove (Walters and Burt 1991).

The literature indicates that a key reason that development interventions such as the one examined in this study fail to achieve their objectives is that they are unable to recruit or develop appropriate institutional structures which are capable of managing the initiative after the intervening agency withdraws. Studies conducted for the World Bank and The United States Agency for International Development found that 52% and a mere 11% respectively, of development projects were likely to continue over time. Institutional failure is considered to be an important contributor to this phenomenon (Brinkerhoff and Goldsmith 1992). Such a dismal track record points to the critical importance of strengthening local institutions' capacity to manage projects themselves.

The matter of institutional capacity and durability are of particular concern in the Caribbean. Many development workers in the region are of the opinion that unique historical and cultural circumstances make poor people in the Caribbean unlikely candidates for participatory development schemes. In particular, a tradition of non participation is thought to stem in part from the long standing dependence on externally driven development actions dating back to the region's colonial history, and the present predominance of a centralized approach to development planning (Renard 1994). For example, Haitians are said to be characterized by an historic opposition to authority and the high value placed on economic freedom. In fact, White and Runge (1994) cite a USAID report written

in 1962 which categorically stated that “the Haitian peasant . . . is incapable of group actions to defend his interests”.

Ralston et al. (1983) argue that a combination of poverty and a lack of attachment to a particular place have contributed to high mobility in the Caribbean historically. The implication of this phenomenon is that those who demonstrate leadership or managerial capabilities migrate elsewhere in search of better opportunities, leaving the less able to manage local projects. Moreover, Caribbean residents are held to harbor a deep and abiding suspicion of all organizations, and fear they will be used to manipulate local peoples. Poor leadership and management, suspicion of organization and poverty and the lack of education lead, in turn, to weak organizations. The authors feel that these organizations are highly susceptible to manipulation and penetration by local elites, who then use their position to exploit the resources nominally under communal management to their own benefit. Some of these characterizations have found empirical support from the Mankòtè case. It has proven difficult to organize the charcoal producers, who are habituated to individual effort, into a management entity that makes decisions and takes actions as a group. Also, it was hoped that the involvement of the wider community in the conservation project might provide a pool from which leadership talent, which was found to be sorely lacking, could be drawn (Walters and Burt 1991).

Notwithstanding these challenges to organization, there is some evidence that collective action is not totally unknown in the Caribbean. For instance, the members of the Aupicon Charcoal and Agricultural Producers’ Group have been shown to be not so suspicious of organizations as to be opposed to joining one. More importantly, there are significant local traditions of reciprocal assistance among small groups. In Haiti, these arrangements are known as *groupmen*. Where there has been local experience with working in these organizations, development workers have found that people were much more willing to engage in, and effective in carrying out, collective water conservation projects (White and Runge 1994). In St. Lucia, a similar tradition of reciprocal assistance known as

*kouidmen* exists (Walters and Burt 1991). Thus it is not possible to conclude categorically that participatory approaches will not work in the Caribbean. Indeed, while there may be inadequate leadership and weak organization initially, this weakness represents an ideal opportunity for strengthening local people's capacity to become good leaders and effective group members. Advocates of common property resources management argue that such institutions may not only improve management efficiency, but also improve local people's managerial and leadership capacities, which helps them to become better able to deal with other social and economic changes which may occur (CANARI 1993; Walters and Burt 1991).

Nevertheless, while participation in resources management and development may be seen as critical in the sustainability of the project, in and of itself, it is by no means a panacea for development problems even where it is well implemented. One of the chief benefits claimed for participatory approaches is that it helps to break the cycle of dependency which results from the paternalistic development enterprise (Gow and Vansant 1983). In *The Critical Villager*, Eric Dudley takes a dim view indeed of such claims. His most damning criticism is that regardless of the efforts expended in seeking local input, the development process by its very nature is paternalistic, and no amount of good intentions can change that fact (Dudley 1993). Indeed, where participatory institutions are crafted and encouraged by outside agencies, this is even more the case since outside actors must inevitably presume that, or at least act as if, they understand local problems and that they are in possession of some knowledge and expertise which will help solve them.

Furthermore, in reference to conservation programs, in many cases, implementing agencies are reluctant to fully involve local people in the definition and implementation of conservation projects. Particularly in situations of widespread poverty and pressing short term needs, there is often a glaring contradiction between conservation measures and needed economic development of which the local populace is all too aware (Drijver 1991). Consequently, the real empowerment of local organizations to manage their own resources has often not

been a primary objective of conservation organizations, since to do so might well mean that desired conservation measures are not pursued. While it can be argued that there is no contradiction between conservation and development, there is often a less obvious connection between these things than there is between more development oriented projects such as farming assistance or irrigation (Little 1994). This makes the effective recruitment of participation problematic even if the implementing agency really desires it.

One final obstacle which confronts development and conservation projects which seek to mobilize popular participation deserves mention. Encouraging local resource users or development recipients to take an active part in controlling the resources upon which they depend inevitably entails a redistribution of authority from whatever institution formerly exercised control over them to the local group. Vested interests can be expected to resist should this entail a redistribution of the existing benefits to their disadvantage (West 1983). The FAO has found from its experience elsewhere that national forestry departments are frequently reluctant to delegate authority to popular groups, especially if this means some loss of control over the resource on the part of the department (Gregersen et al. 1993). The National Government in St. Lucia has shown in past cases that it is not always prepared to accede to popular priorities in resource decisions (Gamman 1994). In the case of Mankôtè, the Government has considered a proposal for the development of a golf course in the area. This is thought to be a possible reason for Governmental hesitance in granting full control of the mangrove to the Producers' Group (Renard 1994).

Despite these cautions, people's participation is seen as essential in developing management institutions and development projects which are capable of enduring over time and adapting to changing external conditions. Even Dudley (1993) does not dismiss participation outright, but rather sees its most important role as that of a vehicle through which people can influence the type of assistance they receive and how it is delivered. Similarly, Little (1994) argues that it is important for local communities to share in the definition of the problem and

participate in its identification. Furthermore, community based conservation programs can be effective providing that the appropriate institutional structures are in place. So while there are difficulties in properly implementing participatory development and conservation programs, and while the decentralization of authority these projects entail may be resisted by local elites, the attempt is nevertheless important to the effective design and implementation of such projects.

### **3.6 Rapid Rural Appraisal**

Out of this recognition of the importance of incorporating local concerns and priorities into project design have arisen new methodologies for doing so, some of which will be adopted for the purposes of this study. Therefore a brief outline of these methods, and some of the problems encountered in using them, will conclude this review. One group of research methods which is touted as being more effective at soliciting people's participation than many is known as Rapid Rural Appraisal (RRA). RRA, and similar systems such as Participatory Rural Appraisal (PRA), provide a framework for popular participation, and allow communities to undertake their own solutions to development problems (Thomas-Slayter 1992). The specific techniques which practitioners of RRA rely on include use of existing secondary sources, direct observation, informal and semi structured interviews with individuals and groups, often returning to the same sources to seek new information and clarification (Chambers 1983; 1994a). Such techniques accord well with this project, which necessarily relies heavily on the information provided by local people. Furthermore, the small size of the relevant population should facilitate the process of returning to the same source for new information and clarification.

However, it must be recognized that while RRA methods rely heavily on people's participation, and therefore are more likely to solicit richer detail and perhaps more accurate information than scheduled surveys, reliance on the extensive participation of informants is a potential weakness as much as it is a strength. It is foolhardy for researchers to assume that poor people have both the

time and the inclination to participate in research activities or conservation programs. This is especially true where the people who are expected to participate are not well informed, are suspicious of the intent of the research, or are simply busy trying to eke out a living. Where this is the case, people can be expected not to participate. Additionally, the outcome of such interviews will inevitably depend on who is participating in them. Frequently, participants are merely those who have the time and inclination to do so, and their answers may be based on no special expertise or knowledge, and the results of such investigation may not be reliable when repeated with others (Pelkey undated). Furthermore, there is no guarantee that researchers are capable of eliciting the true concerns and opinions of people participating in the research. It is entirely possible that merely by asking certain questions and not others, that the researcher will guide the discussion so that particular responses are offered, or issues examined, and the truly relevant questions may never be asked (Campbell 1987).

RRA and related methodologies seek to avoid this researcher influence and the problem of villager reluctance to participate by emphasizing the importance of the researcher's behavior. Being unassuming, patient, and willing to listen is the sine qua non of effective research using RRA based methods.

“Rapport is a key to facilitating participation. Relaxed rapport between outsider and villager, and some measure of trust, are minimum predisposing conditions for participatory rural appraisal....Personal demeanor counts, showing humility, respect, patience and interest in what people have to say; wandering around and not rushing; and paying attention, listening, and not interrupting (Chambers 1994).

While all the above may indeed be true, these are less a catalogue of appropriate field research techniques than they are a basic primer in good manners which every field researcher, regardless of methodological choice, should be committed to.

In a similar vein, RRA practitioners are required both to know what is not worth knowing and not bothering to find out, while simultaneously noticing and taking account of variation from the norm (Chambers 1994 b).

In these endeavors, the individual skill of the researcher becomes critical. However, social anthropologists and others have objected that in the relatively short span of time available to most RRA research exercises, there is insufficient time for the researcher to be properly aware of what is different and what is normal, as well as what is worth knowing and what is not. In depth investigation is needed to determine what the right questions are and how to phrase them so people understand. Furthermore, especially in conservation research, rapid appraisal techniques may be inadequate for detecting longer term phenomena such as seasonality, the history of resource conflict in the area, and the ecological complexity of the system in question (Pelkey undated).

These are indeed shortcomings of the RRA method of which any researcher attempting to use them should be aware. Nonetheless, RRA does offer a suite of flexible approaches which recognizes that not all questions of importance can be known before the research begins, and avoids the cumbersome and often inappropriate techniques of formal interview surveys. These methods are perhaps uniquely well suited to the constraints faced by a single researcher who must learn fairly rapidly about an unknown situation. While RRA methods such as informal interviews are by no means a guarantee of encouraging meaningful local participation in research and development initiatives, they are certainly among the more interactive of processes, and allow greater latitude for additional, possibly important, questions to be discussed.

### **Summary**

Many diverse bodies of knowledge and thought are of relevance to the study reported here. The Aupicon Charcoal and Agricultural Producers' project in Mankòtè Mangrove is an integrated rural development and conservation initiative which seeks to use the tools of local participation in the management of a common property resource to achieve its goals. That goal could be summarized as one of

achieving the sustainable use of the forest resources of Mankòtè so as to provide a continuous stream of benefits to the user group. Therefore, this review dealt first with the concept of sustainable development and sustainability, briefly outlining the origins of the term and the various meanings attributed to it now. For the purposes of this study, sustainable development is considered to be a valid objective when it is taken to mean continued use of resources by the communities which depend on them, while simultaneously engaging those users in the care and preservation of the resource.

A distinction was then made between the open access situation which theorists such as Garrett Hardin postulated inevitably leads to the tragedy of the commons, and common property resources, in which there exist rules of use among the appropriator group which may prevent this outcome. The defining feature of common property institutions is that they require people to participate in the management of the resource. The question of how this participation might be achieved is of central concern to common property researchers and to development professionals, who are also anxious to solicit participation in development projects. Contrary to the expectations of some, people will invest the time and energy required to participate in management and conservation provided they feel that they will benefit from doing so. Nevertheless, there are many obstacles to the successful implementation of popular participation, especially in conservation projects and within the Caribbean region. It is vital to be aware of these in a study which hopes to investigate local attitudes towards, and capabilities for, participation in resource management. The primary tools which will be used to elicit this information are drawn from the repertoire of methods agglomerated under the banner of Rapid Rural Appraisal. While these techniques have some notable limitations, they also offer advantages which make them well suited to this project.

## **Chapter 4: Management and Participation in Mankòtè Mangrove**

### **4.1 The Management Regime for Charcoal Production in Mankòtè**

In the area surrounding Vieux Fort, there is a strong local tradition of exploiting public lands for private uses. Virtually every open area is used by someone for grazing cattle, pigs and horses. Similarly, the communities of Aupicon and Peirrot are composed almost entirely of squatters. However, use of the term squatter should not be taken to imply impermanence. Many residents have lived in the same location for decades, but local residents do not own the land or lease it from the Government. Rather, the original settlers of the region simply erected their houses on a suitable site wherever land was available. This informal settlement pattern is given de facto recognition by the National Development Corporation, the Government agency responsible for controlling land development in the area, and evidence of some development, such as the foundation for a house, is considered sufficient to establish a claim to the land (M. Burt, CANARI, pers. comm. 1996). Prior to the establishment of a resource users group in the early 1980s, the mangrove, like much of the surrounding public lands, was also an open access resource. Any person who so desired was able to fish, hunt, dump garbage and extract timber largely as they pleased.

Charcoal production was similarly an economic opportunity for any person willing to invest the labor. When the U.S. Air Force base closed in 1960, an important source of local employment vanished, and people were in many cases forced to earn an income in any way they could. This was prior to the development of a large scale banana industry and to the establishment of the manufacturing enterprises which exist today, and most people returned to subsistence agriculture. Trees felled when clearing land for farming were, and still are frequently converted to charcoal for domestic use and for sale. The timber available in the mangrove, which had been protected from harvest while it was part of the military base was perceived to be an abundant supply of wood for charcoal making and for construction poles. The average diameter of trees in the mangrove

while harvesting was prevented by the presence of the military was estimated at almost eight inches (Bossi and Cintrón 1985). One of the first people to resume harvesting in the mangrove in the 1960s remembers it taking an entire day for a man using a cutlass (machete) to fell a single tree and cut it into pieces small enough to carry. It was necessary to allow the wood to dry for several days in order for harvesters to be able to carry the larger stems.

The open access nature of the resource, and the perception that there were large quantities of wood available in a small area led to an excess of harvest effort in the forest which threatened its survival. In 1981, The Eastern Caribbean Natural Areas Management Programme (later to become the Caribbean Natural Resources Institute) was awarded a contract to undertake a survey of the environmental conditions of the Lesser Antilles by the Caribbean Conservation Association, a private regional organization. That same year, ECNAMP's services were engaged by the Government of St. Lucia to study the conservation and development requirements of the southeast coast, which had been identified as a conservation priority, as it possessed representative areas of all the coastal environmental formations found in the insular Caribbean, including coral reefs, seagrass beds, and mangroves. As a result of these studies, ECNAMP was authorized by the Government of St. Lucia to begin a field program for integrated coastal resources management in the area. (Walters and Burt 1991; CANARI 1990). The following year, a research project involving local students and discussions with the charcoal producers revealed that there was consensus among the producers that the mangrove was being over harvested and otherwise degraded due to activities such as waste dumping (CANARI 1994; Walters and Burt 1991).

In the 1980s, a survey indicated that there were 21 charcoal producers working in Mankòtè (Romulus 1987). Anecdotal evidence indicates that there were more in previous years, but the rise of the banana industry and other employment opportunities in the region induced people to abandon coal making in favor of other occupations. During these years, this harvest pressure had seriously depleted the mangrove. By 1985, average stem diameter in Mankòtè was

approximately 1.5 - 2 inches dbh, a decline of 3.5-4 inches from measurements taken five years previously. Work at the time with the charcoal producers indicated that they were well aware of the fact that the rate of harvest was not sustainable (Bossi and Cintrón 1985; Annias Verneuil, Dept. of Forest and Lands, pers. comm. 1997).

Discussions and formal workshops were then initiated with the active charcoal producers to identify possible options for the preservation of the mangrove. At this time, the Department of Forest and Lands was planning to begin experimenting with plantations of the fast growing species, *Leucaena*, and it was decided by CANARI, the Department of Forest and Lands, and the charcoal producers to initiate the planting of a woodlot on vacant Government land near the mangrove to provide an alternative source of wood for charcoal making to the natural forest. As well as initiating the fuelwood plantation, CANARI and the Department of Forests and Lands worked with the charcoal producers to develop harvest techniques for use in the mangrove, some of which were novel, and others which built upon traditional practices of the harvesters (CANARI 1994).

In order to facilitate the organization required to manage the plantation, the charcoal producers were encouraged to form into an informal cooperative. Some of the producers active at the time were unwilling to submit to a collective organization and preferred to quit working in the mangrove. Others left to pursue other occupations which became available as the regional economy experienced a period of expansion. Those who remained worked as paid and volunteer labor for establishing the fuelwood plantation, and began to exert pressure to discourage the more casual harvesters of the mangrove. Numbers in the Group were further reduced as the expected economic benefits from the *Leucaena* wood lot failed to materialize, and some left out of frustration. Those who remained embarked on the development of a garden plot on land adjacent to the woodlot which was granted to the Group by the National Development Corporation at the suggestion of CANARI.

The people who coalesced around the fuelwood plantation project became the core members of the Aupicon Charcoal and Agricultural Producers' Group. There were some attempts made to establish the group as a formal cooperative, but these efforts were not pursued vigorously. Nevertheless, the Group was granted de facto rights to continue to harvest in the mangrove when the area was declared a marine reserve in 1986, and have since sought, in cooperation with CANARI, to have those rights formalized in a co-management agreement with the Government of St. Lucia. (Walters and Burt 1991; CANARI 1994). At present, the Group is composed primarily by three families, who together make up the great majority of the twelve member group. The Group is formally headed by a President, but in fact his responsibilities are undefined. Of the three families, one family dominates the Group, both in numerical terms and in influence. The other members of the Group have been recruited from the surrounding community, and are friends or distant relations of the central family. All twelve members were interviewed during this study. Other than personal or kinship ties, there exists no formal mechanism through which other people can apply for membership in the Group, and there are no criteria for establishing membership rights. The dominance of a single family, and the claims made by the Group in the community that they alone have the right to harvest timber in the mangrove, combined with the absence of any mechanism for changing Group membership, has led to the perception among some in the community that the Group is trying to gain complete control of the resources in Mankòtè. This is the source of some resentment toward the Group members because many people feel that they too enjoy historical use rights to the mangrove which they are now being prevented from exercising.

Despite the informal structure of the Group and the existence of some hostility towards it among some community members, since the formation of the Aupicon Charcoal and Agricultural Producers' Group, the mean stand diameter of the trees in the mangrove has stabilized. As of 1992, the mean stand diameter had not changed significantly from 1986 measurements (Smith and Berkes 1993).

indicating that the downward trend in the availability of timber which was observed in the early 1980s did not continue following the establishment of a users group.

Researchers have attributed this change to the adoption of improved cutting practices (Smith and Berkes 1993) which built upon many of the traditional harvest techniques used by the charcoal producers, but also introduced new and better ways of doing things. Perhaps the most significant change has been the virtual elimination of clearcutting in favor of a more selective harvest system which leaves the smaller stems for future growth. A draft management agreement circulated by CANARI to the various responsible government authorities, and written in collaboration with the charcoal producers stipulates that clearcutting shall be prohibited and that a minimum diameter of 2 inches be observed (CANARI 1993). Personal observations in the field indicate that this stricture is being observed by the harvesters. An area which had been completely clear cut by a Group member was never found, although there were some which were close to it.

Another important harvest practice concerns the treatment of the stumps remaining after a tree has been cut. Mangroves reproduce both by seeds and by coppicing from the stump. There are two cutting practices which can affect a plant's ability to reproduce by coppicing. The first is the piling of slash on top of the stumps so that it prevents enough sunlight from reaching it. Some of the old hands in the mangrove were aware that piling the slash on top of the stumps prevented their regeneration and passed this knowledge on to their sons who worked with them from an early age and later began harvesting on their own. Now all the Group members have been educated about this, and most are very careful to pile the slash in such a way that it is kept clear of the newly cut stumps.

The second way to facilitate regeneration from stumps is to cut the tree properly. Firstly, the actual cut should be at a sharp angle and made cleanly without creating a jagged surface. This helps to keep the stump from rotting. This is easily done by experienced harvesters who are expert in the use of the cutlass,

and are able to aim their blows with precision. Less experienced coal producers often produce more jagged cuts at first, but improve with time and practice. Secondly, the stumps must be harvested at a certain height above the topmost prop root. Experienced charcoal producers say that it is best to cut the tree approximately 2 inches above the topmost prop root. This allows the stump to be completely submerged during the rainy season, which the producers say prevents rotting. It also ensures that the maximum amount of charcoal will be produced for every tree harvested. It is particularly attractive for producers to cut as low as possible on the stem because this is where the tree is of greatest diameter. The large pieces of coal produced by this part of the tree is a selling point when marketing the coal because customers perceive large coals to be of higher quality than small ones. If the stump is properly cut and slash piled away from them, coppicing begins as little as two to three weeks after harvest. Usually several shoots will spring up where only a single stem was produced before, which perhaps has contributed to the perception among some Group members that the more the mangrove is cut, the more it will regenerate.

These cutting techniques were developed jointly by CANARI, Department of Forest and Lands officers, and the Group members themselves. They introduced some new practices such as preventing clear cutting, and incorporated some traditional ones, such as clearing the slash and cutting to ensure proper regeneration.

In addition to introducing some widely accepted cutting standards, the formation of a resource users group has had other impacts on harvesting in Mankòtè. One of these is that there has been a gradual reduction over time of the number of people engaged in charcoal production. Romulus (1987) found 21 people or teams of people to be active in the mangrove. In 1996, the official Group membership was 12 people, of whom a maximum of 9 were engaged in charcoal production in any given month. The average number of producers making coals each month was 6.8. These people are the core of active charcoal makers around whom the Group was formed. The remaining 5-6 people are

members of the Group primarily to take advantage of the farm project or are related to the core members and are seeking to qualify as tour guides in the mangrove. The reasons for this decline are several. When the Group was initially formed, a decision was made by CANARI and the Department of Forest and Lands to encourage those who depended most on the mangrove to exert persuasive pressure on the more casual users to cease harvesting (Annias Verneuil, Dept. of Forest and Lands, pers. comm. 1997). Due to this pressure some harvesters decided to stop making coals in Mankôtè. In addition, some of those who decided to stay became frustrated with the early efforts of the Group, particularly with the poor returns realized from the group farm and woodlot, and subsequently decided to leave the Group and charcoal making. Finally, as St. Lucia experienced greater economic growth in the banana and light industrial sectors, increasing employment opportunities elsewhere enticed some away from the arduous life of a charcoal producer.

Those who remain have adopted an informal and highly flexible management regime which reflects the seasonal and part time nature of charcoal making. Unlike many forestry management schemes, there are no formal rotations or cut blocks established in the mangrove. When CANARI first began to study the area, the individual families engaged in charcoal making had divided the mangrove into individually held areas called "champs" (fields) (Y. Renard, CANARI, pers. Comm. 1996). However, by the 1990s, this system had given way to a less clearly defined regime. Smith and Berkes (1993) describe a system in which producers selected an area at the beginning of the season with sufficient timber of appropriate diameter, and worked that area following a zig-zag pattern for the remainder of the work season. Areas which were harvested in one season were left to recover for at least two years before being harvested again. This allowed time for the small stems which had been left from the earlier harvest to grow large enough to be used for charcoal production. The authors note that the net effect of these cutting practices is that a cover of large trees cannot be restored.

Most recent observations indicate some slight changes from the system observed earlier. The rotation of harvest areas continues to be between two and three years, with the continued effect that larger trees are absent for the most part from the mangrove. Of the four species present, black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), buttonwood (*Conocarpus erecta*), and red mangrove (*Rhizophora mangle*), black mangrove are the only large trees in Mankòtè. They are allowed to reach maturity because they are considered too soft to make high quality charcoal, and are better used to provide shade and bird habitat. The two preferred species for charcoal production are the white mangrove and buttonwood. Use of red mangrove for charcoal was observed only once during the research period. Producers prefer to preserve the red mangrove because it is too hard to cut. It also grows adjacent to the main watercourse through the mangrove, and acts as important barrier to the actions of the wind and sea. Conserving the red mangrove is apparently a relatively new practice in Mankòtè. A survey in 1987 found that the charcoal producers at that time preferred to use red mangrove and buttonwood because these were the hardest woods. White, like black, was considered too soft for coals (Romulus 1987).

Also slightly different from the allocation regime described in 1993, is that the producers seem no longer to work in zig zag strips through the mangrove. At present, each producer selects an area to work in at the end of the rainy season when work in the mangrove resumes. The work of harvesting the trees is usually an entirely individual occupation, but the more onerous tasks of carrying the billets and reaping the charcoal are often done with help from other producers on a reciprocal basis. Currently, the vast majority of the harvest activity takes place in the southwest half of the mangrove. Some production is carried out on the north and west side of the road which curves through the mangrove, but this quantity is minor compared with the other side of the road. There are two reasons for this. First, the north side of the road is dominated by red mangrove and buttonwood. The red mangrove is not harvested, and the buttonwood stands in this area are of

small size. Second, as the road moves toward the sea, it deteriorates to such an extent that the drivers of the vehicles used to transport coals to the market refuse to take their vans down it, making it difficult to move any charcoal produced on that part of the road. Each of the six regularly active producers, with one exception, has an area which he prefers to work in. Within that area, the producers move from one stand to the next through the season. They select stands which contain enough harvestable wood to produce the quantity of charcoal which they desire for that production cycle. Other factors which influence their decision are the proximity of the stand to a suitable pit of sufficient size to hold the required amount of wood and surrounded by enough loose soil to cover it. Proximity to a coal pit minimizes the time and effort required for the strenuous task of carrying the harvested trees to the pit. The pit must also have an abundance of young leafy shoots in easy walking distance. These are used to form a buffer layer between the wood and the soil used to seal the pit. When one stand is harvested and the wood set to burn, the producers then move on to another stand in their area near another pit.

The one producer who does not have a preferred area is able to move through the mangrove harvesting small areas throughout. Other producers do not object because of close family relationships to this person. Other exceptions to the system described above exist as well. Occasionally, when one area of the forest contains an abundance of "ripe" trees, three or four producers will work in close proximity in that area. However, this is not a communal harvest. What each person cuts is his or her own, and is converted to charcoal in a separate pit from the others. Although they work close by each other, there is no apparent conflict over who gets to harvest which trees. This is perhaps related to the group norm that no one owns the trees in the mangrove until they cut them down. Only then do they become that person's property. However, this pattern of activity usually endures for one production cycle only. After the trees have been cut and set to burn in a pit, the person whose area the stand is in usually asks the others to move on. Occasionally, this engenders disputes, but these are most often resolved

between the individual producers, many of whom are related, and all of whom know each other well.

The management system described above pertains to the dry season only, but it is the presence of the rainy season, which lasts from July or August until November or December, that defines the seasonal pattern of activity in the mangrove and forces producers to modify their activities. When the rains come, accompanied by powerful waves from storms over the Atlantic ocean, the mangrove fills to varying depths with water brought by runoff from the hills behind it and by waves from the sea. The rainy season causes an involuntary moratorium on harvesting over much of the mangrove. Low lying areas are flooded chest deep, and can remain that way for up to six months depending on the severity and duration of the rainy season. The outer edges of the mangrove are less affected, and may be inundated for only two months. During this time, the area available for harvesting is reduced to those regions which are still accessible, and the level of harvest activity is accordingly curtailed. Some of the charcoal makers quit the mangrove during this season to pursue other employment opportunities in agriculture or construction, a decision made much easier by the clouds of mosquitoes which infest the mangrove during these months. Those who remain are forced to work on the edges of the mangrove where the terrain is slightly elevated and the charcoal pits are less prone to flooding. Even in these areas though, a heavy rain can cause flooding, and if a burning pit is inundated, its entire content will be spoiled. Producers adjust to this uncertainty by shortening the production cycle, cutting smaller lots and burning them for shorter periods. They also largely abandon their respective cutting areas as the presence of water alters the operational boundaries of the mangrove. During the rains the allocation system becomes one of working where one is able, regardless of proximity to others. This is made possible by the fact that the number of producers working at any one time is reduced and production is generally much less, although most continue to make some coal during the rainy season.

This resource management system is highly flexible and is well suited to the seasonal fluctuations created by the rains and the constraints imposed by the amount of timber available in various areas of the mangrove. Each producer is able to select a part of the mangrove that suits his needs, and scarcity in one producer's preferred area is hedged by the ability to move temporarily into another's area. This entirely informal system is made possible by the small number of appropriators, most of whom are related to each other, and all of whom interact with each other on a daily basis. Each producer is constantly aware of where the others are working and what they are doing. This facilitates the communication and compromise necessary for the operation of such a system without the need for codified allocation rules. However, the absence of codified rules and means for their enforcement does impose certain costs.

As noted, Mankòtè was, prior to the formation of a resource users' group, an open access resource which was widely used by the surrounding community. When the ACAPG was established and began to exert pressure to exclude others, it was transformed from an open access to a common property resource (Smith and Berkes 1993). All common property resource (CPR) management systems face certain similar problems of organization which must be resolved in order for the system to function well and to endure. Among the systemic requirements of good CPR management regimes are: the need to have an agreed upon set of rules which participants have had a hand in crafting and are capable of changing if need be; a means of monitoring compliance with those rules, and the ability to impose sanctions for failing to do so (Ostrom 1990). As we have seen, the system of rules for allocating harvest rights within the Group is very informal, and occasions relatively little conflict between Group members. However, the absence of formalized rules for harvest practices does not function equally smoothly.

The draft co-management agreement for the management of the mangrove was an attempt to establish a formal set of rules for harvesters which were written in collaboration with Group members. However, field observations revealed that certain of the practices stipulated in the agreement are not universally respected by

all Group members, although they are respected by most people most of the time. For example, it was not unusual to be walking through the mangrove in the company of one producer and have them point out an area recently harvested by another person with slash piled up over the stumps in contradiction to established practices. Discoveries such as this disturb many of the producers because they are well aware that if those stumps die due to such disregard, there will be less wood available in the future for all of them. Such offenders are spoken to, and the importance of proper slash disposal is explained, but repeat violations are not uncommon.

Stem diameter restrictions are similarly not always respected, but this may be more because they are felt to be inappropriate in some circumstances. This applies particularly to areas where small buttonwood stems are being harvested. When asked about the practice of cutting stems smaller than one inch, one producer responded that the soil conditions in that part of the mangrove prevented the buttonwood from growing properly. Despite the fact that the stems were very small, they were said to be much older than the two years allowed by the standard rotation. This producer said that by cutting the buttonwood, the resulting regeneration would be more robust than at present.

Mangroves do in fact require specific soil conditions for optimum growth. Soil salinity must be within a certain range, and either an excess or insufficiency of salt can result in stunted growth (FAO 1994). Soil salinity was not measured at this site, so it is not possible to determine the veracity of the producer's statement. What is important here is that there is no universal consensus about the appropriateness of minimum stem diameter restrictions in every part of the forest, and therefore there is less than perfect observance of these rules.

Furthermore, there may be no universal understanding of exactly what the rules are, and where and when they apply. During the field research there were several instances in which one or more Group members engaged in activities in the mangrove which other members felt were illegitimate uses of the collective resource, such as cutting timber for commercial sale rather than using it for

charcoal production. Instances such as these led to conflict between the Group members and uncertainty about the behaviour that is allowed and expected with regard to caring for the mangrove.

There is no deficiency in monitoring the actions of each Group member by all the others. The small size of the mangrove, and the yet smaller area where the majority of the harvest activity takes place, means that the results of everybody's work are visible to all the others all the time. On any given day, most people working in the mangrove will meet and speak with each other at some point. If not, it is likely that they will pass through each other's work areas on the way to or from their own area. What is lacking is an appropriate set of sanctions. CPR theory holds that even in situations where repeated interaction between parties is certain and reputation is important, this may not be enough to prevent appropriators from breaking rules when the temptation arises. In these cases, a set of graduated sanctions are required which increase in severity with the frequency of offenses. Such sanctions reassure other actors that violators are in fact caught and punished, even if the punishment is no material disincentive (Ostrom 1990). Such graduated sanctions are entirely lacking amongst the ACAPG. The only recourse available to them is informal peer pressure to convince violators that their actions are inappropriate. In cases where there is little agreement about what the rules are, or whether they are appropriate, such sanctions have proven ineffective, and Group members then have no recourse to an established set of increasingly more severe sanctions. Some Group members have become frustrated at the lack of suitable punishment, and have suggested measures such as confiscating improperly harvested wood or suspending harvest privileges. Others feel that these measures are too harsh, especially as they might be applied against family members, and that it is better to stick to peer pressure and persuasion.

A similar dichotomy of opinion exists surrounding the question of what to do about excluding others from harvesting in Mankôtè. One of the characteristics of a common property resource such as the mangrove is that it is difficult to exclude people from appropriating resources for their private benefit, and what

they take becomes unavailable to others (Keohane and Ostrom 1995). As noted, residents of the communities in the vicinity of the mangrove had traditionally used the site for the disposal of their trash, for fishing and hunting, and for timber. The declaration of the mangrove as a marine reserve in 1986 made the removal or destruction of any of the flora and fauna therein without the written permission of the minister responsible a criminal act (St. Lucia Fisheries Act 1984). This applied to the ACAPG as well. Under the eyes of the law, continued harvesting for charcoal production was illegal, but the Department of Fisheries elected to take no action because they realized that people's livelihoods were involved (K. Nichols, Deputy Director, Department of Fisheries, pers. comm. 1996). Only very recently, in the fall of 1996 has the Department of Fisheries formally recognized the ACAPG's exclusive right to harvest in Mankôtè, and are planning on issuing the Group with official identification cards establishing their claim to the mangrove.

In light of their own uncertain legal rights to operate in the mangrove, the charcoal producers have heretofore had no authority recognized by others to prevent outsiders from harvesting wood in the mangrove as they are accustomed to doing. While the Department of Fisheries has declared its intent to issue identification cards to the charcoal producers, and formally authorize the ACAPG exclusively to harvest wood in the mangrove, the validity of these claims has not been established in the community at large. This is one of the principal motivations for the charcoal producers to enter into a co-management agreement formally specifying their rights and responsibilities as regards the mangrove. It is hoped that this will establish the legitimacy of their claims in the eyes of the wider community and discourage unauthorized harvesting.

Numerous instances of local people who were not members of the ACAPG harvesting sometimes substantial volumes of wood were personally witnessed during the research period. These incidents certainly represent a small fraction of the actual number of occurrences because, as the Group members are well aware, local people know the times in which ACAPG members are working in the mangrove and they choose other times, such as holidays and evenings to make

their harvests. Such illicit harvesting presents a major challenge to the continued conservation of the mangrove. It has been stated that it would be desirable to re-establish a greater number of large trees in the mangrove. Many of the producers agree that this is a desirable goal as it would create the shade needed to protect younger trees and to make work more comfortable, and would create a source of seeds for regeneration. Illicit cutting poses three obstacles to achieving this aim. Obviously, what outsiders take is unavailable for use by Group members, thus increasing the harvest pressure on the trees which remain. Some members claim that the amount of wood taken by outsiders actually exceeds that cut by the Group, although this is, of course, difficult to verify. Furthermore, outsiders may do damage beyond that caused by the actual cutting because they are unaware of the proper cutting techniques which the Group uses to facilitate regeneration. Finally, Group members are very reluctant to preserve trees for the future because they believe it is likely that outsiders will come in behind them and cut those trees themselves. The preservationist Group member is then deprived both of the charcoal and revenue which could have been produced by those trees and of the benefits which might have been gained from allowing the trees to mature. Two instances of this very phenomenon were witnessed during the study period, one of which engendered a severe conflict with a community resident.

While there is widespread agreement amongst the members of the ACAPG regarding the seriousness of the problem, they are less united as to what to do about it. In the absence of recognized legal authority for the Group to prevent others from cutting in the mangrove, the alternatives for enforcing exclusion when some form of coercion is required are limited. Despite the official recognition of the Department of Fisheries in 1996 that the ACAPG is the sole entity authorized to harvest wood in the mangrove, there is no established recourse to enforcement agencies such as the police in Vieux Fort or Fisheries officers. Therefore, the Group has been left to its own devices in attempting to enforce their claims. Some members are in the practice of removing wood known to have been harvested by outsiders and burning it in their own pits. Alternatively, they could confront the

confront the offenders and attempt to make them leave, by means of persuasion or otherwise. Either of these alternatives involves the potential for real conflict between two parties armed with cutlasses, and threats of violence are reportedly not unknown. To improve this unsatisfactory situation, some Group members decided to pursue improved legal recognition of their rights. While no Group member expressed concern over their security of tenure, some prefer to have official recognition of their right to harvest because "then you know you're there". It is in response to their efforts in this regard that the Department of Fisheries agreed in the fall of 1996 to issue identification cards. However, the issues of who will enforce those rights and how remain unresolved. Group members have expressed their willingness to patrol the mangrove at times other than when they are working there. However, they are also aware that doing so exposes them to potentially violent confrontations. Just how they will be able to remove violators who refuse to recognize their authority without resorting to violence is unknown. Some suggest calling the police, but the nearest phone is some distance away, and by the time the police arrive, offenders will be long gone. Others suggest being issued a camera and photographing violators for later prosecution. Convicted offenders would be subject to fines. Those who advocate this option feel that a few examples will be sufficient to deter others from infringing on the mangrove.

However, the Group is not united on the need to actively exclude others. There is a keen awareness among some of the Group of the fact that many of the people who cut wood in the mangrove do so out of acute necessity, and that it is unfair of the Group to deprive these people of the means of making a living. They also believe that it is futile and unjust to fine a person for activities which they are forced to undertake out of poverty in the first place. Many Group members are equally aware that there is already some resentment among the wider community that one particular group is apparently trying to monopolize the resources in the mangrove for their own use. More active exclusion of community members is likely to incur yet more enmity among those who would be excluded. Some of this persuasion believe that rather than keeping people out of the mangrove, it would

be more productive to help them by showing them an appropriate area to cut in, and demonstrating proper cutting techniques. While this could potentially avoid the problem of people cutting improperly and in areas which had been earmarked for conservation, and has the advantage of avoiding conflict with the larger community, it would not address the issue of reducing harvest pressure.

### **Summary**

The evolution of the resource management system employed in Mankòtè, and the current practices of the charcoal producers have been sketched in the preceding section. The formation of the ACAPG has changed Mankòtè Mangrove from an open access resource exploited by many local people to a common property regime mainly used by a small group for charcoal production. Recent measurements indicate that a previously observed downward trend in stem diameters in the mangrove has been halted, but that harvest pressure remains too intense to allow the reestablishment of mature trees. Over time, there have been some changes observed in the management system employed by those who work in the mangrove, including changing the way in which cutting areas are allocated, and establishing some different cutting practices which improve regeneration and eliminate destructive clearcutting. Current practices reflect a blend of traditional practices and new techniques which are suited to the physical characteristics of the mangrove and the seasonal, flexible nature of charcoal making as an occupation. Notwithstanding these not inconsiderable improvements, some difficulties remain to be addressed which affect the long term health of the mangrove. These include establishing and gaining universal acceptance of cutting practices by Group members and making practical and realistic provisions for the exclusion of unauthorized harvesters which are acceptable to all members of the Group. These are the critical questions which must be addressed in the formulation of a management plan.

## **4.2 Perceptions of Participatory Management**

**The co-management agreement with the Aupicon Charcoal and Agricultural Producer's Group and others being contemplated by the Government of St. Lucia is being done under the auspices of an island wide Coastal Resources Management Initiative, part of which is a Beaches and Mangals Action Plan. The aim of the initiative is to foster more effective and sustainable management of these resources, and one proposed means for doing so is through the use of Local Management Authorities (LMAs) (Ministry of Planning, Development and Environment 1996). In order to assess the charcoal producers' willingness to enter into a co-management agreement with the Government of St. Lucia and other stakeholders, it was considered appropriate to inquire as to their experience with the project to date and their expectations for the future. It was hoped that this might avoid the repetition of past mistakes and facilitate the implementation of a management plan responsive to the charcoal producer's needs and reflective of their capabilities as an institution. This information has been gathered through informal interviews with current and former Group members, Government personnel, and others involved with the project over its life. This information has been supplemented by personal observations made over the admittedly too brief period of the field research. The information gathered through these methods has revealed some issues which are well known to people associated with the project, as well as some other information which is perhaps not widely known. Both will be discussed below, concluding with some tentative remarks about the implications of this information for the establishment of an LMA.**

**At the outset, it must be noted that one of the outstanding facets of this part of the study is that every one of the Group members indicated that the creation of a users group was generally a positive development, and that participation in the Aupicon Project continues to have some potential for making improvements in their lives. The exact reasons for this positive attitude were more diverse. In terms of the management of the mangrove, all Group members stated**

that the single most important contribution that managing the mangrove as part of a community based group made was that they now had a united unit with which to deal with others who wish to cut in Mankòtè. Despite continuing problems with enforcing their exclusive rights of access, the Group members all acknowledge that the problem is much less severe now, and that "people can't just come in and do like they want" anymore.

Other responses centered around the material benefits which have accrued as a result of participation in the integrated development and conservation program. Without such participation, they would not have had access to the land which holds the *Leucaena* fuelwood plantation and the group farm. The plot is conveniently situated between the homes of most of the producers and the mangrove, and makes an ideal location to rest after a days work in the company of other Group members to discuss the state of the business. In addition, the farm and fuelwood plantation have been the beneficiaries of not insignificant support from Government agencies and other donor institutions. The funding for the fuelwood plantation, for instance, came from the Organization of American States, and was delivered with the assistance of the Department of Forest and Lands (Walters and Burt 1991). Similarly, a fishpond was constructed by the National Farmers Association (NFA) in an attempt to develop a small scale aquaculture project on the farm. The charcoal producers are cognizant of the fact that these benefits were only possible by virtue of their membership in an association, and know that any future assistance is similarly conditioned. It is Government policy to channel development programs through existing community based groups where possible (Marie Ange Louis, Ministry of Planning, Environment and Development, pers. comm. 1996), a fact of which the charcoal producers are well aware.

Another noteworthy response, as stated by one Group member on more than one occasion, is that he is very proud to be able to demonstrate his skills and knowledge to people from elsewhere who were interested in learning about the activities of this small group of charcoal producers. Related to this is a perception that Group members now enjoy improved status in the community. Formerly

occupying the lower rungs on the socio-economic ladder, there is now greater community respect for the charcoal producers. To some extent this is the result of the many foreign researchers who have come to investigate the Group's workings. The ACAPG has also been called upon to share their expertise and experience with other woodlot project participants, and these connections are maintained to this day. An anthropologist who evaluated the Aupicon project noticed an improvement in social development and self empowerment within the Group (Koester 1990). While the present study was too short to allow such observations, it is true that members of the Group were very active in seeking solutions to the exclusion problem. Delegates from the Group made several trips to the Castries to prevail upon the Department of Fisheries to issue them with identification cards to prove their rights of access, which the Department has since agreed to do.

While the Group members generally believe that its establishment has provided them with some benefits, it has also failed in some respects to live up to its potential. All Group members mentioned that the Group could be much more successful, especially at the farming component of the project, if it were not for the pervasive lack of good organization and commitment to collective activity. The community development literature in the Caribbean makes mention of historical and cultural factors in the region which predispose people against collective action. Caribbean residents are said to harbor a deep and abiding suspicion of all organizations. This, in combination with poor leadership and a lack of education contribute to weak organizations (Ralston et al. 1983). This limited organizational capacity may be attributable to a tradition of non participation, the individualistic legacy of a colonial plantation economy, and a centralized model of government (Renard 1991; pers. comm. 1996). CANARI and other agencies have sponsored workshops on leadership development and group organization on several occasions in the past. Nevertheless, the ACAPG has not generally been successful in organizing itself to implement collective projects, opting instead for a more individually based operation. Although the farm and woodlot were originally conceived of as being held in common and worked cooperatively by the Group, in

practice, individuals each work their own plot of land on the farm, and charcoal from the woodlot is made and sold individually.

However, there are more pragmatic reasons that this is so in addition to historical and cultural predispositions. One of these that was frequently mentioned by the Group members was the fact that the project consists of three components: the mangrove, the farm, and the woodlot. Not all Group members are equally interested in all three aspects of the project. Some Group members do not make coals at all, and are more interested in the farming aspect. Some of those who make coals as their primary source of income are not engaged in farming, and only work on the woodlot when the rains force them from the mangrove. Furthermore, many Group members have other jobs as well. This creates two problems. Firstly, the diversity of employment and the differences of interest make it hard for the Group to coordinate schedules for collective activity. This is especially hard when trying to accommodate the schedules of Government agency representatives as well. Secondly, Group members have different priorities as to where to invest their labor. For many of the charcoal producers, it is not possible to devote months to tending a garden without receiving any compensation. They are accustomed to receiving a cash income every ten to fourteen days, and cannot, in many cases, afford to wait any longer. Pressing needs demand satisfaction, which requires a regular income. These people are reluctant to devote labor to Group farming for return in the distant future when they could be making charcoal and getting paid much sooner. This is greatly compounded by the Group farm's inability to find a reliable market for its produce. There have been instances in the past of large quantities of vegetables spoiling on the ground for want of a market. This leads some producers to conclude that not only is payment delayed, but it is entirely possible that payment may not be forthcoming at all.

The lack of assured financial reward, and the related problem of gaining cooperation for group activities is to some degree responsible for a high level of conflict within the Group. Those who have devoted time and effort repeatedly to supposedly collective undertakings have become resentful of those who have not.

supposedly collective undertakings have become resentful of those who have not. Hostility over the failure of some members to participate in necessary group tasks has been compounded by some unfortunate instances of poor financial management in the past. Some Group members remain convinced that funds and implements have been misappropriated by other Group members, and that revenues from the group harvests which did take place were not equitably distributed. Both Group members and Government staff associated with the project cite the suspicion of malfeasance and poor financial management as the original cause of the conflict within the Group which has persisted to the present day. It has been suggested that the low level of literacy and poor communication between Group members has contributed to this conflict by making proper record keeping and transparent accounting for group expenses and revenues impossible. Poor communication of plans for group held land has also led to conflicts caused by people working at cross purposes and unwittingly interfering with each other.

All Group members indicated that the lack of cooperation caused by intra group conflict was an enduring characteristic of the association. This, as well as the inability to address the lack of universal adherence to harvest practices related above indicates that there is no effective mechanism for resolving conflict within the Group. Among the characteristics of enduring CPR institutions discussed earlier is the existence of a low cost, effective forum where disputes can be discussed and resolved (Ostrom 1990). Impressions gained from field observations suggest that conflicts between Group members are discussed at meetings, but not in a manner likely to lead to a mutually acceptable solution. In fact, these discussions seem to be as likely to result in yet greater hostility and resentment between Group members. Conflicts are sufficiently grave that some Group members refuse to work with certain others, which further erodes the Group's capacity for the collective action necessary to undertake major improvements on the farm. For instance, the farm's most pressing need, in the Group members' opinion, is for irrigation to make it possible to grow crops during the dry season. At present, all work on the farm ceases when the rains end, and

capital needed for such an investment requires concerted group effort, either making coals from the woodlot and selling them to raise money, or otherwise. Due to the lack of organization and the pervasive conflict between Group members, such cooperation is not forthcoming, and if the irrigation system is built, it will be through the efforts of one or two Group members, who will accordingly reap the benefits.

Finally, it must be mentioned that some of the Group members indicated that they have become somewhat disillusioned about the value of participation. They believe that many of the benefits promised by intervening agencies have not been realized. To a large extent, this complaint is justified. Other than wages paid by the Department of Forest and Lands for planting, the woodlot has not generated any significant revenues to date, and certainly not for the Group as a whole. The aquaculture project has had similarly disappointing results. The shrimp originally stocked in the pond did not fare well, likely due to inappropriate water quality. Last year, they tried to raise Tilapia, but again, no significant harvest was possible, although opinions as to why this was the case vary. The Group has also been involved in the construction of a viewing tower overlooking the mangrove in the hopes of generating revenue from ecotourism. This too has not lived up to expectations. This litany of disappointments has led to the perception among some Group members that they are not being sufficiently supported by intervening agencies. They feel it is unfair for agencies to start these projects, but then not provide the ongoing assistance, both materially and organizationally, needed to make them work. This is perhaps due to an inability on the part of the agencies to effectively communicate the fact that that is the very intention of the intervention; to develop community initiative and organizational capacity through giving them management responsibility. It also provides empirical evidence for the statement that people in the Caribbean tend to rely on a central authority to do things for them, rather than accepting responsibility for it themselves. Related to this disillusionment is a frustration at the lack of tangible benefits stemming from the large research effort devoted to the Aupicon Project.

One Group member stated that he felt exploited by foreign researchers such as myself. While he did not mind discussing the project and sharing his knowledge, he is frustrated that neither he personally nor the Group profited from doing so. He suggested that in the future, Group members might charge a fee for their knowledge just as lawyers or doctors do.

These sentiments, and the preceding discussion of the Group's perceptions of their experience with the project to date should be given careful consideration by those implementing the LMA. While all the membership recognize that there are benefits to being Group members, and are generally positive about the project's potential, it would be mistaken to assume that they will continue to participate into the future without ongoing support. Group members have indicated that they would be willing to devote time to the establishment and maintenance of an LMA, and to undertake further enforcement activities. However, they have indicated that they would require some assistance in setting up a credible enforcement regime. Past experience with the project indicates that an appropriate LMA must also provide some forum for conflict resolution and some expertise in financial management. This may be done either through renewed efforts at institution building aimed at the Group itself, or by providing it through the other members of the LMA. The Department of Fisheries has indicated its willingness to provide whatever assistance is appropriate in this regard (K. Nichols, Deputy Director, Department of Fisheries, pers. comm. 1996). Finally, every effort must be made by those in the LMA to establish clearly the rights and responsibilities of the Group members and the nature of assistance they can expect from other agencies involved. This should prevent the reoccurrence of past problems with unrealistic expectations about project activities, which may be essential to maintaining the willingness of some Group members to participate in the management of Mankòtè.

#### **Summary:**

One of the objectives of this study was to investigate the perceptions of Group members of their experience to date in participating in the Aupicon Project

**and their willingness to continue to do so under a more formal co-management agreement. Informal interviews with Group members revealed a strong positive attitude towards the Group and belief in its potential. This was balanced, however, by disappointment and concern over the pervasive lack of cooperation and high levels of conflict within the Group which have prevented it from living up to its potential. For the most part these problems are caused by a history of financial mismanagement and perceptions of impropriety on the farm, and by the different interests of Group members. Existing conflicts have been allowed to fester for extended periods due to the absence of any effective means to resolve such disputes. Some resentment was expressed toward Government and other intervening agencies for failure to provide sufficient assistance once various projects were initiated, and thereby creating unrealistic expectations within the Group. These difficulties must be addressed by any LMA if the continued participation of the ACAPG in the management of the resources on which they depend, and about which they are very knowledgeable, is desired.**

## **Chapter Five: Valuation of Goods Produced in the Mangrove**

### **5.0 Introduction**

**Mankòtè Mangrove, like other mangroves, and indeed other wetland ecosystems throughout the world, provides a range of goods and services to humans. Some, like timber production, are valued through economic markets, and are easily quantifiable. Others, like shoreline stabilization, carbon storage, and fish nurseries, are not traded in the market at all, and their value remains largely speculative. Nevertheless, the alarming rate of conversion of wetlands to other uses has prompted an effort to quantify these untraded values so that the full economic value of an ecologically functional wetland can be compared against that of the competing alternative use (Turner 1991; Ruitenbeek and Cartier 1993). Such an approach demands that linkages be established between various components of the mangrove and the services they provide, so that impacts on one component can be assessed in terms of the effect this will have on desired products (Ruitenbeek and Cartier 1993). The value ascribed to these benefits is then added to the direct market traded benefits, and the total economic value of the wetland is calculated.**

**However, it is very difficult both to establish the magnitude of the linkages between ecosystem components and the goods and services they produce, and to delimit the area which is impacted. Carbon storage, for example, is a benefit to the entire globe if one accepts the hypothesis that global warming is due to excessive carbon emissions. Similarly, it is difficult to define the exact impact of mangrove clearing on fish populations in isolation from other factors such as water pollution. Due to these problems, this study is limited to an estimation of the two major economic uses of the mangrove; cattle grazing and charcoal production. Other goods and services provided by the mangrove will be discussed below, but due to the difficulties described above, no attempt was made to measure them or to attribute some or all of their value to the mangrove. Nevertheless, the information**

presented here represents a small step toward documenting the economic importance of a healthy mangrove ecosystem to various groups in the region. Hopefully, such information can be used as a counter argument should the conversion of the mangrove for development again become a topic for debate among policy makers as it has in the past (Renard 1994).

One of the principal resource uses of the forest, cattle grazing, will be discussed first by attempting to estimate the contribution the mangrove makes to the local livestock industry both in qualitative and quantitative terms. The economic value of charcoal production from October 1994 to November 1996 will then be determined and compared with some previous years to show any changes over time, as well as the total value of the charcoal industry. An estimation is then made of both the proportion of the total charcoal consumption of Vieux Fort which originates in Mankôtè, and the foreign exchange savings which are achieved by maintaining a domestic source of renewable cooking energy. Together, these represent the primary economic contributions of the mangrove to the Vieux Fort region and to the nation, and can be one element of any argument for its preservation. These arguments may be supplemented in the future by a more in depth study of the other non quantified resources which are identified, but discussed only briefly at the close of this section.

## **5.1 Cattle Grazing**

Mankôtè Mangrove is crisscrossed by well worn cattle trails which serve as the highways of the mangrove, providing relatively easy passage for people through the otherwise tangled forest. The charcoal producers make use of these trails to travel to and from their cutting areas and to make the job of carrying the cut billets to the firing pits easier. While the cattle move throughout the mangrove, the majority of their grazing activity occurs around the fringes of the forest where the tree growth is less dense and grass grows in the open clearings. Much of the unoccupied public land in the Vieux Fort area is used by local

residents for grazing. Cattle and other livestock, such as goats and pigs represent a sort of “bank account on the hoof” for many people in the region. Because they are grazed on public lands or fed with waste food, they can be reared at little or no private cost, and then be sold or slaughtered as the need arises. Alongside this informal livestock sector exists a commercial livestock industry which includes a dairy farm and several ranchers who gain their living from raising cattle for sale.

Among these commercial operations is the Community Pasture Program organized by the Government run Beausejour Agricultural Station. The program provides common grazing to a number of large and small cattle farmers organized into an informal cooperative. Members are charged a stocking fee, membership fees, and the purchase of a required number of shares in the cooperative. The money thus generated is used to purchase needed inputs such as fences and pumps. The Community Pasture Program represents the largest concentration of cattle on the entire island. Currently, the Program manages thirty different areas of land which are subdivided into grazing paddocks. The paddocks are then opened to grazing by members’ livestock on a rotating basis (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996).

However, the land controlled by the Community Pasture Program is insufficient to support the number of cattle in the cooperative on a year round basis. During the dry season, which is approximately five or six months, the grass in the fenced land does not grow quickly enough to recover from the grazing pressure. It is at this time that some of the members of the Community Pasture Program begin to move their cattle through the mangrove, which is one of several other grazing pockets which are used as relief pastures during the dry season. This system allows the regular grazing paddocks sufficient time to recover from their use. The need for these alternative pastures is not only due to the lack of rain during the dry season. The Community Pasture Program also suffers from the classic tragedy of the commons (Hardin 1968), in that the available grazing land is overstocked (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996). Individual stockmen are encouraged to add additional cattle because their wealth

is increased with the size of their herd, while the costs of degraded pasture are spread over the entire membership of the program. Individual farmers are reluctant to reduce the size of their herd voluntarily in the absence of assurance that others will follow suit (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996).

The mangrove, then, is not used for grazing by members of the general public who wish to raise their livestock on public land. It is, rather, an integral part of a grazing management system which is essential for providing needed forage during the dry season, and permitting the other grazing areas to be rested. Field research indicates that five farmers from the Community Pasture Program use the mangrove to graze their cattle over a six month period. Farmers in the program generally sell the steers and bulls from their herd, keeping the heifers to increase the herd. Animals are usually sold for anywhere between \$2000.00 E.C. and \$4000.00 E.C. Sale price is determined at the time of sale by negotiation between the buyer and seller based on the buyer's appraisal of the health and size of the animal (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996). The contribution the mangrove makes to this cash value is difficult to determine accurately. Usually the value of a grazing area can be determined by the price of other grazing opportunities, or by the additional value of the animals resulting from the ability to graze in a particular area less additional operating costs (Abelson 1996). The additional value of the animal from grazing in the mangrove is difficult to determine. Also, the farmers in Community Grazing Program pay the \$24.00 E.C./head stocking fee charged by the Community Pasture Program, and would not have to pay additional grazing fees for these cattle regardless of their choice of grazing areas. If they were not grazed in the mangrove, they would merely be left in the community paddocks, although this would greatly exacerbate the current overstocking problem. Accordingly, a simpler method has been selected which has been applied elsewhere. The value of a particular landscape feature to grazing can be estimated by simply equating the value of the animal when sold with the proportion of its life spent grazing there (Thomas et al. 1991).

Using this method, the value of the mangrove to the cattle industry can be estimated. A total of fifty-six head are moved through the mangrove as part of the grazing rotation by five farmers over a six month period (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996). Assume that half of these are steers or bulls which will be sold for between \$2000 and \$4000 E.C., and the other half are heifers which usually are not sold, but which are worth \$500 to \$600 E.C. each (Paul Williams, Stockman, Community Pasture Program, pers. comm. 1996). Multiplying the number by the price of the animals gives the total value of the herd. Since the herd spends six months a year in the mangrove, the mangrove may be said to generate one half of this value. This gives a maximum value of:

$$28 \text{ steers or bulls} * \$4000 = \$112,000 \text{ E.C.}$$

$$28 \text{ heifers} * \$600 = \$16,800 \text{ E.C.}$$

$$\text{total} = \$128,800 \text{ E.C.}$$

$$\$128,800/2 = \$64,400 \text{ E.C. } (\$33,894.73 \text{ CAD}).$$

Using the minimum price values cited above gives the following:

$$28 \text{ steers or bulls} * \$2000 = \$56,000 \text{ E.C.}$$

$$28 \text{ heifers} * \$500 = \$14,000 \text{ E.C.}$$

$$\text{total} = \$70,000 \text{ E.C.}$$

$$\$70,000/2 = \$35,000 \text{ E.C. } (\$18,421.00 \text{ CAD}).$$

The approximate total value of the mangrove to the livestock industry in the region is likely in the range of \$35,000 E.C. to \$64,000 E.C. However, two additional factors must be mentioned to accurately reflect the value of Mankòtè to the farmers who graze cattle there. The first is that the mangrove is just one location through which the cattle are moved every day, although they spend the majority of each of those days (from about 10:00 AM to 3:00 PM) in the mangrove before being returned to their paddocks at night. Therefore some proportion of the value

of the cattle is attributable to locations other than the mangrove. Counterbalancing this is the fact that the cattle which are moved through the mangrove seem to maintain a better body weight and condition than do the cattle kept in the paddocks year round. Those kept in the paddock undergo a yearly cycle of growth and leaning corresponding to the rainy and dry seasons (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996). A healthy, larger animal will fetch a higher price than a lean one, perhaps compensating for the amount which should be subtracted for non mangrove grazing areas. Due to these factors, caution would indicate that the minimum values be used as a rough estimate of the economic value of the mangrove to the livestock industry in the Vieux Fort region.

The preceding deals only with the total value of the livestock currently present in the mangrove, and does not take into account the number of cattle actually sold by the farmers. This may be estimated by an alternative valuation calculation which uses a proportion of the yearly sale figures from the Community Pasture Program as a whole and attributes this proportion to the five farmers who use the mangrove for grazing. The Community Pasture Program has 136 head registered. Of these approximately 20 animals, primarily bulls and steers are sold each year, or 14.7% of the herd (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996). Using these same proportions, we may assume that 14.7% of the 56 head which are grazed in the mangrove are sold annually, or approximately eight bulls or steers.  $8 * \$4000 = \$32,000$ , which gives a maximum value of \$16,000 E.C./year.  $8 * \$2000 = \$16,000$ , giving a minimum annual value of \$8000 E.C./year. The annual value therefore appears to be between \$16,000 E.C. and \$8,000 E.C. Again, caution would indicate that the minimum value of \$8,000 be used when discussing the importance of the mangrove to grazing.

However, the use of the mangrove as a grazing area may be discontinued in the near future. The Government of St. Lucia currently plans to make it illegal for cattle to be allowed to wander in unfenced areas because of the high numbers of traffic accidents involving cattle. When the plan is implemented, cattle found wandering loose may be impounded or perhaps shot. This will effectively end the

use of Mankòtè as a grazing area, and will force the Community Pasture Program to make some adjustments. Regardless of Government action in this regard, the Program is currently pursuing plans to build an irrigation system to address the shortage of forage during the dry season which will eliminate the need for relief pastures such as the mangrove. Given these developments, it is entirely possible that Mankòtè will cease to contribute to the production of cattle in the near future (Mr. Valmont, Beausejour Agricultural Station, pers. comm. 1996; Leo Burt, Stockman, pers. comm. 1996). Should this happen, the impact on the charcoal producers will be mixed. Most producers do not consider the cattle to be a problem, and appreciate their role in creating and maintaining trails through the forest. At least one producer, however, has occasionally suffered the loss of some charcoal when cattle trampled on his pit, allowing air to enter and burning part of the pit to worthless ash. Obviously, these sorts of losses will be eliminated, but so will the trail maintenance function now provided by the herd. From the perspective of the management of the mangrove, aside from occasional damage to charcoal pits, cattle grazing appears to be an entirely compatible use with management for charcoal production.

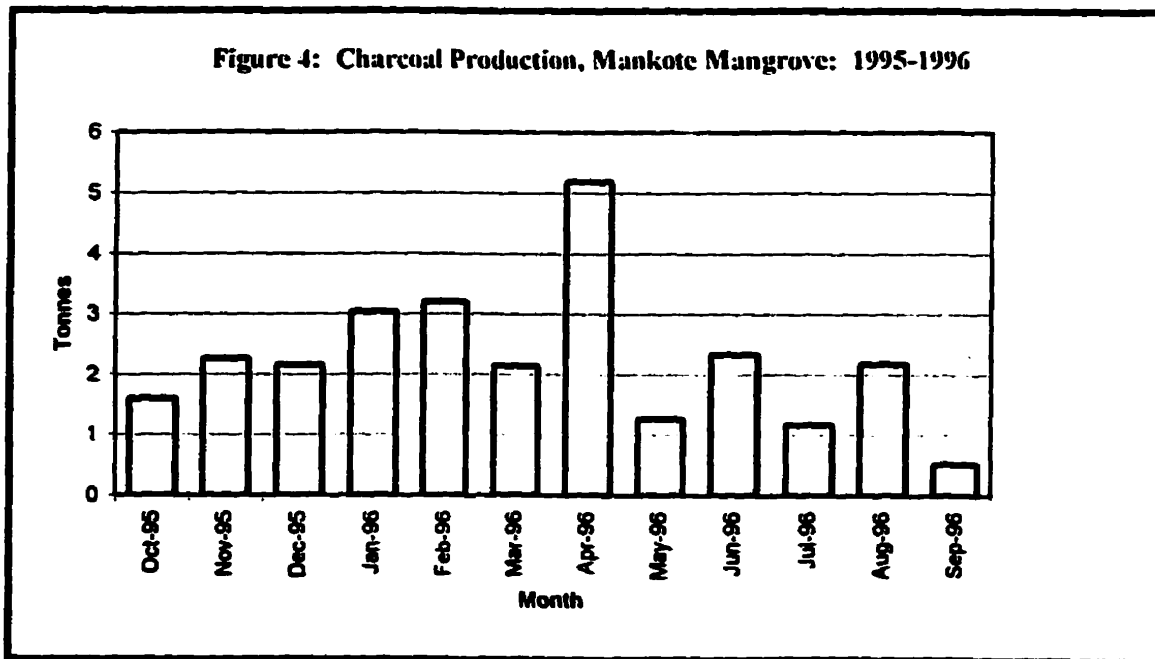
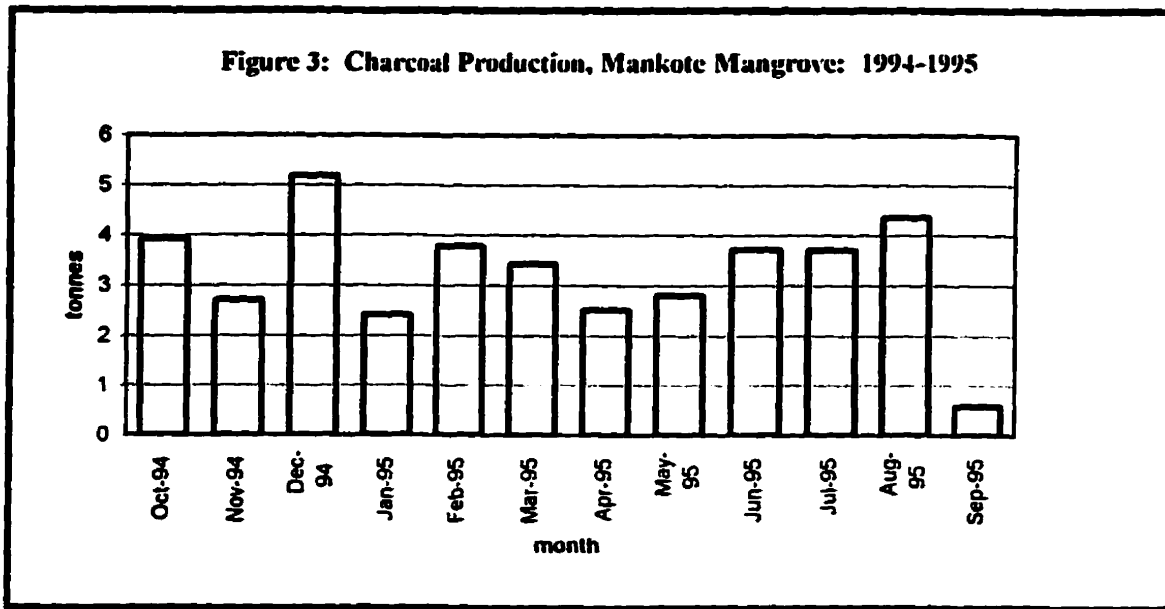
## **5.2 Charcoal Production:**

Charcoal production is the most important use of the mangrove in terms of both its economic value and its importance to the livelihood of those engaged in the industry. Charcoal production is similarly the activity with the greatest impact on the health and integrity of the forest. As discussed earlier, uncontrolled timber harvesting has caused serious degradation in Mankòtè before, and harvest pressure continues to prevent the reestablishment of the mature forest which once existed. Therefore, monitoring the level of activity in the charcoal sector, including the number of participants and the volume of their production is a vital component of monitoring the status of the mangrove. Documenting the quantity and value of charcoal production also provides authorities with a better idea of the importance of the mangrove in providing a means of subsistence for the charcoal producers.

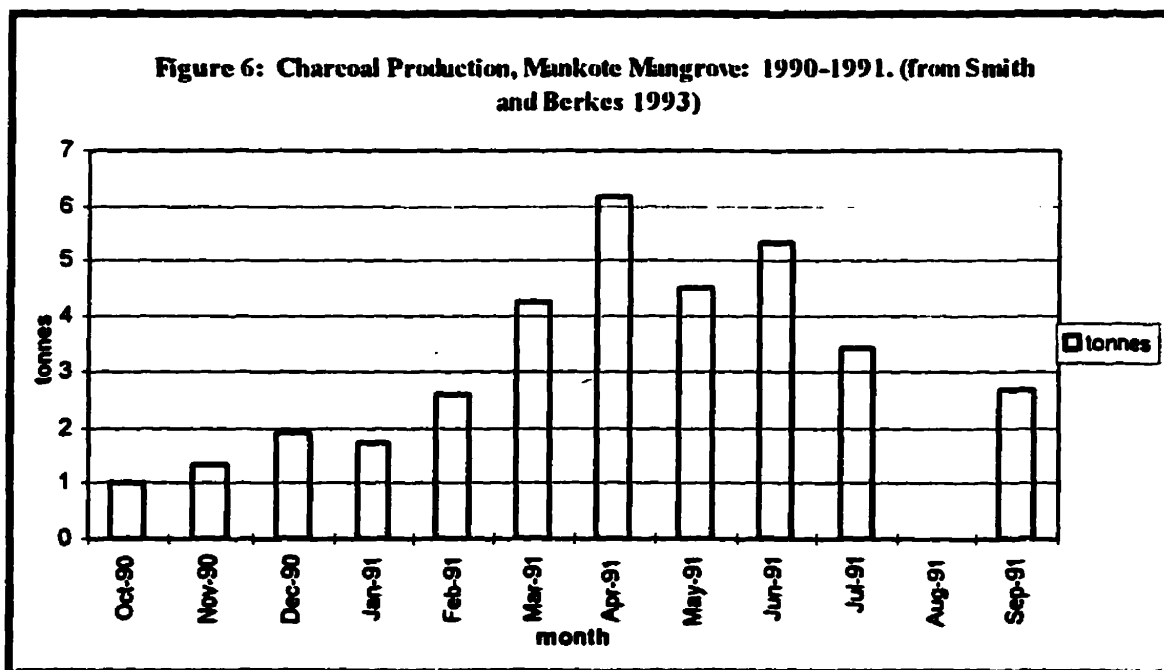
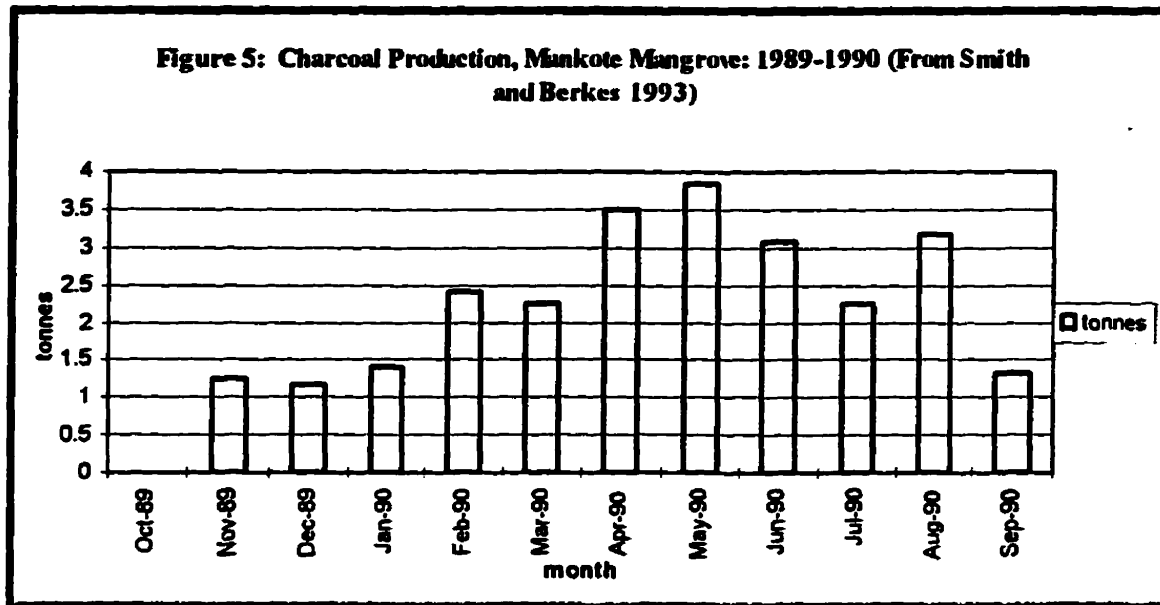
The Aupicon Charcoal and Agricultural Producers' Group has been active in monitoring their own production and reporting these figures to CANARI since the mid 1980s. The data available permit a comparison between several years, although there is no continuous data covering the entire life of the project. These figures have been examined to detect changes in the quantity of charcoal harvested. Production from October of 1994 to September of 1996 has been used to document the total value of the charcoal harvest on an annual basis. The total production for the years 1994-5 and 1995-6 are shown in Figures 3 and 4 below. The charcoal producers use three different bag sizes to transport their coal. To facilitate record keeping, the Group member who collects the production data every month standardizes these three sizes to the equivalent number of the smallest bags used. A number of these small bags were weighed, and the mean of their weights (19.52 kg) was used to calculate the weight of the charcoal being produced annually. The total production for 1994-95 was 2007 bags of charcoal. Production fell by just over 27% in the next year, when only 1452 bags were produced.

When multiplied by the average weight of a small bag, these totals give production volumes of 39.17 tonnes and 28.34 tonnes in 1994-95 and 1995-96 respectively. A small bag is sold in the market in Vieux Fort for \$28.00 E.C. Thus when these figures are totaled, the cash value of the charcoal harvest over the two years can be determined. In 1994-95, that figure was \$56,196 E.C. (\$29,576.84 CAD), and in 1995-96 \$40,656.00 E.C. (\$21,397.89 CAD) was earned by the Group. The decline in production between the two periods is attributable to two factors. Probably the most important is that, although the two figures continue to show the expected seasonal variation, the rainy season of 1995 was quite late, and much drier than usual. As a result, the producers were able to maintain production throughout the season largely unaffected by the presence of water in the mangrove. Secondly, there was, on average, one less producer working in the 1995-96 season. In 1994-95, the number of active producers ranged from five to

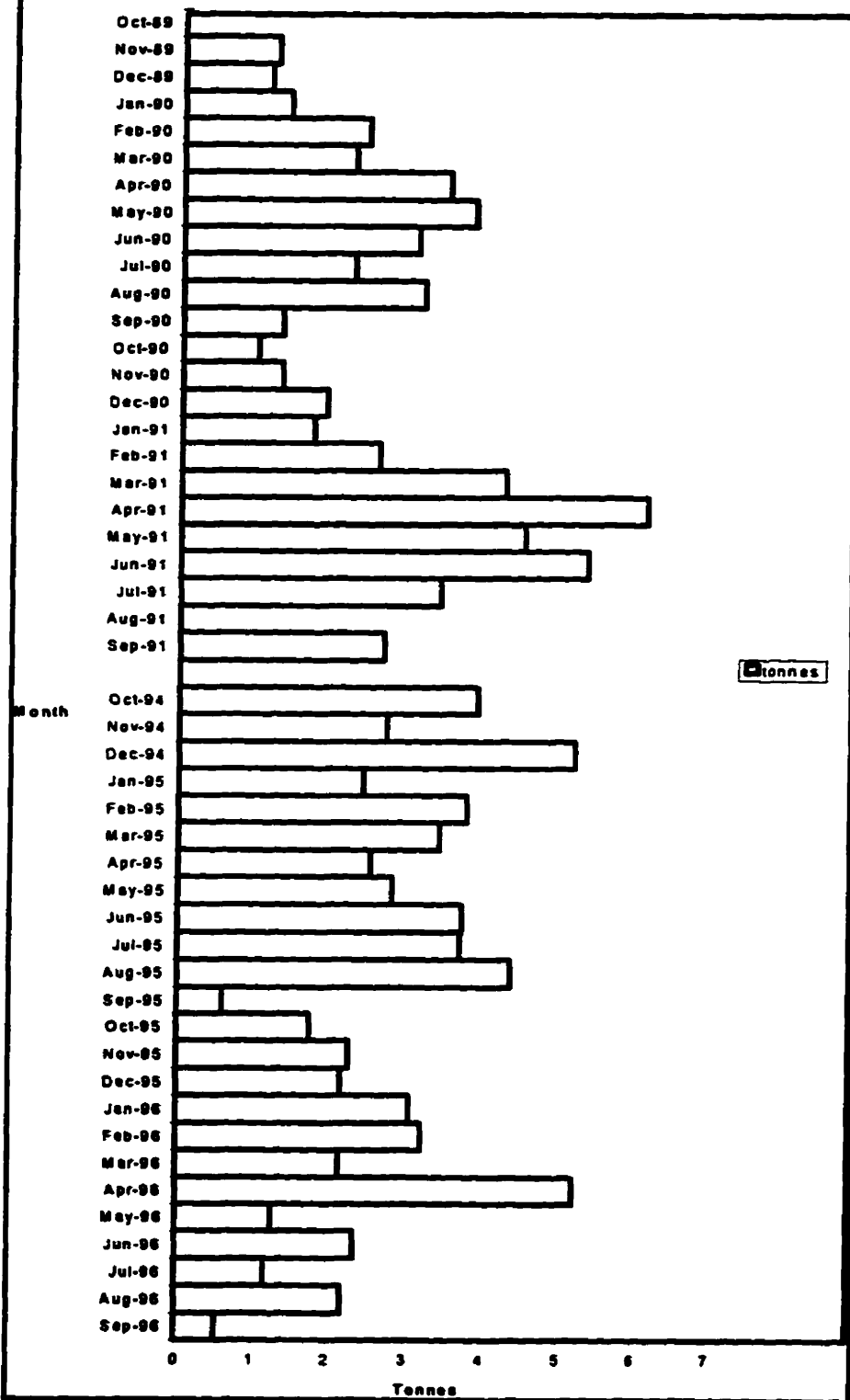
nine over the twelve months, and the average was seven. In 1995-96, the number of active producers ranged from four to eight, and the average was 6.



For the purposes of comparison over the short term, the data from Smith and Berkes work (1993) are reproduced below. From these figures, (Fig. 5 and Fig. 6) total production volumes for the two years have been estimated. They



**Figure 7: Summary of Charcoal Production, Mankôtè Mangrove: 1989-1991; 1994-1996**



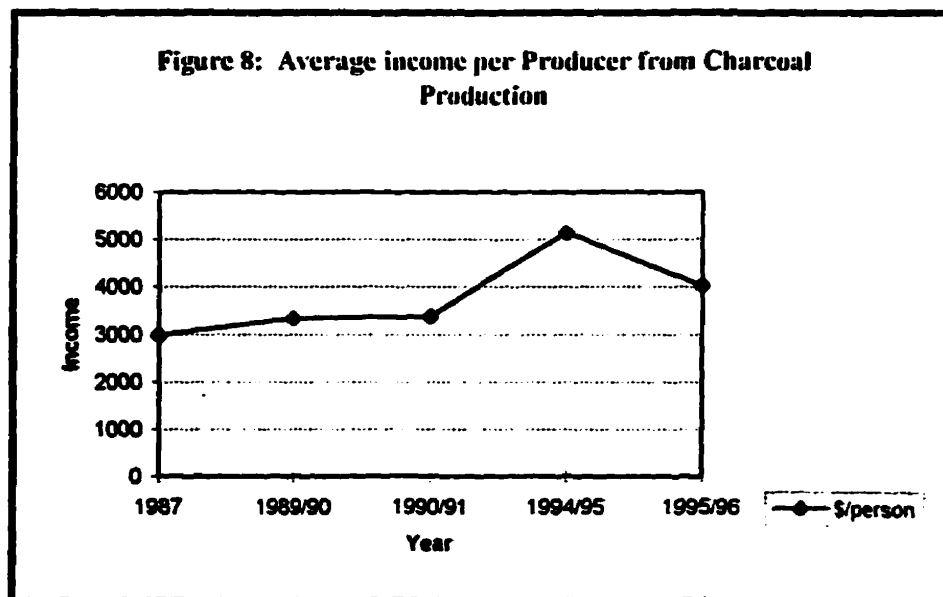
show that production is slightly greater in the later time periods. In 1989-90, the total production was approximately 25.64 tonnes, and the next year showed an increase to 34.89 tonnes. This gives a total over the two years of 60.53 tonnes. In the two year period of 1994-1996, that total is 67.51 tonnes. This is a relatively slight difference, but is noteworthy because Smith and Berkes report between ten and fourteen active producers working in the mangrove in the period between 1989 and 1991. In the more recent period, although the ACAPG numbered twelve members, no more than nine were actively making charcoal. This indicates that although the number of producers making charcoal on a regular basis has declined, production from the mangrove has not. This is consistent with the observations of community members who are familiar with the Group. They feel that although there are fewer people working, the mangrove is not harvested less. This is attributed to the fact that people used to be engaged in charcoal making on a very casual and part time basis, but now those who remain in the mangrove are devoting a greater effort to charcoal production.

Figure 7 shows the production trends over time from the years for which data were available. Subsequent to 1987, when the number of producers recorded reached a peak of 21, many producers gave up charcoal making in Mankòtè, either because they were unwilling to work in a collective context, or because other employment opportunities became available. In the period between 1989 and 1996, for which production data are available, between fourteen and six people working in the mangrove have maintained remarkably constant production volumes. The fact that the mangrove has been able to sustain this level of production over seven years indicates that the current harvest pressure is not causing further degradation of the forest.

Furthermore, the fact that similar quantities of charcoal are being distributed among fewer people suggests that the remaining producers are realizing greater revenues from their work in the mangrove. Indeed, the total income from charcoal production was \$57,111.00 E.C. in 1987, divided among 21 producers

(Romulus 1987). This is the equivalent of \$62,690.45 E.C. in constant 1990 dollars. In 1994-95, total revenue is estimated at approximately \$56,196.00 (2007 small bags\* \$28.00/bag) and in 95-96 it was \$40,656 (1452 small bags \* \$28.00/bag), or \$46,213.82 E.C. and \$32,287.17 respectively in 1990 dollars. These revenues were distributed between a maximum of nine people, confirming the conclusions suggested by the production figures.

Figure 8 and Table 1 show the changes in income per person between 1987 and 1996. The increasing trend confirms the conclusion that the producers who continue to be active in the mangrove are, on average, realizing a greater income from their work there than was previously the case. Since fewer producers are maintaining constant production levels and individual incomes from charcoal production are increasing, it must be the case that the remaining producers are each devoting a greater effort to charcoal production currently than was the norm in the late 1980s. The constant production figures, and the fact that the remaining charcoal producers are earning more from their labour in the mangrove indicates

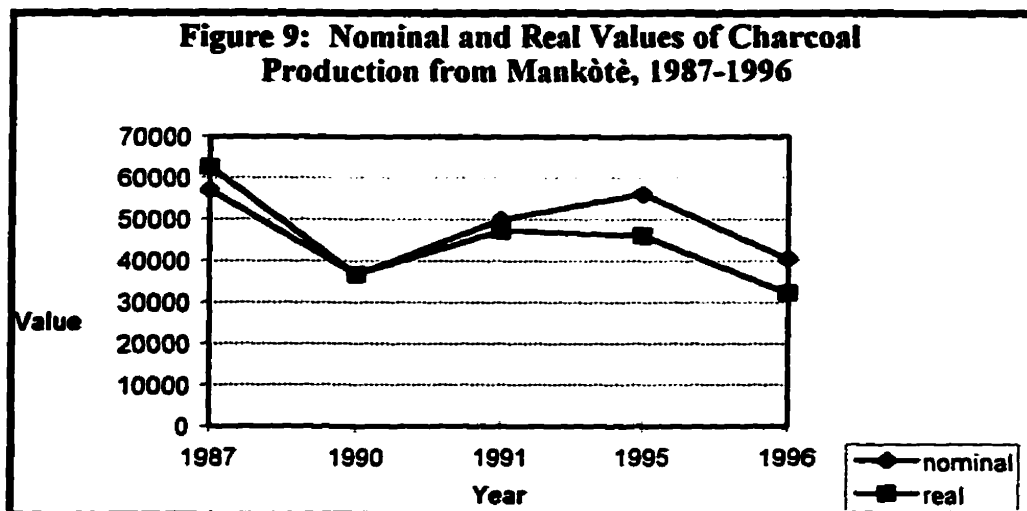


**Table 1: Value of the Charcoal Harvest and Number of Participants for Selected Years.**

<b>Year</b>	<b>Quantity</b>	<b>Estimated Value in 1990 constant E.C. dollars</b>	<b>Number of Participants</b>	<b>Income per Participant in constant 1990 E.C. dollars</b>
1987	N/A	\$62,690.45 E.C.	21	\$2985.26
1989/ 1990	25.64 tonnes	\$36,778.68 E.C.	10/11	\$3343.52
1990/ 1991	34.89 tonnes	\$47,348.28 E.C.	11/14	\$3382.02
1994/ 1995	39.17 tonnes	\$46,213.82 E.C.	9	\$5143.86
1995/ 1996	28.34 tonnes	\$32,287.17 E.C.	8	\$4035.89

that some measure of success has been achieved in the management of the forest, both in terms of preserving the resource and in enhancing the livelihoods of the charcoal producers. However, additional analysis demonstrates that the situation may not be as stable as one might think from the preceding discussion.

While individual producers' incomes are increasing, the real value of the charcoal harvest from Mankotè is doing the opposite. While the nominal value of the aggregate harvest has remained fairly constant between 1987 and 1996, the value of the charcoal harvest has not increased as fast as the price of other goods. Figure 9 shows the difference between the nominal and real value of the charcoal harvest in 1990 constant dollars. The graph shows that since the base year, 1990, the value of the charcoal harvest has not kept pace with inflation. This means that the real earnings of the charcoal producers are being eroded, and they are not able to buy as much with the charcoal they produce as they used to be able to. In order to maintain their current standard of living from charcoal production, therefore, the producers must either increase the price of charcoal, or the quantity they produce.



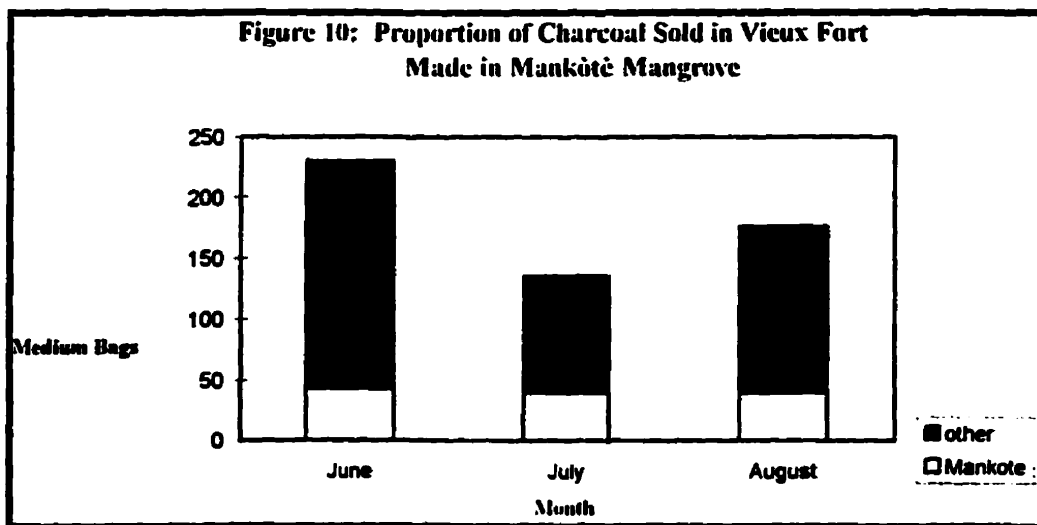
The presence of a powerful incentive to increase production raises the possibility that the sustainability of the harvest in the mangrove is by no means assured. Continued monitoring of production volumes is necessary to ensure that any increase in production volumes to compensate for declining real values of charcoal are detected, and solutions sought in cooperation with the charcoal producers.

The market destination of this volume of coal is the town of Vieux Fort. Charcoal from Mankòtè remains an important source of cooking fuel for many residents of the town and surrounding communities. Not only does production from Mankòtè take the place of alternative sources of charcoal, but it also replaces the use of liquefied propane gas (LPG), which is imported with scarce foreign exchange. Together, these are important benefits of the mangrove which are realized by the community at large and are worthy of some examination.

One objective of this research is to document the proportion of total charcoal sales in Vieux Fort which originates in Mankòtè Mangrove. Accordingly, information was collected at various times in the Vieux Fort market about the origin of sellers who were not part of the ACAPG, and the quantities of charcoal these others brought to the community. The main market days are Fridays and

Saturdays in June and for both days in August. Both days are represented on only two weeks in July. For the months that data are available, totals from each week have been calculated and standardized into medium sized bags, which contain six tins each. These were compared with monthly production figures collected for Mankôtè to estimate the relative contributions of each. These numbers must be regarded as rough estimates only. Besides the obvious gaps in the data, the research fails to include the local wholesalers who also distribute coals both from Mankôtè and from elsewhere. The extent of this trade is unknown, although a brief investigation early in the research period revealed only two such dealers, one of whom did business only with the ACAPG producers.

With that said, the following Figure (Fig. 10) shows the approximate proportions of Mankôtè coals and those from elsewhere in meeting the charcoal demand in Vieux Fort. The percentage represented in the figure are 18.6% for June, 29.4 % for July, and 22% for August. The relatively low percentage in June reflects a high number of sellers during the early part of the month. In the first



week recorded, June 1, ten producers from areas other than Mankôtè were present, the highest number recorded. Over the rest of the period, this number

never exceeded five. In July only two weeks were recorded for the market, but production from Mankòtè for the entire month was used. If the production from Mankòtè is halved to equalize the number of weeks recorded, the resulting percentage is 29.4%. The best available data are from August, but even here, one week is missing from the market data.

The data do not warrant making any definite conclusions about the importance of Mankòtè to the coal market in Vieux Fort, but suggest that other areas contribute the majority of the charcoal consumed in the town, perhaps as much as four fifths to two thirds. This figure may in fact attribute too much to Mankòtè, since group production is over represented in the available data set. Due to the considerable limitations of these data, a second set of calculations were performed to provide an alternative assessment of the contribution of Mankòtè to the total charcoal consumption in Vieux Fort. A 1984 study of energy consumption in St. Lucia found the average charcoal consumption per household per year to be 330 kg (UNDP/World Bank 1984). In 1996, the number of households in Vieux Fort using charcoal for cooking on a regular basis was 482 (Department of Statistics 1996). This gives a total charcoal consumption in Vieux Fort of approximately 159,060 kg/yr. In 1995, Mankòtè supplied 39,177.64 kg to the town, or 24% of the total. In 1996, total production from Mankòtè was 28,343 kg, or 17% of the total. These figures suggest that an estimate of approximately twenty per cent of the total charcoal consumption of Vieux Fort being supplied by Mankòtè Mangrove is not unreasonable.

St. Lucia, like many other Caribbean nations, is heavily dependent on imported energy to meet its domestic needs. Electricity on the island, for example, is generated by thermal generating plants burning imported diesel fuel. Similarly, much of the cooking fuel used in St. Lucia is liquefied propane gas (LPG), which also must be imported. However, the island does have one important source of cooking fuel which is both locally produced and renewable. Wood and wood products such as charcoal continue to be used by many islanders, particularly those with lower household incomes (Wilkinson 1983). The energy which is produced

locally does not have to be imported, and thus saves scarce foreign exchange. This is particularly important in St. Lucia, which has recently seen import earnings from banana sales slump by one quarter, reducing the amount of foreign exchange available to pay for imported fuel (Government of St. Lucia 1994).

In this way, the charcoal produced in Mankòtè makes a contribution to the national economy as well as to that of the charcoal producers and the community of Vieux Fort. The value of this contribution can be estimated by the indirect substitution method (Richards 1994). If charcoal from Mankòtè were for some reason no longer available, residents of Vieux Fort would be required to turn elsewhere for their cooking fuel needs. The two most likely options for meeting this need are increased imports of LPG, or the purchase of additional charcoal from elsewhere. While the demand for charcoal might be met from increased domestic supplies from the countryside, this would not be cost free. The charcoal supplied from the drier hillsides is made from forests which are not as productive as the mangrove, and increased supplies from these areas could further exacerbate existing problems of deforestation, erosion, and coral reef sedimentation (A. Smith, Research Scientist, CANARI, pers. comm. 1996). Furthermore, it is possible that no new supplies from the countryside would be forthcoming in response to a lack of charcoal from Mankòtè, if current supplies represent the total number of farmers who are willing and able to make coals. The alternative to these sources for meeting charcoal demand is to import charcoal from other countries. Currently, the vast majority of charcoal imports to St. Lucia originate in Guyana (Department of Statistics 1996).

For the purposes of this analysis, it was assumed that if coals were no longer forthcoming from Mankòtè, imports of charcoal from Guyana or LPG would be increased to meet the demand. Using the import prices per kilogram of these fuels, and heat equivalent values to standardize heat output between charcoal and LPG permits a calculation of the value of charcoal from Mankòtè in foreign exchange expenditures saved. First, the simpler calculation for charcoal from other countries will be made. In 1995, 52,083 kg of charcoal was imported into

St. Lucia at a cost of \$29,213 E.C. c.i.f. Total charcoal production from Mankòtè from October of 1994 to September of 1995 was approximately 39,177.64 kg. If this production had to be met from external sources, the total import quantity for the year would be 91,260 kg, which would cost \$51,105 E.C. Thus, the total annual import savings which exist as a result of charcoal production in Mankòtè is \$21,892 E.C. c.i.f. .

To calculate the savings from not having to import an equivalent quantity of LPG, it is first necessary to standardize energy output between the two sources. The best way to do this would have been to take samples of charcoal made in Mankòtè and measure its heat content. Unfortunately this was not practical in the field, and such specific information is unavailable. However, it is possible to estimate the heat value of charcoal by using values which are available for other species. The heat content of charcoal is more dependent upon the process by which it was made than on the species from which it was derived (Dr. A. Hollingdale, Natural Resources Institute, pers comm. 1997). In Mankòtè, the charcoal is produced in traditional earthen pits, and the wood is not properly dried. Earthen pits generally carbonize wood at the lower end of the possible range of temperatures and improperly dried wood also reduces carbonization temperature (Wartluft and White 1984; A. Smith, Research Scientist, CANARI, pers. comm. 1997)). It is the temperature of the carbonization process which determines the energy content of the resultant charcoal. At the lower end of the possible range of temperatures, tests conducted on Acacia produced heat values of 22,400 kilojoules/kilogram at 300 degrees centigrade and 29,880 kj/kg at 400 degrees. Similarly, Oak produces charcoal with an energy content of 32,5000 kj/kg (Hollingdale, Krishnan and Robinson 1991). Because of the lower carbonization temperatures produced by earthen pits, the lower end of the range of possible temperatures is assumed, and an estimated heat value of 30,000 kj/kg will be used as a proxy for the heat energy content of the charcoal produced in Mankòtè (A. Hollingdale, Natural Resources Institute, pers. Comm. 1997). For LPG, heat

values per kilogram were initially found in BTUs, which were then converted to joules as follows:

1 kg LPG = 48490 BTUs. (Inter City Gas Co. 1996) 1 BTU = 1054.5 joules (McGraw Hill Dictionary of Scientific and Technical Terms 1989), so 1 kg of LPG generates  $48490 \times 1054.5$  joules = 51,132,705 joules, or 51,132 kJ/kg. Therefore, it takes  $51,132/30,000 = 1.7$  kilograms of charcoal to equal the heat energy content of one kilogram of LPG.

Table 2. Summary of heat content conversions.

Estimated charcoal heat content	30,000 kilojoules/ kilogram
1 BTU	1054.5 joules
1 kg liquefied propane gas (LPG)	48,490 British Thermal Units (BTU)
1 kg LPG = 48,490 BTUs*1054.5 Joules	51,132,795 Joules
heat value of 1 kg of LPG in Kilojoules	51,132 kilojoules
charcoal equivalent of 1 kg of LPG	$51,132/30,000 = 1.7$ kg

In 1995, then, the 39, 177.64 kg produced in Mankòtè is the equivalent of 23,045.67 kg of LPG. In 1995, imports of LPG totaled 5,376,316 kg, at a cost of \$6,485,007 E.C. (D. Cenac, Ministry of Planning, pers. comm. 1996). This gives a per kilogram cost of 82 cents E.C.. Again, if charcoal from Mankòtè were replaced by LPG which costs 82 cents/kg to import, the additional foreign exchange expenditure would be \$18,897.45 E.C., or about \$9,946.00 CAD annually.

It would seem to be more efficient to replace lost production in Mankòtè with LPG rather than importing charcoal because much less would have to be imported. However, this would impose additional costs on households which currently use charcoal, since charcoal is less expensive to cook with than gas in Vieux Fort. Coal from Mankòtè sells for \$7.00/tin. Each tin weighs an average of 5.7 kg, giving an average cost of \$1.22/kg. Gas, on the other hand, sells at retail for \$28.00 for a 20 lb. canister. This gives a price of \$3.08/kg. Using the

conversion of 1.7 kg of coal for every kg of LPG, a person would have to purchase 1.7 kg of coal at a price of \$1.22 to get the equivalent cooking energy of a kilogram of LPG. This gives a cost of \$2.07, a savings of \$1.01/kg over cooking with gas. In Vieux Fort, 482 households regularly cook with charcoal, using an average of 330 kg per year. To replace this energy with LPG would mean purchasing 194 kg/household of gas at \$3.08/kg. This would result in an increased cost for each household of \$194.00 E.C./yr., or \$93,951.44 E.C./yr. for the town as a whole. Since Mankòtè supplies between twenty and thirty percent of the town's charcoal, a similar proportion of the \$93,951.44 savings realized from using charcoal is attributable to the mangrove. Using a figure of twenty five per cent, the use of Mankòtè charcoal results in a domestic savings to the 482 households of \$23,487.86 E.C./ yr. The lower price of coal versus gas is compounded by the high capital costs associated with cooking with gas. Stoves were advertised in Vieux Fort for between \$545.00-\$645.00 E.C., which many people cannot afford to pay. These two factors explain why charcoal continues to be the fuel of choice for low income families, despite the greater ease, speed, and cleanliness of gas stoves.

### **5.3 Non Quantified Values**

While the most significant economic uses of the mangrove are timber for charcoal and grazing land, many local people use the mangrove for a wide variety of other goods. As Mankòtè is a marine reserve, all of these activities, with the exception of charcoal production, are officially illegal, but they are accepted in practice. During the transition from the rainy season to the dry season, fishing in the waterways of the mangrove is a very popular activity. Members of the ACAPG describe hundreds of cars parked along the road leading in to the mangrove during the fishing season, as people from as far away as Micoud attempt to catch the Tarpon, Tilapia, and Snook which live in the mangrove during the rainy season.

Crab hunting is another activity widely practiced by residents of the Vieux Fort area. The charcoal producers frequently eat fresh caught crabs for lunch while working, and consider them a delicacy, and the mangrove, especially to the north nearer the beach is pockmarked by the holes dug by people seeking the crabs that tunnel underground. Crab harvesting is such a widespread activity that there is some anecdotal evidence that crab populations are declining. Many of the charcoal producers and others who spend much of their time in and around the mangrove have noticed a dramatic scarcity of crabs in recent years, which they attribute both to over harvesting and to the pollution of the mangrove by oil and other refuse. Should this be true, there may be significant consequences for the mangrove and its related ecosystems downstream. Crabs have been found to perform an important role in the litter dynamics of the forest, turning over the sediments in the forest floor by their burrowing, and by grinding the litter fall (Rutzler and Feller 1996).

Finally, the mangrove is used by many people from Vieux Fort and the surrounding towns for recreation, including bathing, and for the wild fruits which grow there. The brackish waters of the forest are believed to possess therapeutic properties which are good for a wide variety of ailments, from the common cold to arthritis. The almonds, coconuts, and a fruit called *fat park* are regularly to be found in the hands of passersby in the forest, providing benefits to even the most casual visitor.

In addition to these commodities, the mangrove provides valuable ecosystem services. One of these is the nutrient rich sediment discharge into the nearshore coastal waters. Mankòtè is a basin mangrove, and therefore there is an interchange of water between the mangrove and the sea only at certain times of the year. During the rainy season, increased runoff in the basin and the action of waves during storms combine to breach the sandbar which separates the mangrove basin from the open sea. When such a breach occurs, large quantities of nutrient laden sediments are released into the open sea. This discharge contributes greatly to the productivity of the seamount farms which are located in the next bay to the

north (A. Smith, Research Scientist, CANARI, pers. comm. 1996). Seamount is a seaweed used in local beverages and in the food processing industry. It grows wild in locations around the island, and is now beginning to be commercially cultivated on a small scale. These nutrients also contribute to the importance of the area as a lobster harvesting site and help support the inshore fishery, which is another locally important industry (Department of Fisheries undated). Mankòtè also provides other ecosystem services similar to those of other mangrove forests in the region. These include shoreline stabilization, provision of fisheries nursery areas and wildlife habitat (Bacon and Alleng 1992).

### **Summary**

Mankòtè provides a wide range of resources, all of which are important, although to various degrees, to the surrounding communities. While it is considered desirable to evaluate all these goods and services in economic terms when assessing the benefits of a wetland, due to the technical difficulties inherent in doing so, this study is confined to a description of those resources. These included fish and crab harvests, sediment discharge, and recreation. Of these, there is anecdotal evidence that crab populations, which are important to the mangrove ecosystem, may be declining due to pollution and/ or over harvesting.

Quantification of the value of those resources which produce a direct and measurable economic benefit was also attempted. The two commercially important resources taken from the mangrove are timber for charcoal production and forage for cattle. The cattle which graze in Mankòtè are owned by members of the Community Pasture Program. The mangrove plays a vital role as one of several relief pastures for cattle which cannot be supported on the regular grazing paddocks during the dry season. Investigation determined that five farmers graze 56 head of cattle over a period of six months. Two sets of calculations were used to determine the value of the mangrove to these cattlemen, one which describes the estimated maximum and minimum total values of grazing in Mankòtè, the other which does the same for annual values. These calculations give a maximum total

value of the herd of \$64,400.00 E.C. and a minimum of \$35,000.00 E.C. The annual maximum value is \$16,000.00 E.C./yr., and the minimum is \$8,000.00 E.C./yr. The fact that the mangrove does not contribute the entirety of six months worth of grazing, but may maintain better health in the cattle, suggests that minimum values be used.

Based on the available data, charcoal production was found to be fairly constant, but the number of active producers has declined over time. The total production of charcoal in 1994-95 was 39.17 tonnes, and in 1995-96 it was 28.34 tonnes. This translates into an approximate cash value of \$56,196 E.C./yr. and \$40,656 E.C./yr. respectively. By way of comparison, the cash value of the harvest was \$57,111.00 in 1987. In constant 1990 dollars, the 1994-95 harvest was worth \$46,213.82, that of 1995-96 was worth \$32,287.17, and the 1987 volume was valued at \$62,690.45. The revenue from charcoal production is now being distributed between fewer producers than at any time previously recorded, leading to greater individual earnings. However, the real value of the harvest has been falling since 1990, which may provide an incentive for the charcoal producers to increase production in the future.

Although the available data were limited, preliminary investigation suggests that while the volume of charcoal sold in Vieux Fort which originates in Mankòtè is not the majority of total consumption, it is nevertheless an important source. Observations in the market and calculations of total consumption compared with production from Mankòtè indicate that a range of between 20 and 30 percent is a likely estimate of the mangrove's contribution to coal use in Vieux Fort.

Lastly, it was calculated that if charcoal production in Mankòtè were discontinued, the costs of importing charcoal to replace it would be \$21,892.00 E.C. If it were replaced with LPG, that cost would be \$ 18,897.45 E.C. However, to pursue this last option would penalize low income families who rely on charcoal for cooking because it costs less than gas. Taken together, the minimum annual value of cattle grazing, the average cash value of the charcoal harvest between 1994 and 1996, and the savings to the residents of Vieux Fort

which accrue as a result of not having to pay the additional costs of switching to LPG, gives an estimated annual value of the mangrove of \$79,913 E.C. As this figure does not include the value of the ecological functions of the forest or that of the resources not traded in the market, the true value of the mangrove is likely to be much higher, demonstrating the value of continuing to manage the mangrove for charcoal production and to maintain the forest's long term health. The known annual commodity values and the unknown ecosystem service values which together would comprise the total annual value of the mangrove are shown in Table 3 below.

Table 3: Estimated Annual Value of Traded Commodities from Mankòtè Mangrove.

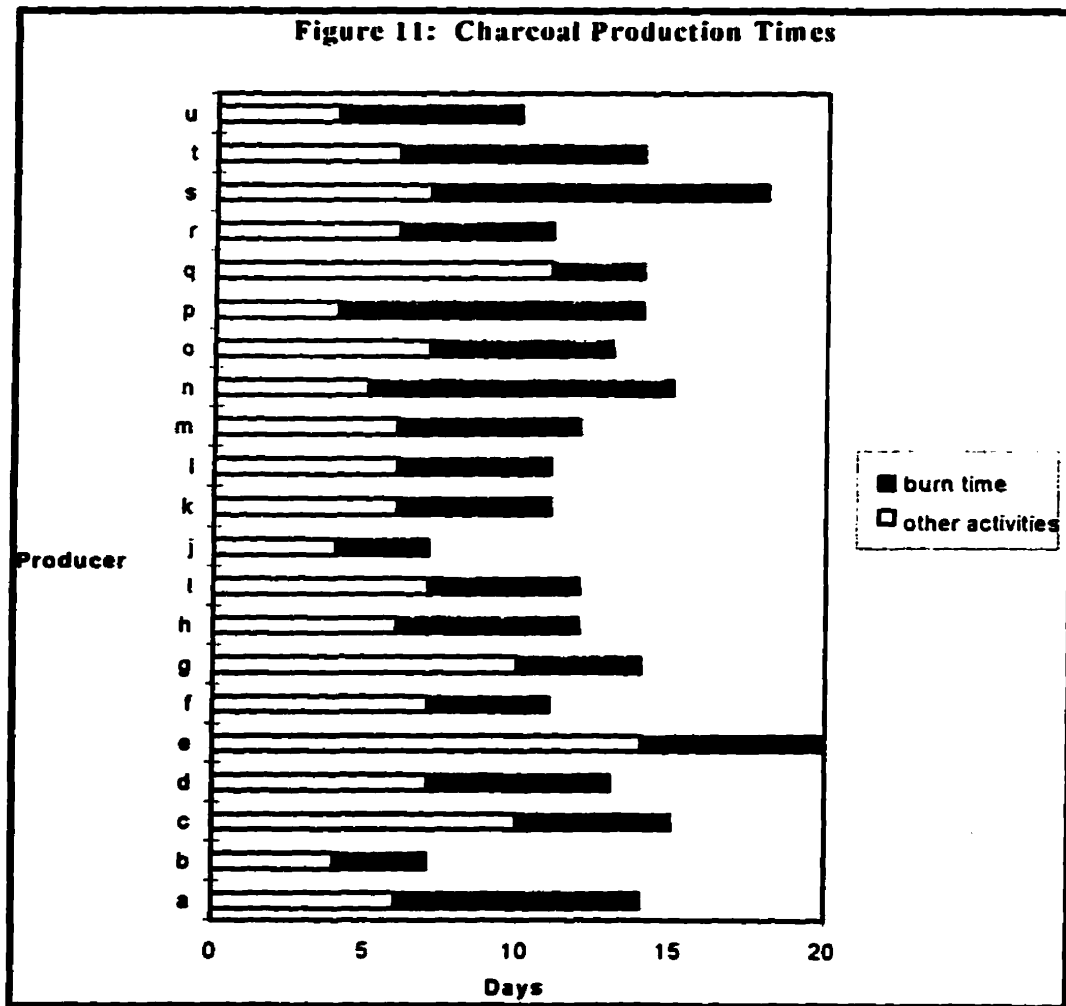
Commodity	Year	Value (E.C. dollars)
Charcoal Production	1994/95	\$56,196.00
	1995/96	\$40,656.00
	average	\$48,426
Cattle Grazing	1996	\$8,000
Savings to community from not switching to LPG	1996	\$23,487.86
Crab harvesting		N/A
Fishing		N/A
Fruit and nut collection		N/A
Recreation		N/A
<b>Estimated total annual value of traded commodities</b>		<b>\$79,913.86</b>
<b>Ecological Services</b>		
Nutrient value of sediment discharge		N/A
Fisheries nursery area		N/A
Soil stabilization		N/A
Water purification		N/A
Bird Habitat		N/A
<b>Estimated total annual value of traded commodities.</b>		<b>\$79,913.86</b>

### **5.3 Socio - economic Analysis of Charcoal Production**

Having considered the aggregate economic importance of the mangrove as a whole we will now turn to a discussion of the contribution the charcoal industry makes to the households of the charcoal producers. For the majority of group members, charcoal production is only one of two or three other occupations which together make up their livelihood strategies. While it was not possible to quantify the relative contributions of each, it was possible to determine a ranking of the importance of each to the household for most producers. This ranking will be complimented by an estimation of individual incomes based on field observations. This information will be discussed in the context of the costs of production and the nature of the market faced by the producers. In large part, the characteristics of the market are determined by the number of participants and seasonality.

Before launching into the economic analysis, it will be useful at this point to describe the production process. The cycle begins with the harvesting of the trees. These are then cut into four or five foot lengths. This is done exclusively with cutlass, and takes anywhere from one to three days depending on how much charcoal is desired. Then the billets are carried by hand to a nearby pit. The same pits, of which there are many throughout the mangrove, are used repeatedly. This saves the labor of digging new pits, and also is believed to produce better coal. Two long, thick (3-5" diameter) trunks of any species of tree are placed lengthwise beside each other about four feet apart. The billets are then stacked across them to a height of some three feet. The stack is then covered with green boughs from nearby, then a layer of thick brown paper. Finally, the entire arrangement is sealed with a four or five inch deep layer of soil. Before the pit is completely sealed, burning coals are introduced at one end. Once the stack has caught fire, the pit is closed. Then the pit is allowed to burn for anywhere between four and fourteen days. There is an obvious incentive to make the stack burn as fast as

possible, but this is countered by the fact that a fast burn yields lower quality coals, which are then harder to sell. The speed of the burn is controlled by the amount of oxygen allowed to enter the pit. This is controlled by the number and size of the holes made in the sides of the pit. Once the wood has finished burning, the pit is opened, and once cooled, the coals are gathered by hand into sacks. Finally, they are carried to the road, where a truck takes them to the market in Vieux Fort. The following figure (Fig. 11) shows the considerable variation in the time required for production. The variable production times point out the flexible nature



of charcoal production. Total production time varied between seven and twenty days, and averaged 12.6 days. The burn time varied between four and fourteen days, with an average of 6.8, and most often represented a large portion of the time required to make a pit of coal. Depending on the amount of coals desired, cutting time usually varies between one and three days. Carrying usually takes one or two days, and stacking and sealing the pit requires between one and two days as well. The harvesting of the coals can take as little as one day, or as many as three, again depending on the amount of coals. For most producers, a working day is usually three or four hours, between the hours of five A.M. and noon. This allows them to do the heavy work before it gets too hot, and affords the opportunity of working on their farm or relaxing in the late afternoon. The flexibility of the system allows producers to adjust the process to meet their particular needs at that point in time. Producers decide on the quantity of coals they want to make based on the amount of money they need, the time frame they need it in, and the amount of work they are prepared to do. They are then able to estimate fairly closely the amount of time they need to devote to cutting, and the speed at which they need to burn the pit. The highly flexible process is also ideally suited to a subsistence strategy which relies on more than one source of income. The majority of the producers have more than one occupation demanding their time and should a job opportunity come along, charcoal making can be abandoned at any stage of the process and resumed at a later date. Thus there are few, if any, costs associated with leaving the mangrove to work elsewhere when possible.

Table 4 indicates the other employment engaged in by the charcoal producers. Only two producers responded that coal making was their sole means of support. However, of the producers who do have other occupations, coal making was regarded as their main occupation by all but four of them, two of whom are not group members, and therefore are not regularly working in the mangrove. Thus, coal making is the only or is the most important occupation for six out of the ten producers listed. In fact, the other occupations are in many cases used primarily to supplement the income from charcoal making. This is

particularly true of the construction and agricultural laborer jobs listed in the table. The jobs used to supplement income from charcoal production are usually short term wage employment, which may last for a day or a week, rarely more. But these jobs have the advantage that the wages are paid at the end of every day. Because there may be as much as two weeks in between charcoal harvests, many of the producers rely on these short term jobs to provide cash to meet immediate needs. Because the charcoal making cycle is so flexible, they are able to work as long as the job lasts, and then resume coal production. Similarly, the coals can be left while required work is done on the farm and then resumed later. Although no quantification was attempted, it is likely that farming in most cases accounts for a relatively small proportion of total income. Security work and the other regular wage occupations make a greater contribution to household income than most of the other categories. In these cases again though, the work is usually in the late afternoon or night, allowing the mornings to work in the mangrove.

Table 4: Occupations of Charcoal Producers

<i>Producer*</i>	<i>Other Occupations</i>
1	security guard, family farm, group farm
2	group farm, family farm, construction, agricultural labor
3	group farm, construction, agricultural labor
4	family farm, construction, agricultural labor
5	none
6	security guard
7	none
8	group farm, family farm
9	cleaner
10	farming, construction

\*producer refers to adults who were active in producing charcoal during the research period. Not all are group members.

Of those for whom charcoal making is their most important or sole source of income, it is important to note that this is not merely what they do when other employment is scarce. The life of a charcoal maker is valued for the freedom it offers, and for the chance to work in relatively pleasant physical surroundings. Charcoal producers set their own hours, and are their own bosses, attributes which are highly valued by many of the group members. These benefits are in addition to that fact that charcoal production does in fact pay as well or better than most of the occupations open to the producers. The minimum wage in St. Lucia is \$5.40/hr (Department of Communications and Works 1996). A labourer in a factory or in agriculture was recorded as earning between \$25.00 and \$35.00 E.C. a day in 1992 (Espeut 1992). Charcoal producers engaged in these occupations confirm these numbers, saying that they earn between \$25.00 and \$30.00 a day in agriculture, and can make a maximum of \$45.00/day in construction. Usually, farm labour is a five hour day, from seven to noon, and builders work a full eight hour day. Thus daily wage rates roughly match that of the minimum wage.

On the other hand, charcoal production can pay considerably more than this, for less time spent working. When it is calculated, the average daily earnings of a charcoal producer are \$68.30 if the burn time is not included. While a pit is burning a producer must monitor it daily. However, the time required to monitor the pit varies between a mere glance in passing to three hours spent recovering the pit if some part of it is in danger of collapse. Including the monitoring time as labor gives an average daily income of \$28.58. This compares favorably with the wages available in agricultural labor and construction, although it is less than the maximum amounts in those categories. But when one considers that the average work day in the mangrove is three to four hours, while that in agricultural labor is five, the hourly earnings for charcoal production using an average workday of 3.5 hours is \$8.16, which exceeds those available in the other occupations.

The figures in Table 5 below were derived from field observations, and provide empirical corroboration for the charcoal producers' own estimates of their monthly earnings from the mangrove. Informants believed that they could earn

between \$800.00 and \$1000.00 month if they worked hard every day, but more realistically, they earn between \$500 and \$600. The figures shown below indicate that two weeks of work, including burning time, is capable of yielding \$600.00, and 20 days of work can yield over \$900.00. They also show that an estimate of \$500.00 to \$600.00 a month is reasonably accurate.

**Table 5: Estimated Incomes and Earning Periods for Charcoal Producers**

Producer	Month	Burn Time	Total Time	Gross Earnings	Net Earnings*
1	May	6 days	14 days	\$600.00	\$550.00
2	May	4 days	7 days	\$308.00	\$279.00
3	May	10 days	15 days	\$392.00	\$357.00
4	June	7 days	11 days	\$196.00	\$175.00
5	June	14 days	20 days	\$952.00	\$875.00
1	June	7 days	11 days	\$120.00	\$104.00
6	June	10 days	14 days	\$532.00	\$487.00
6	June	6 days	12 days	\$224.00	\$201.00
2	June	7 days	14 days	\$480.00	\$438.00
6	June	4 days	7 days	\$252.00	\$227.00
4	June	6 days	11 days	\$252.00	\$227.00
4	July	6 days	11 days	\$399.00	\$364.00
1	July	6 days	12 days	\$400.00	\$365.00
7	July	5 days	15 days	\$238.00	\$215.00
6	July	7 days	13 days	\$675.00	\$620.00
4	July	4 days	14 days	\$236.00	\$213.00
6	July	11 days	15 days	\$364.00	\$331.00
4	August	6 days	11 days	\$266.00	\$241.00
8	August	6 days	14 days	\$168.00	\$149.00
1	August	4 days	10 days	\$170.00	\$151.00

\* Net earnings represent the minimum possible values, assuming the maximum transportation cost of \$2.00/bag, and that all loads were composed of small bags.

The inputs required in this process are few and inexpensive. The principal tool of the charcoal maker is the cutlass. These cost from \$15.00 to \$20.00 E.C. depending on size. Because they must be heavy to cut the hard mangrove wood, and frequent sharpening wears them down quickly, they must be replaced about every three months. However, this cost is not solely attributable to charcoal production since the same cutlass is used for many other tasks. The maximum annual cost of the cutlass is therefore  $\$20.00 * 4 \text{ cutlasses/yr.} = \$80.00$ . One third of this may be attributable to charcoal production, or \$26.00/yr. This gives a total input cost for cutlasses of just over \$2.00/month. The only other implement used is a shovel to cover the pit in soil. Shovels last a very long time, and in many cases are salvaged from the garbage rather than bought new. Another essential input is the paper which is used to cover the pit. This is a relatively new practice, introduced in the 1990s. The presence of the paper helps prevent soil from trickling down through the green boughs and into the stack of wood and interfering with the burn. The paper is also salvaged from the dump where it is left by the Winera box factory. The cardboard rolls which the paper comes on are used to help support the sides of the pit. Like most of the other inputs, the bags used to store the coals are also usually salvaged from the dump. Failing this, they can be bought for 50 cents each from the local bakery. Bags are saved at the market and reused until they become too worn out for further use. Thus, the only significant cost associated with charcoal production is transporting the coals to market. The standard rate for transportation is \$2.00 E.C./bag. However, the group members have a long standing relationship with one transport driver, who most often accepts what is offered by way of payment.. Thus, the \$2.00/bag fee is the maximum cost which might obtain.

The only other cost faced by the charcoal producers is the fixed price of the right to sell their coal in Vieux Fort. For \$7.00 E.C., charcoal sellers purchase the right to operate in the market and to have any leftover coals stored in a locked shed until the next market day. The money is collected by an employee of the town council, who issues each seller a ticket authorizing them to be present in the

market. The cost of the market stall and the maximum transportation costs for small bags were used to derive the net income estimates in Table 5.

Daily conditions at the market influence the selling price of the charcoal. If there is a large number of sellers, prices often fall from the standard price of \$7.00/5 kg tin. to \$5.00. This is not unusual just prior to the onset of the rains, when farmers begin clearing land for planting. Farmers frequently convert the felled wood into charcoal and sell it in Vieux Fort, creating a glut. Conversely, if coals are scarce, particularly during the rainy season and just before Christmas when demand is at its peak, prices may rise to \$8.00/tin. Despite the fact that there is frequently an excess supply during the dry season and a shortage during the rainy season, only one Group member makes a habit of storing coals made during the dry season and selling them when the rains come. When asked about this, other producers acknowledged the wisdom of this plan, but said they did not do so because they preferred to get all the money from their coals as soon as possible.

The large number of sellers, both from Mankôtè and elsewhere, present during the dry season means that the market at these times closely resembles a competitive market. The Vieux Fort coal market is characterized by a large number of sellers behaving as price takers, facing very few barriers to entry, all with a relatively homogenous product. During the rains, demand exceeds supply, and those sellers who are present can demand higher prices. Such price increases are always episodic, however, because there is a continuing incentive for each producer to reduce the price relative to his or her competitors and sell more coal. Interviews with coal sellers in the market indicate that they are all well aware of the fact that if they all agreed to increase the price, they would all make more money. However, it is very difficult to obtain the cooperation necessary to form a price cartel of this kind. This is particularly true since the individuals selling change from week to week.

## **Summary**

**It is apparent that charcoal production is a very flexible pursuit which is well suited to a survival strategy which depends on having more than one source of income. Most of the ACAPG members hold other jobs as well as charcoal production, but most of them consider coals to be their primary employment. Not only is coal making a low cost occupation valued for the freedom and flexibility it offers, but revenues from this source are at least comparable to, and may exceed those possible in the other occupations available to the producers. Field observations accord well with charcoal producers' own revenue estimates of a gross monthly income from charcoal making of approximately \$500-\$600. The only significant input costs faced by the producers are for transportation and the right to sell coals in the Vieux Fort market. These costs range from a mere \$16.00/month to \$93.00/month depending on the size of the load and the number of loads brought to market each month.**

## **Chapter 6: Conclusions and Recommendations**

### **6.1 Conclusions**

Over the past decade and a half, Mankòtè mangrove has been transformed from an open access resource which was clearly suffering the tragedy of the commons predicted by theorists such as Hardin to a common property resource managed by a collective of resource users, the Aupicon Charcoal and Agricultural Producers' Group. Over the intervening years, the Group has, to all appearances, succeeded in managing the mangrove for charcoal production in such a manner that the condition of the resource base has stabilized, and the production of charcoal appears to be sustainable. This case is in some respects exceptional to many common property resource management institutions, in that the institution did not evolve organically over a period of many years in an effort by local resource users to govern the use of those elements of the natural world upon which they depended. Rather, the integrated conservation and development project known as the Aupicon Project, consisting of a fuel wood plantation, a farm, and the mangrove, was initiated by a regional NGO in cooperation with National Government authorities who recruited the participation of the charcoal producers.

Along with the deliberate creation of an institution which is provided with some level of management control over a resource comes the responsibility of ensuring that that institution is designed to both protect that resource and to meet the needs of the membership. This may require that the institutional structure evolve over time, just as the institutions of indigenous common property resource management are continually changing to adapt to changing circumstances. Initially, the charcoal producers' input was sought largely in a consultative capacity. Later, it was hoped that the ACAPG would be able to assume full management responsibility for the mangrove, woodlot and farm. However, long experience has demonstrated that this is not feasible at present for a variety of reasons discussed in the preceding chapters. The ACAPG is now being conceived

of as a partner in a co-management agreement with the Government and other stakeholders, rather than as a purely community based resource management institution (Brown 1995).

This study may be considered a small part of the groundwork which must be done prior to effecting such a transition. The proposed co-management agreement is intended to consolidate the legal status of the ACAPG and to address some of the institutional and management issues which are in need of attention. For such an agreement to be effective, the members of the ACAPG must be prepared to continue to devote their energy and labor to establishing management objectives and to implementing them. Furthermore, other decision makers must be committed to maintaining a functioning mangrove ecosystem which provides important goods and services, both to those who gain their living from the forest and to the public at large.

Therefore, this study was conducted with two purposes in mind. The first was to document more completely the various uses of the mangrove, and where possible, the economic value of those uses. This is based on the premise that economic arguments for conservation of natural features are more powerful and practical than those based on aesthetics and existence value alone. Secondly, the experiences of the ACAPG membership in participating in the management of the mangrove was solicited. Experiences to date will inform the Group's opinions concerning the time and effort they are willing to devote on an ongoing basis to the co-management exercise currently being contemplated.

To fulfill these purposes, four specific research objectives were formulated in consultation with academic committee members and CANARI. The conclusions reached regarding these objectives are detailed below. These will be followed by more general conclusions about the problems a co-management agreement might successfully resolve. Finally, the last objective, that of making recommendations concerning those functions of a co-management board most useful in assisting the ACAPG to manage the mangrove will be addressed.

**The first objective of the research was to describe the resource management system employed by the charcoal producers in Mankòtè Mangrove. Since the formation of the Group, a previously observed downward trend in stem diameters has been halted, indicating that the mangrove is not being further degraded. However, the reestablishment of the large mature trees which once existed is impossible given present harvest pressure. The improved health of the mangrove is attributable to the reduced the number of people harvesting in the mangrove, and to the adoption of a set of harvest practices which facilitate regeneration of harvested trees. Particularly important in this regard has been the adoption of a system of selective cutting rather than clear felling. This ensures that smaller diameter stems are preserved into the future.**

**The management system employed by the Group is largely informal, and is based on constant interaction among Group members. While Group members work in close proximity, the actual felling of the timber is an entirely individual activity. Reciprocal assistance is sometimes offered for the more arduous tasks of carrying the timber and harvesting the charcoal, but the coals so produced remain the property of the person who felled the trees alone. The allocation system for the timber has changed from that which was previously reported (Smith and Berkes 1993). Rather than working through the mangrove in zig zag strips, the charcoal producers, with one notable exception, now simply select an area which contains sufficient timber to last the season, where they remain throughout the dry season. However, they are able to temporarily cross into each others' areas where an abundance of wood exists. The flexibility inherent in this allocation system is well suited to the physical characteristics of the mangrove and to the seasonal fluctuations of the job.**

**However, some problems persist. The most important of these is a continued inability to enforce the Group's exclusive rights of access. This inability, it must be emphasized, is a relative, rather than an absolute one. While problems of exclusion persist, all Group members agree that there is no longer an open access situation. However, enforcement remains imperfect, and no established**

procedure exists for enforcing exclusion where some kind of coercion is required. Group members are divided as to the desirability of rigid enforcement, some preferring simply to ensure that intruders harvest in a proper manner and location. People of both persuasions are aware that to actively exclude others from the mangrove both exposes them to dangerous situations and creates enmity in the community in which they live. The continuing inadequacy of the enforcement regime is to some extent responsible for the failure of the group management system to re-establish a canopy of mature trees in the mangrove. Conservation of this kind is a risky proposition in a situation where there is no guarantee that others will be similarly restrained.

Secondly, there is no universal acceptance of the need for particular harvest practices amongst the Group. There are an established set of harvest practices which facilitate the regeneration of the mangrove, and thus diminish the impact of the timber harvest. These include keeping the stumps clear of slash, and cutting at a certain height above the topmost prop root. While all Group members claim to adhere to these methods, in practice, it is not always so. There is also a lack of agreement regarding what constitutes a valid use of the mangrove among Group members. The timber in the mangrove is occasionally used for purposes other than charcoal production, and there is no set of rules to establish which of these uses are acceptable and which are not.

This lack of established operational rules has occasioned some conflict between Group members. Furthermore, there is no set of graduated sanctions which the charcoal producers all agree are appropriate. This is obviously the result of there being no agreement about what constitutes a violation of Group rules, but nor are there any agreed upon punishments which could be applied even in cases where there was consent that rules had been violated. Some Group members feel that it is sufficient to use peer pressure and persuasion, while others believe that it is necessary to resort to confiscation of improperly harvested charcoal or suspension of harvesting rights. Until these issues are resolved one way or

another, there can be no expectation that harvest practices will be universally respected.

**The second objective** of the study was to investigate the perceptions of the charcoal producers of their experiences to date in participating in the management of the mangrove. This was done with an eye towards assessing their willingness to enter into a formal co-management agreement. Informal interviews with the Group participants indicated a generally positive attitude towards actively participating in an integrated conservation and development project concerning the mangrove. The primary benefit cited by all the Group members was that since the Group was formed, there has been a united organization to facilitate dealings with others who wished to cut illegally in the mangrove. Group members also cited both material benefits, such as receiving Government assistance on the farm and woodlot components of the project, and less tangible benefits such as increased social status in the community and pride in their work.

Despite the generally positive opinions voiced by Group members, there was also a high level of frustration that the Group has so far been unable to effectively function as a self-governing collective entity. Three reasons were given for this outcome. The first is that there has been throughout the project history, an inability to organize Group members for required collective action. This history of poor cooperation among the Group has helped to create a high level of internal conflict which further erodes the Group's interest in and capacity for collective action. This conflict stems from both the repeated failure of some Group members to contribute to group activities and instances in the past of perceived wrongdoing and financial mismanagement. These perceptions are greatly facilitated by the total absence of any kind of regularized reporting and accounting procedures for collective activities which are comprehensible to all the Group members. As discussed, the ACAPG does not at present have the ability to effectively discuss and resolve these conflicts. Rather, they persist over time and colour all group interactions and individual decisions about whether and when to participate in group projects.

The third reason the members of the ACAPG are disillusioned with the possibilities of communal management and other activities is a list of failed initiatives which raised expectations initially, but which were unable to deliver the expected benefits. The Aupicon Project has been the beneficiary of a number of Government sponsored initiatives, including an aquaculture project and an effort to develop ecotourism in the mangrove. None of these projects has so far succeeded in providing a noticeable contribution to the Group members' livelihoods despite the considerable investments which have been made, both in time and material resources. Some of the Group members feel that the reason these projects have failed is because they are poorly conceived. Initial startup costs and materials are provided, but there is no ongoing support for the Group in terms of technical assistance or organization. While the intentions of the intervening agencies has clearly been to try and develop local capacity by handing over the management of these projects to the Group, the Group does not, in many cases, possess the skills requisite to make them successful. These experiences have made Group members wary of further involvement with any project which consumes their time and energy, and holds out little possibility of reward.

These difficulties may to a large extent be the inevitable outcome when an organization for common property resource management is developed at the behest of an intervening agency rather than as the result of spontaneous indigenous action. While many successful common property management regimes have had decades, even centuries, to struggle with and resolve issues of how to secure cooperation and resolve conflict, this group has the experience of only several years. In locally devised systems, an organic process of change occurs as rules are adjusted incrementally to meet new needs. No such process has occurred, nor could such a process have occurred given the relatively short time frame, and the fact that participants had no past experience with working collectively. Therefore, there has been no opportunity for local institutional structures for conflict resolution or collective decision rule making to develop. In this case, ongoing assistance from the responsible agencies is likely necessary to provide these

services. It is unreasonable to expect that a group thrown together by virtue only of a common occupation would in short order develop an appropriate set of behaviours and rules which facilitate collective resource management.

**The third objective** was to document, where possible, the value of the resources found in the mangrove. It was found that the mangrove is used by the entire community for a wide variety of resources. However, due to the difficulty of collecting the necessary data to evaluate all these, the study was restricted to quantifying only those economic goods directly attributable to the existence of the mangrove. Among the non quantified resource values which are exploited by the people of the surrounding communities are fishing, crab harvesting, and recreation. Of these resources, there is some evidence indicating that crab populations are declining due to over harvesting, pollution, or both. The mangrove also provides many ecological services which have economic benefits, including nutrient discharge into near shore waters, wildlife habitat, and fisheries nursery areas.

The two most commercially important resources which are directly attributable to the mangrove are cattle grazing and charcoal production. The mangrove is an integral component of a rotational grazing system employed by five stockmen who are members of a Government sponsored common grazing system known as the Community Pasture Programme. The mangrove is used as one of several alternate grazing site which gives the regular pastures owned by the Programme a chance to be rested during the dry season, when the pastures do not produce enough forage to support the entire herd. In total, these five farmers run approximately fifty six head of cattle through the mangrove over the six month dry season. The total value of the mangrove to cattle grazing was found to be between \$35,000 and \$64,000 E.C., with an annual value of between \$8,000 and \$16,000 E.C./yr. However, the mangrove may soon cease to be used as a grazing site due to changes in agricultural practices in the region.

Although a complete time series of charcoal production data was not available, there are several years for which figures exist, permitting an examination of changes in harvest levels over time. The annual value of charcoal production

was found to be fairly constant over the seven year period between 1989 and 1996, with some fluctuations due to changes in the number of active producers and local weather conditions. In 1994-95, the total value of charcoal production was found to be \$56,196 E.C., for 39.17 tonnes of coal. In 1995-96, those values were \$40,656 E.C. for 28.34 tonnes. This gives a total production over the two years of 67.51 tonnes, a 6.98 tonne increase from the previous period for which records were available, 1989-1991. However, overall, charcoal production has remained fairly constant between 1989-1996, indicating that the existing level of harvest may be sustainable. This production is now being distributed between fewer producers. In 1989-1991, between ten and fourteen producers were reportedly active, while in the more recent period, no more than nine people were working. This indicates that each individual producer is producing more charcoal, and realizing a greater income. However, despite the constant production volumes and rising individual incomes, the value of the charcoal harvest is declining in real terms. This raises the possibility that the charcoal producers may increase production in the future to compensate for the falling value of the harvest.

In addition to providing an income to the charcoal producers and cattle ranchers, and free biological resources to the community, it is also necessary to acknowledge that the mangrove represents a renewable source of domestically produced energy in an island economy which is heavily dependent on imported fuel to meet its energy needs. Charcoal remains a widely used cooking fuel in the Vieux Fort region, despite the increasing availability and popularity of gas stoves. The significance of this domestic energy source to the community of Vieux Fort, and to the country as a whole was documented in two ways. Firstly, the percentage of the total charcoal consumption in Vieux Fort which was met by production from Mankòtè was estimated. Secondly, the foreign exchange savings which are realized by not having to import the energy produced in the mangrove were calculated.

In order to document the contribution of Mankòtè to the total charcoal demand in Vieux Fort, observations of the number of charcoal sellers present at

the weekly coal market were periodically made. These observational data were incomplete, but suggest that the mangrove accounts for between twenty and thirty per cent of the total charcoal consumption in the town. However, the amount of charcoal from Mankòtè is over represented in these figures. An alternative calculation was made to verify the previous findings, and returned an estimate of between 17 and 24 per cent. Taken together, it seems reasonable to conclude that approximately one fifth of the total quantity of charcoal sold in the Vieux Fort market originates in Mankòtè Mangrove.

In terms of the importance of charcoal production in Mankòtè to the national economy, an indirect substitution method was used (Richards 1994), where the value of the mangrove is estimated by calculating the money which is saved by not having to import alternative fuels. Two alternatives are available to replace production from Mankòtè, assuming no increase in production from other local sources. Either charcoal could be imported from Guyana, or liquefied propane gas could be imported. If the alternative were charcoal, the 39,177.64 kg of coals from Mankòtè saves the nation \$21,892 E.C. in import costs. If LPG were the preferred alternative, the savings would be \$18,897.45 E.C., or about \$9,946 CAD annually. However, if coals were replaced by gas as the only available cooking fuel, lower income families would be forced to pay the increased capital and operating costs associated with exclusive reliance on LPG for cooking, a burden which in many cases would not be welcome. Overall, the total value of the traded commodities exploited in the mangrove was estimated at \$79,913 E.C./yr. This figure does not include the untraded commodities, or the value of the ecological services provided by Mankòtè.

The fourth objective of the study was an examination of the individual socio-economics of charcoal production. The findings reported provide further support for the conclusion that although fewer harvesters are employed in the mangrove, the level of effort has increased. While earlier reports (Romulus 1987) indicated that charcoal production was a part time or casually pursued activity, those producers who remain active all list charcoal making as their primary

occupation. Furthermore, in the majority of cases, working in the mangrove was given as the principal source of household income. Charcoal production was also found to be a competitively remunerative occupation when compared with others available to group members. A daily income of approximately \$28.00 was calculated, which compares well with wages paid agricultural and construction laborers. Overall, Group members estimated that they usually earned approximately \$500.00 to \$600.00 E.C. per month during the dry season, a figure which was confirmed by field observations of monthly production. Significantly, while wages earned in charcoal production compared well with the available alternatives, the daily income of \$28.00 could be met with much less work when making charcoal than when engaged in other occupations. It must also be emphasized that charcoal making is not an occupation of last resort, done only because no others are available. Most of the regular producers attach a high value to the freedom and flexibility of the business, in which each man is responsible to no one but himself, as well as to the opportunity to work in a relatively pleasant physical environment.

Input costs for the business were found to be both few and inexpensive. In most cases, the required inputs are scavenged from the local landfill. The only significant input costs are transportation, which has remained constant at a maximum of \$2.00/bag E.C., and the price of a market stall. However, a continuing constraint to increasing the returns available from charcoal production is the market conditions faced by the producers. During the dry season, the coal market resembles a perfectly competitive market, featuring a large number of sellers with a relatively homogeneous product. Competition between sellers often drives prices below the regular charge of \$7.00/tin. During the rainy season, demand often exceeds supply, and prices are increased slightly above the \$7.00 level. However, these increases are eroded as soon as supply conditions change.

This study demonstrates that the mangrove continues to be an important resource both to the persons who gain their livelihoods from it, and to the surrounding community who benefit from its resources, both for fuel and other

uses. Furthermore, it seems that the Group has been reasonably effective in managing the resource to produce sustained benefits. However, this is a relatively new organization, and is certainly a novel form to the charcoal producers. To a large extent, this single fact explains the many difficulties which the Group has encountered, and indicates that ongoing assistance from external agencies will be necessary to assist the ACAPG in effectively managing the resources which have been placed under their stewardship, including all three project components, the farm, fuelwood plantation, and the mangrove. This assistance is needed to take the place of the institutional characteristics present in enduring common property resource management institutions elsewhere, but which have not had time to develop in Aupicon. It is upon this premise that the following conclusions are offered regarding the kinds of support which are needed.

The first of these is perhaps the most obvious. A co-management agreement will finally establish in law the charcoal producers' exclusive rights to harvest timber in the mangrove. As noted, until the fall of 1996, the work of the charcoal producers was illegal under the Fisheries Act. Since then, the ACAPG has obtained written permission from the Chief Fisheries Officer as required by legislation, officially establishing their claim to the mangrove. The establishment of the LMA would provide an institution through which this authority could be exercised in cooperation with the relevant Government departments, such as Fisheries, the Department of Forest and Lands and the Ministry of Planning. Having a demonstrable Governmental sanction for their rights to harvest in the mangrove will serve the additional function of helping to legitimize the Group's right to exclude others from harvesting in the mangrove in the eyes of the wider community. This was the impetus behind some Group members petitioning the Department of Fisheries for identification cards, and is something the Group members feel is a primary motivation for entering into an agreement.

Enforcement of these established rights is also required. More effective enforcement of exclusion will provide a greater incentive to conserve among the active producers, who at present are loath to leave suitable timber standing for fear

that others will merely enter the mangrove and cut it down at a later date. Community based enforcement continues to be necessary because neither the Department of Fisheries nor the Department of Forest and Lands possess the personnel to provide ongoing policing in the mangrove themselves. The ACAPG has indicated that they would be willing to devote a greater effort to patrolling the mangrove as long as they have both the authority and the ability to punish intruders. However, the nature of that enforcement regime is the topic of some controversy amongst the charcoal producers. This critical question must be resolved in a consensual manner as a first step in establishing an enforcement regime. As described above, the ACAPG membership is not used to making and adhering to consensus based decisions. However, if all members do not feel that they have had a hand in crafting these rules, they will be less likely to devote their time to enforcing them, providing the occasion for yet more conflict between Group members. Therefore, all, or at least most, of the Group members must be brought together on at least one occasion by some person skilled in group facilitation to resolve this question.

Whatever the outcome of such a discussion, it is likely that the Group will require some external support in implementing the decided upon enforcement regime. This is particularly true should the Group decide to pursue the more rigorous option. Such action will require coercion sooner or later, and some provision must be made to eject intruders without jeopardizing the safety of the enforcers. Technical assistance from the Department of Fisheries or Forest and Lands in establishing some means of rapid communication with the police in Vieux Fort, such as hand held radios and training in their use and maintenance is one possibility for doing so. Similarly, if the Group decides to pursue the less confrontational path, there must be some established method for those who wish to cut in the mangrove to apply to the Group for permission. At present, such permission is granted occasionally on a case by case basis by individual Group members, and other Group members may not be informed of the decision. This again can lead to misunderstandings and conflict. A necessary first step in this

regard is to notify the public through the media that the mangrove is closed for timber cutting to all but the ACAPG. This action should be supported by installing signs to the same effect around the edge of the forest. Such notification should also include instructions as to how people in need of timber for poles or other uses could secure the required permission from the management authority.

Harvest pressure in the mangrove continues to be too heavy to allow the reestablishment of the mature stands of trees which previously dominated the forest. The intensified use of the wood lot and farm remain the best possibilities for reducing that pressure. Group members have indicated that if the farm were able to support crops during the dry season, they would devote more effort to the farm and less to the mangrove. Similarly, Group members acknowledge that the fuelwood plantation is presently under used. If the ACAPG is to more effectively manage the mangrove, the farm and woodlot components of the project must be more efficiently utilized. At present, the two major impediments to doing so are the inability to organize the required collective action, and the lack of marketing and financial management skills.

The collective action required to develop the farm as a common enterprise is unlikely given past difficulties and the current pervasive conflict within the Group. However, it is possible to continue to operate the farm and woodlot as land held in the Group's name, but operated on the basis of individual effort and reward. This arrangement acknowledges the fact that some Group members are less interested in farming than others. However, even should farming be restricted to a few Group members, those people will not be producing as much charcoal, thereby reducing harvest pressure. Marketing the produce of the farm has been a significant problem in making the farm an economic concern. The National Marketing Board had initiated discussions with the Group to enter into guaranteed contracts to purchase a given quantity of output provided quality control is satisfied. However, these discussions led nowhere. External support would be useful in providing a liaison between the NMB and the Group to conclude these discussions if possible and to provide the required technical assistance to meet

quality standards for those Group members who wish to engage more actively in farming. For those who wish to concentrate on charcoal production, simple technical assistance from the Department of Forest and Lands would be useful in rekindling interest in exploiting the plantation as it was intended. This could include such efforts as educating the Group members as to appropriate harvest methods to maximize *Leucaena* regeneration after harvest.

These measures recognize that cooperation between Group members is scarce and conflict is not, and so do not seek to recreate the ACAPG as an effective cooperative institution. Nevertheless, there are opportunities to minimize conflict, particularly as regards the mangrove. An important source of conflict is the lack of universally established and accepted rules regarding what uses of the mangrove are appropriate, and which harvest practices need to be imposed to ensure the maximum regeneration. In the course of establishing a LMA and a formal co-management agreement, the opportunity exists to work toward achieving group consensus about these practices and a commitment to adhering to them. Furthermore, the LMA could serve as a forum for dispute resolution in case of transgressions of harvest practices or disagreements between Group members.

Conflict resolution is one part of a process of renewed attempts at institutional and individual capacity building which must be targeted toward members of the ACAPG. Given current capacities for organization and the expression of a collective will, along with low levels of literacy among the Group, it will be exceedingly difficult for the Group to participate in a meaningful way in a Local Management Authority. Efforts have been made in the past to develop organizational and leadership skills with Group members. However, some of the beneficiaries of these programs have left to pursue other occupations, or have reduced their involvement in the Group for other reasons. Wider participation in these capacity building exercises may have been discouraged by the fact that they required participants to take the day off work and travel to the workshop venue. Whatever the reasons, at present, there is no one in the Group capable of representing the interests of the entire ACAPG effectively in the LMA decision

process, whatever form it eventually takes. The ACAPG may, therefore, be relegated to the role of adhering to management directives, rather than having a role in shaping management goals. To prevent this marginalization, a concerted effort to develop durable leadership skills must be made. To avoid repetition of past mistakes, it would be desirable that such training be distributed as widely over the membership as possible, and that it be done in Vieux Fort or Pierrot.

In addition to providing the ACAPG with the expertise in enforcement, marketing, management and dispute resolution which are needed to assist the Group to manage the mangrove, a co-management agreement is needed for one additional purpose. As noted, a principal reason that harvest pressure in the mangrove has declined somewhat is that economic opportunities have presented themselves elsewhere. Should this situation change, and economic conditions worsen to the extent that charcoal production again becomes the option of last resort for many, the mangrove will once again be under threat in the absence of any legal controls (Walters and Burt 1991). Similarly, production volumes within the Group may increase. An LMA which serves to support, but is separate from, the ACAPG would be capable of authoritatively controlling entry into the mangrove and protecting the resource. Such an authority could serve as one forum where applications of potential new producers could be reviewed and accepted or rejected as appropriate. The LMA would also be able to establish a mechanism whereby other resource uses such as crab harvesting or timber cutting for construction poles could be accommodated.

## **6.2 Recommendations**

The conclusions of this study lead to some recommendations for action which will hopefully contribute to the sustainable utilization of Mankôtè by the ACAPG. Following from the conclusion that the most useful role a Local Management Authority could play would be to provide the support and management expertise that the charcoal producers lack, these recommendations will require the investment of resources on the part of intervening agencies. It is

**understood that these resources are critically scarce, and must be invested with care. However, the Government of St. Lucia is interested in pursuing local resource management projects, of which Mankôté will be an example. Proper attention to ensuring that these institutions work effectively and truly involve the resource users will entail costs, but these costs may be recovered in the form of better management of the coastal resources so critical to the islands economic and environmental health. Therefore, the following recommendations are offered:**

- **The proposed Local Management Authority should allow the charcoal producers to continue to operate in the mangrove according to the procedures and methods which the Group has devised, rather than devoting its energies to the establishment of an elaborate formal harvest rotation. The informality and flexibility of the current harvest regime is well suited to the seasonal availability of the resource, and the small number of appropriators.**
- **The external agencies who will be involved in the proposed co-management agreement, such as CANARI, the Department of Fisheries, and the Department of Forest and Lands should continue to assist the ACAPG in managing the integrated conservation and development project of which the mangrove is an integral part. This assistance should take the form of providing and developing the conflict resolution, management and collective organization skills which the Group currently lacks.**
- **The ACAPG should be actively involved in the formulation and implementation of management objectives for the mangrove in partnership with the other stakeholders in the LMA. This will require that some efforts be made towards the education and training of Group members in leadership skills.**
- **The LMA, including Group members, should undertake the responsibility of establishing procedures whereby Group membership can be reviewed and applications for Group membership considered. This will involve creating a set of criteria for membership rights by which applications can be evaluated.**

- **The LMA and Group members should assume the responsibility for establishing some mechanism whereby other resource uses of the mangrove, such as grazing, cutting timber for construction or crab harvesting can be considered and accommodated where deemed appropriate.**
- **This study partially documented the value of the resources used in Mankòtè. Further research in this regard would usefully be directed towards establishing the magnitude of the value of the ecological services provided by the mangrove for other economically significant resources such as seamoss cultivation and the inshore fishery.**
- **Finally, transect surveys or some other measure of the amount of timber available in Mankòtè should be made in cooperation with the ACAPG as soon as possible, and should be carried out on a routine basis thereafter. This study did not assess the sustainability of the harvest by any means other than production volumes over time. This is not a suitable substitute for scientific measurement. Without such knowledge, there is no basis on which to make or justify management decisions.**

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