EVALUATION OF MANAGEMENT PROGRAMS FOR SUSTAINABLE MANGROVE DEVELOPMENT: THE CASE OF THE PHILIPPINES

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ABSTRACT

This study applies policy evaluation as a technique of resolving inefficiency of management policies and programs in achieving sustainable development of mangroves. It aims to emphasize the interrelationships of socio-economic, ecological, and institutional issues of resource management in planning and decision making. This is achieved through the review of the concept of sustainable development and the characteristics of mangrove ecosystems.

The case of mangrove management of the Philippines is used to test the relevance of policy evaluation in natural resource management. The evaluation is based on a multi-disciplinary perspective of sustainable development which considers the interrelationship of socio-economic, ecological and institutional issues relating to the utilization of natural resources, such as mangroves, for human purposes. A conceptual set of goals for sustainable mangrove development is developed and associated evaluation criteria are derived to analyze the sustainability of mangrove policies and programs. The evaluation of mangrove programs of the Philippines illustrated the view that unless a closer review and examination is made on existing and proposed programs in management of the country's mangrove resources, government efforts which focus on the resource alone will only lead to further degradation of the mangrove ecosystem. The Goal Achievement Matrix (GAM) is used as a framework, within which the impacts of such programs are reviewed. The evaluation concludes with the general recommendation that Philippine mangrove policies and programs for managing mangroves needs to be altered to avoid conflict and disintegration and to achieve more efficient and more holistic approach to their management. Specific socio-economic, ecological and institutional recommendations are made to improve the country's mangrove policies and programs.

The study reinforces efforts to implement the concept of sustainable development in natural resource management, which currently includes little evaluation of the consequences of efforts in achieving intended goals.

The study introduces conceptual goals and criteria which may be used in any tropical country to ensure sustainable development of mangroves. This set of goals and criteria, embracing the interrelationships of socio-economic, ecological and institutional factors, may serve as guide or framework in managing mangroves and other similar ecosystems now and in the future.

The study also emphasizes the usefulness of GAM as a framework for evaluating policies about complex issues of natural resource management. The GAM methodology, which has been traditionally used in ranking alternative programs in the context of urban planning, is shown to be useful in evaluating natural resource management policies and programs. With the introduction of sustainable development criteria into GAM methodology, the evaluation technique not only provides relative ranking of mangrove programs, but indicates how well a particular program achieves the goals of sustainable mangrove development.

It is hoped that resource managers, researchers, and other concerned individuals are motivated to undertake program evaluation more effectively in order to achieve sustainable development of natural resources.

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GLOSSARY

Adventitious root	a mangrove root system which originate from the hypocotyl and later from the stem in an upward sequence, sticking down as rather thick repeatedly branched root finally striking ground and rooting.
Allocthonous sediments	terrestially-derived sediments carried by river discharges that brings nutrients that are incorporated by plants.
Aquaculture	the management of living aquatic resources to increase production beyond the levels of normally available from harvesting wild stocks.
Aquifer	a water bearing bed or stratum of earth.
Barangay	the village unit form of local government in the Philippines.
Bio-diversity	the variety of life in all its forms, levels and combinations.
Carrying capacity	capacity of an ecosystem to support organisms, while maintaining its productivity, adaptability and capability of renewal.
Cutting cycle	the number of years between major harvest in the same working unit with rotation.
Detritus	particles originating from plant materials that drains into the body of water. They serve as energy budgets of fisheries within mangroves and offshore marine life.
Ecological processes	a continuous action or series of actions that is governed or strongly influenced by one or more ecosystem.
Ecosystem	a system of plants, animals and other living organisms together with the non-living components of their environment.
Edaphic factors	soil related factors that affect the growth of plants (e.g. soil type, soil structure, etc.).
Evapotranspiration	loss of moisture due to evaporation, percolation and run-off.

Facultative halophytes	types of plants that are not restricted to only one function. These are plants that can either tolerate fresh or saline water.
Food chain	a series of organism, each successive group of which feeds on the group immediately previous in the chain, and is in turn eaten by the succeeding group.
Fry fishermen	mangrove dependent communities that only gather milkfish fry or shrimp fry for cash income.
Genetic diversity	the variety and frequency of different genes and/or genetic stocks.
Interstitial salinity	the salinity level of sea water within the interstices.
Laminar water flow	the movement of ground water.
Lease	a privilege granted by the State to a person to occupy and posses, in consideration of a specified rental, in forest land of the public domain in order to undertake any authorize activity therein.
Life-support system	an ecological process that sustain the productivity, adaptability and capacity for renewal of lands, water, and or the biosphere as a whole.
Mangroves or mangrove forests	either the constituent plants of tropical and subtropical intertidal forest communities or the community itself.
Natural resource	biophysical resource that is used directly by people.
Neritic waters	the region of shallow water adjoining the sea cost.
Nipa	an important palm species growing abundantly in mangrove areas.
Over-wash islands	islands form from the accumulation of sediments carried by river discharges and wave action.
Pneumatophores or stilt roots	submerged or exposed roots which function as respiratory organs.
Rehabilitation	to return a degraded ecosystem to an un-degraded condition, which may be different to its original state.
Species diversity	the variety and frequency of different species.

Sustenance fishermen	mangrove dependent communities that gather adu fish or fish fry for consumption.
Tanbark	ground bark materials of mangrove trees being tapped for the extraction of tannin.
Viviparous seedlings	seedlings that germinate within the parent plant before they are shed.

ACRONYMS

ADB	Asian Development Bank
CARL	Comprehensive Agrarian Reform Law
CBA	Cost-Benefit Analysis
CENRO	Community Environment and Natural Resources Officer
CRMC	Coastal Resources Management Committee, DENR
CFP	Community Forestry Program
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
DAO	DENR Administrative Order
FLMA	Forest Lease Management Agreement
FSP	Forestry Sector Program
GAM	Goal Achievement Matrix
ISFP	Integrated Social Forestry Program
IUCN	International Union for the Conservation Nature and Natural Resources
MSA	Mangrove Stewardship Agreement
NAMRIA	National Mapping and Resource Information Administration
NFP	National Forestation Program
NGO	Non-governmental Organization
NPCO	National Program Coordinating Office
NRMDP	Natural Resources Management Development Program
OECF	Overseas Economic Cooperation Fund

OM	Organic Matter
PBS	Planning Balance Sheet
PCARRD	Philippine Council for Agriculture and Natural Resources Research and Development
PENRO	Provincial Environment and Natural Resources Officer
PHP	Philippine peso
RED	Regional Executive Director
UPI	United Press International
WB	World Bank
WCED	World Council for Environment and Development

CHAPTER ONE
INTRODUCTION

1.1 RATIONALE

In recent years, environment and natural resources management efforts have concentrated on the formulation of policies and programs to achieve both social and ecological needs. However, dissatisfaction and complaints have been widespread about the inefficiency of such policies and programs (means) in achieving their intended goals (ends), at times even producing undesirable consequences. Most often, policy inefficiencies has been blamed on the process of making judgements which is largely influenced by individual (e.g. political) or complex organizational (e.g. funding agencies) behavior. Such processes have sometimes led to desirable policies, but most often they lead to undesirable ones. One way to reduce the number of undesirable or inefficient decisions is to develop a more formal scientific approach to policy analysis or evaluation.

Policy analysis or evaluation is one of the mechanisms of decision making which enables the achievement of a deeper understanding of policy issues and ensures policies effectively deal with such issues. Policy evaluation searches for feasible courses of action, generating information and gathering evidence of the benefits and other consequences that would lead to their adoption and implementation, and in order to help policy-makers choose the most advantageous action (Quade 1989).

However, policy evaluation has its drawbacks, being largely influenced by political and bureaucratic processes. Most often, observers are inclined to take the position that political whims and biases inevitably dominate the extent to which evaluation evidence influences policy making (Nachmias 1979).

Viewed from the scientific perspective, policy analysis is the objective, systematic, empirical examination of the effects policies and programs have

on their targets in terms of the goals they are meant to achieve. In essence, policy analysis is goal-oriented focusing on effectiveness, rather than on the decision-making process that leads to the adoption of policies. Thus, policy analysis may improve the quality of policy decisions if it becomes an integral part in the formulation of public policies. With systematic, empirical, objective information on the impact of policies, better decisions can be reached: ineffective programs can be abandoned or radically modified, effective programs can be expanded, and more responsible budget allocations can be made (Nachmias 1979).

This study recognizes the need of policy evaluation as an essential part of the decision making process and the implementation of policies and programs in the management of the environment and natural resources. It has to be considered as an integral part of the environment and natural resource management process in order to ensure the effectiveness of policies and programs in achieving their intended goals. Although policy evaluation is not yet a perfected discipline (Quade 1982), it may be appropriate to consider it, especially in dealing with complicated socio-economic, ecological and institutional problems associated with management of the environment and natural resources. It provides decision makers with information through research and analysis, isolating and clarifying issues, revealing inconsistencies in policies and efforts, generating new alternatives and suggesting ways of translating ideas into feasible programs to achieve communities' ends.

The concept of sustainable development provides a challenge to be considered in the evaluation of environment and natural resources management policies and programs. Theoretically, it recognizes that development needs to be responsive to the complex relationships of the socio-economic, ecological and institutional aspects of managing the environment and natural resources. As mentioned in Caring for the Earth by the World Conservation Union (IUCN 1991), the World Conservation Strategy (1980) emphasized that:

> conservation includes both protection and rational use of natural resources, and is essential if people are to achieve a life of dignity, and if the welfare of the present and future generations is to be assured... conservation calls for globally coordinated efforts to increase human well-being and halt the destruction of the Earth's capacity to support life (IUCN 1991, p. 1).

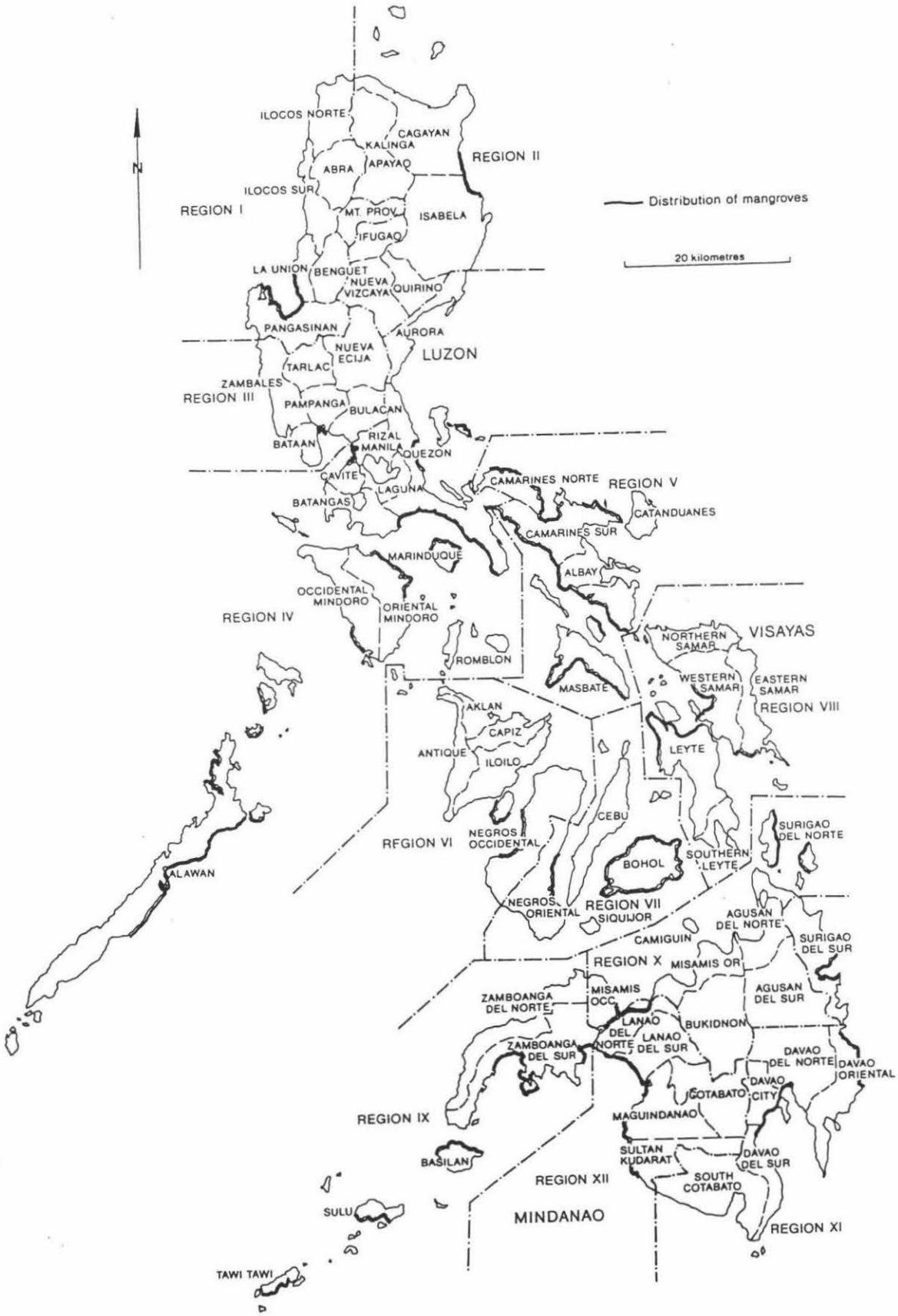
Policies and programs about the management of mangroves in the Philippines provide a challenging test case of the proposed policy/decision making technique. Mangrove policies and programs are those courses or plans of actions prescribed by society to influence decisions related to the management of mangroves. Formal policies are embodied in the programs or plans, forestry laws, rules and regulations in mangrove management.

1.2 STATEMENT OF PROBLEMS AND OBJECTIVES OF THE STUDY

Evaluation of policies and programs about mangroves is important because mangroves are rare, and have been continually degraded despite the escalated concern on their conservation and protection. The depletion of the mangroves in the Philippines for example, provides an illustration of the bad experiences in the management of this valuable resource. In 1918 it was estimated that the country's mangrove forests cover an area of about 450,000 hectares. In 1988, later estimates indicate that only about 139,725 hectares remain, a reduction of about 310,275 hectares. This represents about 70 percent of the earlier estimate which has been converted to other uses over a period of 70 years (DENRa 1991). Figure 1.1 shows the relative locations of mangrove areas in the Philippines, which were widely scattered and tend to be concentrated in Region 4 in the Province of Palawan, in Region 9 in the Province of Zamboanga, and in Region 8 in the Province of Samar and the Province of Bohol in Region 7. Table 1.1 provides the summary of the areal distribution of the country's mangrove resources.

As noted in the report, Philippine Environment in the Eighties, submitted to the President by the Department of Environment and Natural Resources (1990), government policies contributed in most part, to the rapid conversion and

Figure 1.1 Map showing the relative locations of mangrove forests in the Philippines. (Source: PCARRD (1987).



degradation o loss of the country's mangrove forest. This results from apparent neglect of previous governments in considering the peculiarities of mangrove ecosystems, in favor of immediate economic and political gains. Mangrove policies have been rarely based on real issues and problems in the management of mangroves, but generally based on the economic and political interest of decision makers/politicians (Revilla 1986). As a result, such economically and politically oriented policies have not only caused the degradation of the resource, but they have also aggravated the incidence of poverty in coastal areas of the country, which ultimately became associated with further degradation of the resource.

Table 1.1 Areal Distribution of Mangrove Forests in the Philippines

REGIONS	Area (ha)	Percentage
Luzon	(65,000)	(46.5)
Region I	200	0.1
Region II	3,400	2.4
Region III	500	0.4
Region IV	51,000	36.5
Region V	9,900	7.1
Visayas	(37,325)	(26.7)
Region VI	2,825	2.0
Region VII	9,650	6.9
Region VIII	24,850	17.8
Mindanao	(37,400)	(26.8)
Region IX	19,300	13.8
Region X	8,600	6.2
Region XI	7,100	5.1
Region XII	2,400	1.7
TOTAL	139,725	100.0

(Source: DENRa, 1991)

1.2.1 **Socio-economic problems and issues in mangrove management**

Continued decimation of mangrove forest in the Philippines may be attributed to population pressure within these areas. The open access nature of mangroves and near shore fisheries has attracted the most impoverished

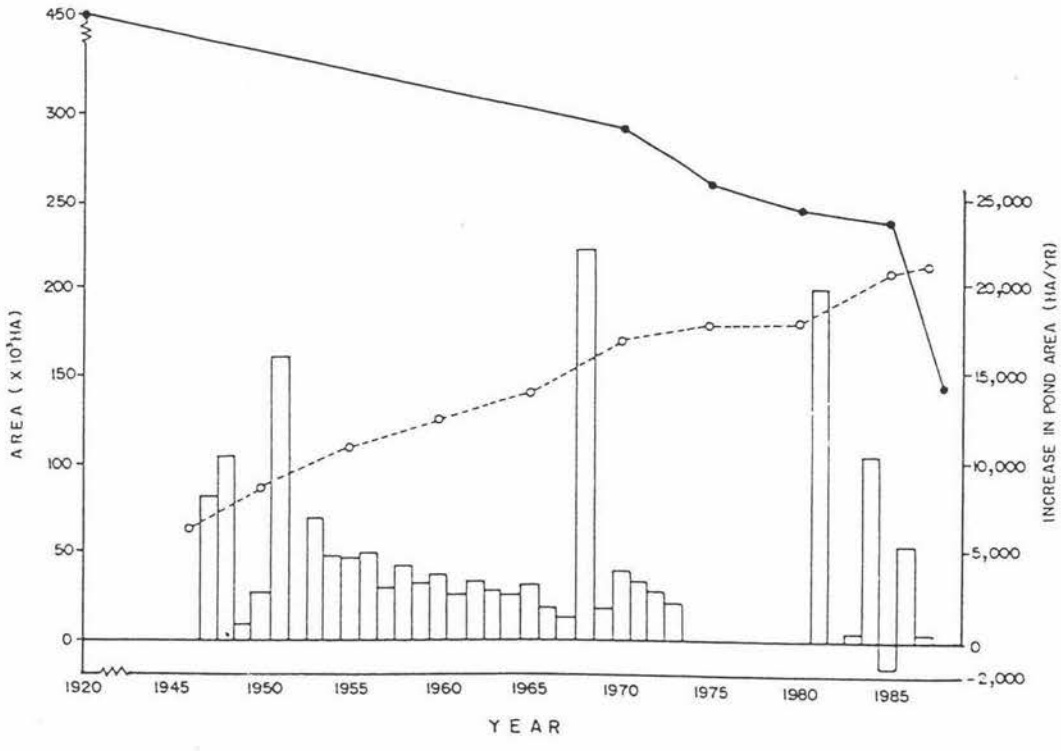
population from adjacent agricultural and coastal areas and induced unsustainable mangrove extraction techniques. Most of this population, which is estimated up to be about 55 percent of the country's population is dependent on the near shore fisheries. These fisheries are extremely sensitive to two habitats which influence the life cycles of various fish species, namely mangrove and coral reef (Kumar 1990). There is also strong evidence of inequitable utilization of the mangrove resources, further pushing the impoverished coastal communities into poverty and giving no choice but to illegally cut mangrove trees for their survival. This is due to the people's limited representation to lobby for their rights to the resource. In the mid 1970s, for example, the conversion of mangroves to fishponds increased because of the powerful lobby of fishpond operators, a few rich individuals (DENRb 1990).

Accelerated cutting of fuel wood and the conversion of mangrove areas to brackish water fish ponds have considerably reduced the areal extent of vegetated mangrove forest. Surveys on fish pond construction, for example, show that of the total 310,275 hectares reduction in mangrove area, about 210,457 hectares or about 70 percent was transformed into brackish water fish ponds. National Mapping and Resource Information Authority (NAMRIA 1990) updated the surveys which originally began in 1963. Prior to 1950 there were already 85,000 hectares of fish ponds. From 1952 to 1987, or a span of 35 years, the yearly conversion rate was about 5,800 hectares. Graphically, Figure 1.2 shows the increase and decrease of brackish water fish ponds and mangroves in the Philippines (Primavera 1991).

Over-harvesting and a lack of replanting is usually the initial source of degradation in affected areas. Most of the generalizations of logging policy in the Philippines were considered even more applicable to mangroves, which suffer from even lesser attention and unenforced regulations. Harvesting often concentrates on the commercial species, avoiding the low value species.

Local fuel wood demands lead to continuous cutting of branches resulting in stunted, shrubby trees which further tilt future use towards local subsistence. Chronic over-cutting contributes to soil erosion and may produce changes in soil composition, e.g., replacement of muddy clay mangrove soils with sandy coastal soils, contributing to a decline in growth and a poor environment for regeneration (World Bank 1989).

Figure 1.2 Graph showing the increase and decrease of fishponds and mangroves in the Philippines



1.2.2 **Ecological problems and issues in mangrove management**

The decline in areal extent of mangroves is better documented than the qualitative losses, such as the changes in species mix through excessive harvesting of useful mangrove tree species to the exclusion of others; the shift in age structure towards younger stands as larger trees are felled; and the decline in timber productivity as successive generations of mangroves are harvested. In terms of biological diversity, the decline in mangroves has been more significant than strictly areal measure would imply (World Bank 1989).

The loss includes the destruction of fish populations which are dependent on the mangroves for refuge and food. Once the area is cut and converted into other land uses then it ceases to function as a natural system. Immediate effects are reduction of detritus which eventually affects the food chain, reduction in the size of the breeding area for fish and other marine life, and eventually reduction in fish catch. Consequently, the livelihood of mangrove-dependent communities, such as the sustenance fishermen, commercial fishermen, fry gatherers and even the fish pond operators are affected. All this will impinge on the ecosystem itself, ultimately causing its collapse.

Loss of a potential source of genetic material for the development of salt-tolerant tree species also cannot be overemphasized in any consideration of losses in bio-diversity of mangroves.

Loss of the mangroves has also exposed coastal infrastructure to the full force of tropical storms and allowed greatly increased shoreline erosion. Damage to coastal roads, houses and fish pond dikes has become severe after the mangrove storm buffer is lost. In some cases, a loss of up to 50 meters of low-lying coastline has been observed (DENRb 1990).

The mangrove forest and the coral reefs are also ecologically linked with the inland and upland areas: increased water and sediment pollution due to erosion, disruption of water flow, etc. reduces growth, or even kills the mangrove trees and fish species. Mangrove forest destruction in some areas, for example, has also been caused by pollution due to mining and dumping of mine tillings and solid water on mangrove swamps, causing irreparable damages to the area (DENRb 1990).

1.2.3 **Institutional and organizational problems and issues in mangrove management**

There are four major organizations involved in management of mangroves in the Philippines: national government agencies, local governments, non-

governmental organizations, and user groups. All these groups are mandated to protect and advance people's right to a balanced and healthful ecology in accordance with the rhythm and harmony of nature (Philippine Constitution, Art. 2, Sec. 16).

1.2.3.1 ***National government agencies***

The two main government agencies concerned in the management of mangroves are the Department of Environment and Natural Resources (DENR), and the Department of Agriculture (DA).

DENR is the primary agency responsible for sustainable development of the country's environment and natural resources, such as mangroves. It is concerned with management, development, protection and regulation of all the country's natural resources to ensure equitable sharing of benefits derived therefrom, for the welfare of present and future generations of Filipinos. It is also responsible for classifying and delineating of mangrove areas to be retained for protection and preservation, and which can be issued for fish pond construction (DENRe).

Mangrove policies and programs are implemented through DENR's field offices, Regional, Provincial and Community Environment and Natural Resources Offices (see Appendix 1). They are administered by a committee - the Coastal Resource Management Committee (CRMC), composed of representatives from DENR, DA and Department of Agrarian Reform (DAR), as well as universities, non-government organizations, aquaculture groups, and fishermen. CRMC is in charge of making an inventory of coastal resources, developing appropriate policies, and livelihood programs in line with sustainable utilization, and disseminating information about the importance of the coastal/mangrove ecosystems.

However, the DENR has limited capability in planning and policy formulation for resource use. Planning appears to be largely a matter of quantitative

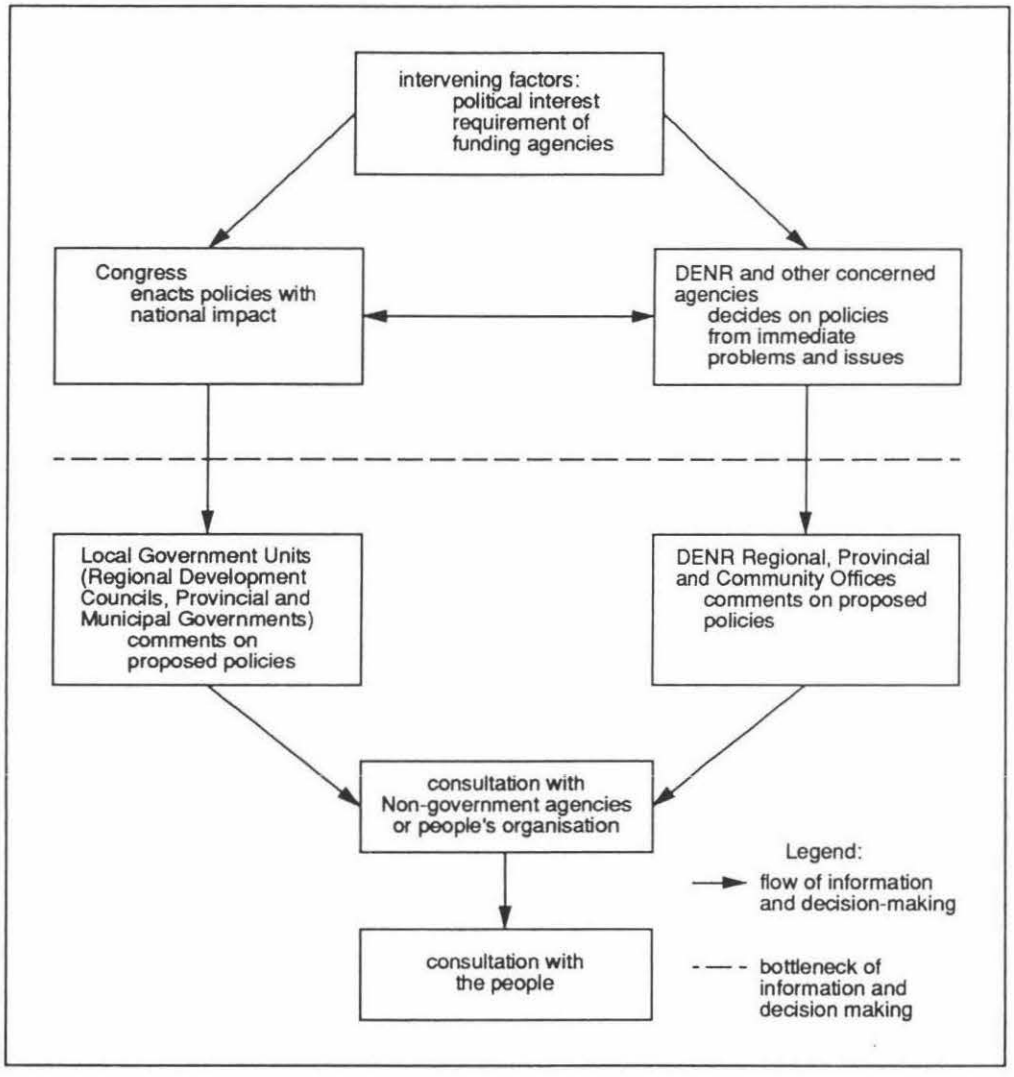
target setting for resource management programs and largely influenced by the availability of funding and the requirements of funding agencies, followed by statistical monitoring of implementation progress. There are also weak links between DENR Regional, Provincial and Community Offices with provincial and local administration structure, increasing their incompetence in solving urgent planning problems over which the latter have direct authority (Natural Resources Management Development Project 1990). Though these problems may be solved by the recently approved local government code of 1991, directing the decentralization of some DENR functions to the local governments, its implementation is still to be seen, because of the recent change of government administration.

Furthermore, policies are usually formulated at the national level, through national government agencies (who decides on policies and programs from immediate problems and issues), and congress (who enacts policies with national impact). In congress, national environmental policies or laws are ideally formulated with due consultation with the people concerned or through the local government and non-governmental organizations down to the barangay level and DENR. In practice however, congress is dominated by elite individuals, who represent themselves as the people's representatives but do not actually cater to the needs of the people, instead satisfying their individual interests. An example of this is the Comprehensive Agrarian Reform Law (CARL), considered by the landless, the unrepresented as pro-elite (Goodno 1991). CARL deprives the rights of many poor and landless people who depend on the sincerity of the government in helping them from the turmoil of poverty.

DENR, which is supposed to represent the quality of the environment and welfare of the people directly dependent on natural resources, in Congress, is often limited by bureaucracy. Most often, it is constrained by the requirements of funding agencies and political interest. As a consequence, DENR appears to be a mere mediator between the government and the

people. Figure 1.3 shows the indicative diagram of formulating resource management policies in the Philippines and its problems.

Figure 1.3 Indicative diagram of policy formulation in the Philippines and its problems



DA, on the other hand, is concerned with the regulation of mangrove areas which have been classified for fish pond development. It is also the government agency primarily responsible for improving fish farm incomes and generating work opportunities for farmers and fishermen. Mainly, its programs are directed towards improving fish culture techniques and providing marketing assistance to fishermen.

DA, like DENR, has consolidated and decentralized its agricultural services. However, there is still a proliferation of agencies dealing with management and administration of fish ponds. Each agency pursues a specific concern with little regard for other units of government, resulting in overlaps and conflicts. In addition, DA's regional and provincial base operations remain weak since the planned integration of its bureaus. Its technical division, responsible for operations, does not have a direct link with the field personnel and facilities needed to provide program and project services to farmers and fishermen (World Bank, 1989). These problems, as with DENR resulted in their incompetence in delivering services to the target beneficiaries.

1.2.3.2 ***Local governments***

Local governments, composed of provincial, municipal and barangay councils, are also considered important in the management of mangroves. Under provisions of the recently approved Local Government Code of the Philippines (1991), they are now given the responsibility of implementing several mangrove programs. This is due mainly to their closeness to the coastal communities, the issues prompted by resource degradation, and their legislative control over most of the natural resources within their boundaries (World Bank 1989). However, as mentioned earlier, the implementation of the decentralization directive is still to be seen because of the recent change of government. There are also some apprehensions that implementation of decentralized programs will become highly politicized as shown by previous government experiences in the Philippines.

1.2.3.3 ***Non-government organizations (NGO's)***

The non-government organizations (NGO's), on the other hand, are composed of religious and non-religious groups. They are also involved in both the development and conservation of mangroves, with roles ranging from advocacy of rights of the poor or under-represented to implementing programs at local, regional, and national levels. Their principal contribution has been their ability to motivate and mobilize communities to participate in projects, and

to enable the intended beneficiaries to avail themselves of related government services. NGOs have likewise contributed much to government's reforestation activities as contractors, both in the uplands and in mangrove areas.

However, the popularity of NGOs also presents some risks. For example, as NGOs become conduits for increasing amounts of public funds there is a risk of losing some of the independence and freedom of action that makes them credible, effective and attractive to beneficiary groups. Also, the cost-effectiveness of NGOs may be based more on anecdotes than substance, as their capacity for monitoring and evaluating their own performance is limited. NGOs also cover all parts of the political spectrum from right to left, which may tempt them to over commit themselves, thereby reducing their effectiveness (World Bank 1989).

1.2.3.4 ***User groups***

There are two groups of users influencing management of mangroves: direct users and indirect users. Direct users are the coastal communities (sustenance fishermen and fry fishermen), timber licensees, and fish pond operators.

Sustenance fishermen and fry gatherers are traditional small-scale mangrove users, depending on the mangrove resources for survival. Until the increase of population (by migration and natural increase) in the mangrove areas, mangrove was usually considered sustainable, (i.e., the gathering of fry and/or fish for subsistence and the minimal utilization of timber resource for the construction of their dwelling and for local use). The current exploitation on mangroves has been increased to the point where destruction of the resource occurs.

Timber licensees and fish pond operators, a few rich individuals, have also been exploiting the mangroves both as a forestry and fishery resource. This required the classification of mangrove areas for forestry and for fishery

purposes. Utilization of the mangrove timber resource was allowed through a 25-year license agreement (renewable for another 25 years) issued to individuals or groups of individuals by government. A sustained-yield management scheme has been required in the extraction of timber and other minor forest products. However, this has not been followed religiously and has caused severe destruction in the mangrove resource. An example is the case in the Province of Palawan, where the logging activity of two logging companies remains unstoppable, despite the proclamation of the whole province as a bird sanctuary and game refuge. Mangrove trees in this province have also been continually, illegally cut for fuel wood and transported to the urban centers, such as Manila.

Fishpond operators, are likewise issued with 25-year Fish Pond Lease Agreements, renewable for another 25 years. These groups of users and government have considered the mangrove resource as the best suitable land for fish and shrimp production. In the 1980s, government declared a policy to promote the fishery industry which necessitated the allocation of mangrove areas for fish pond construction. Such policy then resulted to increase of fish ponds and destruction of mangrove forests, shown in Figure 1.2.

The other, indirect group of users to be considered in the decision-making is municipal communities, regional and national communities, and the future generations. The municipal communities are the immediate beneficiaries of the mangrove resources. Most of the coastal municipalities in the Philippines, for example, have been dependent for their fuel wood and food from mangroves. In essence, the status of mangrove ecosystem therefore has an impact on the prosperity of life in these communities. Such impact ranges from socio-economic to ecological effects that need to be considered in managing the country's mangrove resources.

Regional and national communities indirectly use mangrove resources for protection, scientific, recreational, and even for nourishment. As discussed

earlier, mangroves also serve as a significant barrier from storms and as an important source of genetic materials necessary to develop more tolerant species that would maintain their protective role along the coastal areas. Finally, mangroves act as an important breeding and nursery area for a significant number of marine life to maintain the supply of fish in the urban areas.

Future generations must also be considered in decision-making as indirect users. These groups are also concerned for the protection and conservation of mangrove resources to meet their needs, eventhough it may be difficult at this stage to articulate those needs.

To summarize, Table 1.2 provides a list of the socio-economic, ecological and institutional problems and issues of managing mangroves in the Philippines.

Table 1.2 Problems and issues of mangrove management in the Philippines

Socio-economic issues/problems	Ecological issues/problems	Institutional issues/problems
poverty among coastal inhabitants and the increase of population within the mangroves	excessive loss of mangrove tree and fish species due to unsustainable extractive strategies and land uses	planning and policy formulation is limited with quantitative target-setting, and the requirements of funding agencies and politics
open access nature of the mangroves, but limited to few rich individuals	decreased species diversity and species composition which affects mangrove sustainability	vague responsibilities over policy formulation and program implementation in the case of DA
limited representation of coastal communities in planning and decision-making	loss of potential source of genetic material needed for the development of more salt-tolerant tree species for coastal protection	lack of coordination between local governments, DENR and DA and the risk of a highly politicized program implementation with the decentralized form of government
	decreased productivity of mangroves due to shift of age structure towards young stand	the risk of loosing their (NGOs) credibility, effectivity and attractiveness to beneficiaries as they become conduits of increasing amounts of public funds and allies of both the rightist and leftist. Their cost-effectiveness is largely based more on anecdotes than substance
	soil erosion and exposure of coastal and inland infrastructure to the full force of storm	

As presented above, managing mangroves in the Philippines represents a challenge for sustainable development and management largely because of population pressure that confronts the inexorable realities of ecological principles. There are strong coincidences between population growth,

resource depletion, environmental quality and the incidence of poverty in the coastal areas.

From the above discussion, the following problems that confront the management of mangroves in the Philippines are identified with the corresponding objectives to be achieved by this study:

Problem 1. Inefficiency of mangrove policies and programs in achieving their intended goals of meeting social and ecological needs within the coastal areas. Planning and decision making is largely based on quantitative target-setting, followed by statistical monitoring of implementation progress. As such, policy formulation is largely influenced by political, or organizational interest.

> Objective 1. To emphasize the relevance of policy evaluation as a decision/policy making technique in mangrove management.

Problem 2. In conjunction with problem 1, mangrove policies and programs in the Philippines are therefore formulated with a lack of understanding or neglect of the real issues and problems of mangrove management. Mangroves are considered by themselves ignoring that they are associated with socio-economic, ecological, and institutional issues shown in Table 1.2.

> Objective 2. To emphasize the interrelationships of the socio-economic, ecological and institutional aspects of mangroves in decision making and policy evaluation through discussion and understanding of the concept of sustainable development.

> Objective 3. To develop a conceptual set of goals for sustainable mangrove development through comprehensive review and understanding of the concept of sustainable development and mangrove ecosystem.

Objective 4. To test the conceptual set of goal identified for sustainable mangrove development in evaluating the mangrove policies and programs of the Philippines.

Objective 5. To develop the appropriateness and practicality of Goal Achievement Matrix (GAM) for use in evaluation of policies and programs concerning the development of natural resources.

Objective 6. Finally, to recommend better actions which will help provide a clearer understanding, and hopefully some solutions to the problems and issues in the management of mangrove resources in any country which faces similar problems.

1.3 SIGNIFICANCE OF THE STUDY

In the Philippines, efforts in the research and management of the mangrove forests have attempted to grapple with the principle of sustainable development. Conservation means both protection and rational use of natural resources in order to achieve the welfare of present and future generations, as emphasized by the World Conservation Strategy (IUCN 1980). This means that the process of mangrove development should be viewed from the outset as a multi-objective undertaking that includes an explicit and defined concern for the quality of life of coastal communities and the quality of the mangrove ecosystem. Within such a management context, it is necessary to consider the role of policy evaluation in providing better policy options. It enables the clarification of socio-economic, ecological and institutional issues necessary in the formulation of more feasible and realizable development mangrove policies and programs.

Mangroves need to be carefully managed, starting with the formulation of sensible policies and programs about the development of the resource. Such policies and programs should cater to the real improvement of the quality of life of the dependent coastal communities, and the vitality and integrity of the

coastal areas as a whole. Also, the establishment of a proper institutional machinery would ensure that mangrove programs are well supported and implemented.

Firstly, this study demonstrates its relevance in providing an emphasis on policy evaluation as a decision-making mechanism in the management of mangroves. This study serves as a catalyst to initiate efforts towards a more holistic approach in the management of mangroves for their sustainable development.

Secondly, the conceptual set of goals for sustainable mangrove development derived in this study provides a breakthrough in dealing with the complex issues of managing mangroves. Although it may not be considered as universal goals for all mangroves, it may serve as a useful reference wherein a specific goals may be developed for a particular mangrove area. Meanwhile, criteria are derived from these goals for sustainable mangrove development to be applied in the evaluation of the mangrove policies and programs of the Philippines, which represents a challenge for environment and natural resources management. Thus, in the end, the study provides recommendations that may be considered in the improvement, or formulation and implementation of feasible and sustainable mangrove development programs of any country concerned with similar problems.

Lastly, this study is also of enormous importance to the author given his employment at the Environment and Natural Resource Department of the Philippines.

1.4 **ASSUMPTIONS AND LIMITATIONS OF THE STUDY**

In this study, policy evaluation is applied by focusing upon possible outcomes of a combination of newly implemented and proposed programs and to recommend actions that bring about a particular result. This is the prospective evaluation, wherein an evaluator should have a clear understanding of the

values, goals and objectives of the different resource users. In doing the evaluation, one of the assumptions made in this study is the rationality of considering the concept of sustainable development and mangrove development issues in the derivation of a conceptual set of goals for sustainable mangrove development to resolve the different issues of mangrove management. Based on this set of goals, criteria are determined wherein mangrove policies and programs may be evaluated.

A scientific approach to policy evaluation normally would include an in-depth survey of the issues and impact results. However, in some instances policy or program impacts could be assumed or projected in order to anticipate possible policy failures or weaknesses in achieving a desired set of goals in managing a particular resource. In this study, the projection of program impacts is based on the five years experience and knowledge of the author about the mangrove programs in the Philippines considered in the evaluation.

Considering the above assumptions and limitations of this study in achieving primary information about the implementation of Philippine mangrove policies and programs, this study is limited to recommending actions necessary to improve mangrove policies and programs of the country.

The study is written in American English considering the author's need to utilize the study in a government which uses American English. It may be noticed in the discussion the use of Philippines, Philippine and Filipinos. Philippines or Philippine refers to the country and Filipino is used in reference to the people.

1.5 **METHODOLOGY OF THE STUDY**

The objectives of the study, mentioned earlier, determined its methodology. As illustrated in Figure 1.4, Chapter 1 provides the rationale of policy evaluation in the management of the environment and natural resources. The

chapter discusses the problems and issues in management of mangroves of the Philippines, the chosen case study of this thesis.

Chapter 2 discusses the concept of sustainable development. The chapter aims to develop a perspective and identify general goals for sustainable development of natural resources.

Chapter 3 identifies and discusses the ecological and sociological aspects of mangrove ecosystem to be considered in decision making or evaluation. The chapter aims to identify general goals for mangrove management to be combined with the general goals for sustainable development of natural resources identified in Chapter 2 to develop a conceptual set of goals for sustainable mangrove development.

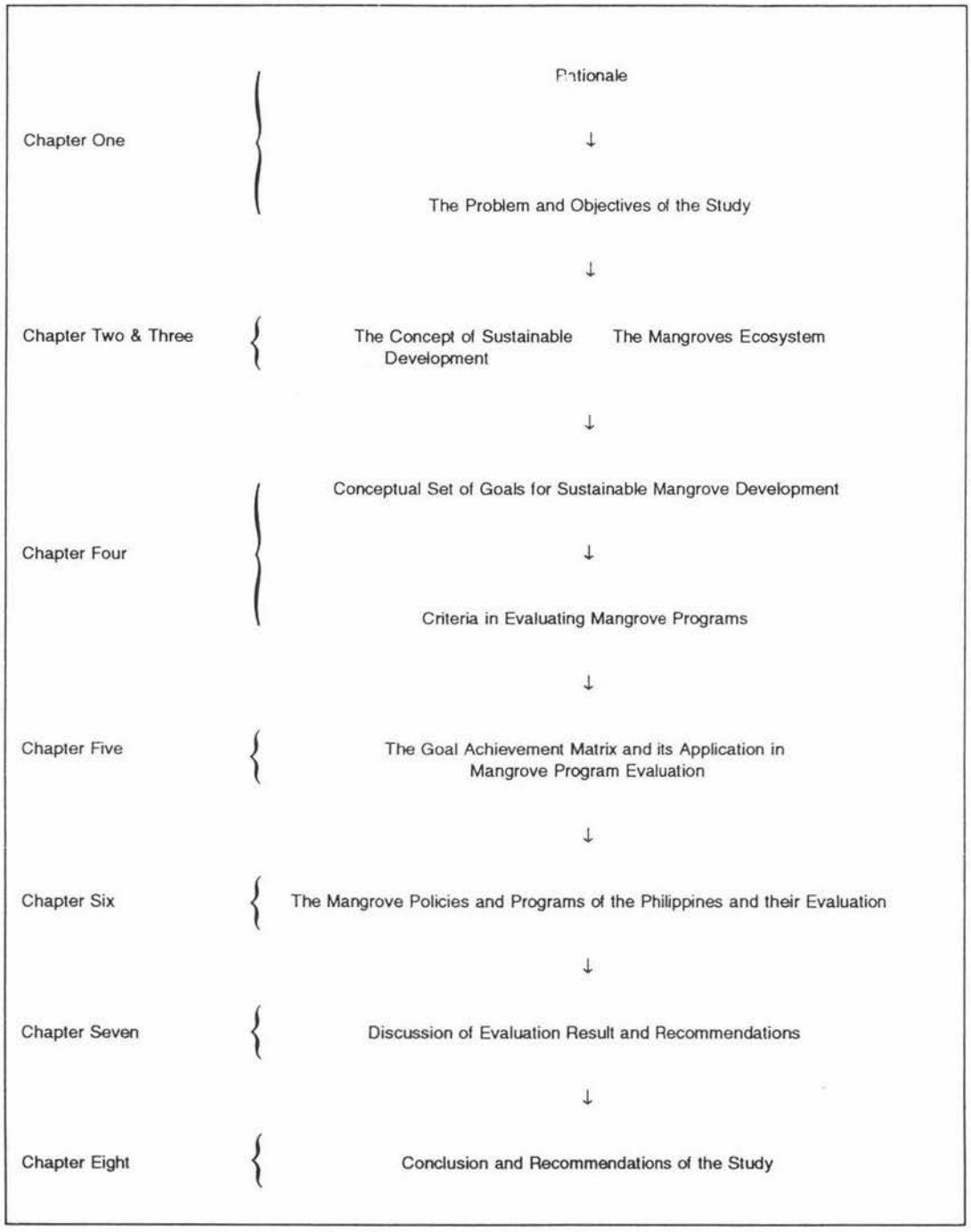
Chapter 4 is the development of a conceptual set of goals for sustainable mangrove development, based on the discussions of the concept of sustainable development and the mangrove ecosystems. This includes the identification of criteria by which mangrove policies and programs can be evaluated.

Chapter 5 discusses Goal Achievement Matrix (GAM) as the chosen methodology to be used in the study. The chapter includes discussion of the application of GAM in evaluating mangrove policies and programs.

Chapter 6 discusses mangrove policies and programs of the Philippines and their GAM evaluation. This also includes a sensitivity analysis of each program to determine the effect of several weighting regimes that may be considered in the evaluation.

Chapter 7 discusses the GAM results of evaluating mangrove policies and programs of the Philippines. This includes observations and recommendations

Figure 1.4 Methodology of the Study



that may be considered to improve the policies and programs of the Philippines in the management of the country's mangrove resources.

Chapter 8 concludes the thesis with a discussion of the implications of the study in the general management of mangroves and of necessary research to ensure sustainable development of mangroves over the long term.

CHAPTER TWO
SUSTAINABLE DEVELOPMENT

The main objective of this chapter is to develop a perspective and identify goals for the sustainable development of natural resources. The goals to be identified in this chapter will be combined with those to be derived in Chapter 3 to develop a conceptual set of goals for sustainable mangrove development.

Sustainable development has become a normative planning concept which should be considered as a fundamental objective of natural resource management policies. Since the Cocoyoc declaration on environment and development in the 1970s, it has served to catalyse debates over the relationship between economic change and the natural resources (Redclift 1987). Sustainable development is founded on the conviction that people themselves can alter their behaviour when they see that it will make things better, and can work together when they need to. It is aimed at change because most societies' economies and values need to alter if we are to care for the Earth and build a better quality of life for all, now and in the future (IUCN 1991).

2.1 DEFINITIONS OF SUSTAINABLE DEVELOPMENT AND SUSTAINABILITY

The concept of sustainable development was created from the context of renewable resources, such as forest or fisheries. Literally, sustainable development simply means development that can be continued, either indefinitely or for a certain period of time. However, most proponents of sustainable development have taken it to mean the existence of ecological conditions necessary to support human life at a specified level of well being through future generations. There has been a strong emphasis on ecological sustainability: the biophysical laws or patterns that determine environmental responses to human activities and a human's ability to use the environment. This initiated the realization that, in addition to or in conjunction with those

ecological conditions, there are also social conditions that influence ecological sustainability or unsustainability of the people/nature interaction (Lele 1991).

Along this line, several definitions of sustainable development (IUCN 1980 & 1991, Repetto 1986, World Commission on Environment and Development (WCED) 1987, Naess 1990, Engel 1990, Redclift 1987, Fri 1991) are considered in this study to generate a factual meaning of the concept to develop a perspective and identify goals for the sustainable development of the environment and natural resources.

As defined by IUCN (1980 & 1991) and Repetto (1986), sustainable development involves a substantial emphasis on the quality of life and preservation of the natural environment. The World Conservation Strategy emphasized that:

> humanity, which exist as part of nature, has no future unless nature and natural resources are conserved. It is asserted that conservation cannot be achieved without development to alleviate the poverty... (IUCN 1991, p. 1).

To realize this, the World Conservation Strategy emphasizes three development objectives to be considered. These are: maintenance of the ecological processes and life-support system, preservation of genetic diversity, and sustainable use of species or ecosystems (IUCN 1980).

The Brundlant Report in 1987, on the other hand, defined sustainable development in a different way. According to the report, sustainable development is considered as:

> a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (WCED 1987, p. 46).

On this definition, it can be noted that the whole emphasis is on human needs and aspirations. There is nothing about the necessity to ensure the survival of other forms of life that are threatened by economic growth and development (H.R.H. Prince Phillip 1991).

The above definitions of sustainable development, although contrasting with each other, provide a clear manifestation of considering the agenda of improving quality of human life and the environment for present and future generations as the main objectives of economic and environmental development. However, as noted by Redclift (1987) from Flaver and Glaeser (1979), the main issues of whose needs are going to be met, who are the participants, and which groups or organizations will be hurt by environmental harmony, remains unresolved. This scepticism of Flaver and Glaeser is still well founded, even up to the recently held United Nations Conference on Environment and Development (UNCED), the Earth Summit in Rio de Janiero in June 1992. There is still an immense aversion of governments and international organizations to really achieve sustainable development. Examples are the refusal of the United States to sign the bio-diversity convention, and the remaining control by the World Bank over environmental funds. The vested interest of the 'superpowers' still prevail imposing solutions that maintain their power and standards of living intact (The Ecologist 1992). The World Bank still retains its control over environmental loans despite noted adverse effects, such as deforestation and environmental degradation in the Philippines and other countries (United Press International 1992).

The plight of the poor around the world, who have been facing the ill consequences of environmental degradation, still remains a big issue for sustainable development proponents, despite the conferences and debates (The Ecologist 1992). In essence, the situation implies that the objective of development should not be merely identifying approaches towards the environment, but also the promotion of alternatives that deal effectively with

political and institutional issues. This is strengthening individuals' commitment and coordination towards supporting sustainable development.

Implementation of the concept of sustainable development, therefore, involves political change that has to be made at the local, national and international level. For sustainable development to become a reality it is necessary that priority is given towards the alleviation of poverty, especially in the poor countries which have been marginalized by international development (Redclift 1987). Development must be directed along the line of each culture, not along a common centralized line (Naess, 1990).

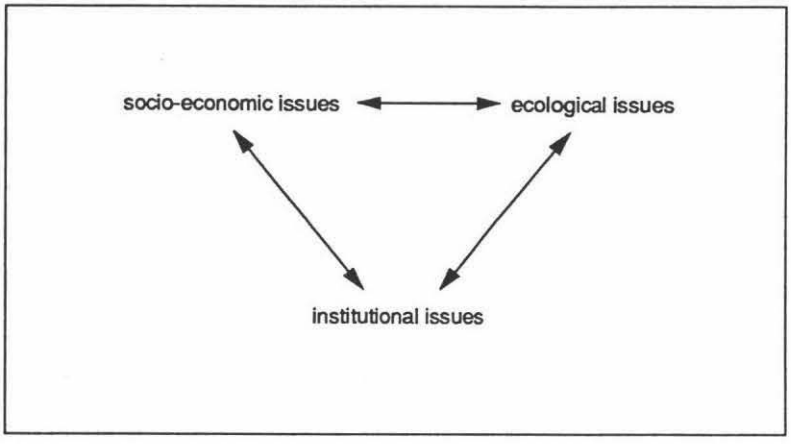
Barbier (1987) likewise argues, that the real improvement in the quality of human life, especially in the third world, cannot occur unless the strategies which are being formulated and implemented are environmentally suitable for the long term, are consistent with social values and institutions, and encourage grassroots participation in the development process. There will be no sustainable development or meaningful economic growth without a clear commitment to preserve the environment and promote the rational use of natural resources at the same time.

Similarly, approaches to sustainable development must differ, depending on the cultural heritage and religious traditions of individual societies. They must be based on the recognition that ecologically sound knowledge is a part of the cultural traditions of native and other traditional societies and an awareness of how modern cultural values have destroyed sustainable patterns of lands and resource use (Engel 1990). This is because cultural diversity often parallels ecological diversity and local traditional adaptations are often the most environmentally sound practices (McNeely 1988).

Considering the above definitions and notions of sustainable development, it may be appropriate to consider a perspective which should influence the formulation and evaluation of development policies and programs. This is the

interrelationship of the socio-economic, ecological, and institutional issues, which should be considered as an integral part of the development process, as shown in Figure 2.1. In policy formulation or evaluation, it is necessary to understand the interrelationships between all issues, whatever management priorities or weightings may be given to individual issue.

Figure 2.1 Sustainable Development Process



2.2 PRINCIPLES UNDERLYING SUSTAINABLE DEVELOPMENT

In considering sustainable development in policy formulation and evaluation, there are several critical principles that have to be recognized to facilitate the process of setting priorities in the allocation of resources to achieve sustainable development. These principles are identified by the Caring for the Earth Strategy (IUCN 1991):

2.2.1 Improvement of the quality of life

The principle provides one of the criteria by which policies and programs of resource and environmental management can be formulated and analyzed. The aim of development must be to achieve real improvements in the quality of life (IUCN 1991), through alleviation of poverty and fulfilment of basic needs. With a decent living standard, people are able to realize their potential, build self-confidence and lead dignified and fulfilled lives. The goal of development should be to achieve economic growth and to attain a long and healthy life for people through education, access to the resources needed for

a decent standard of living, political freedom, guaranteed human rights and freedom from violence. It must be realized that development is real only if it makes our lives better in all these respects.

This principle must be explicitly considered because poverty and opportunity have been the two root causes of rapid population growth, of encroachment on marginal soils of forests, of depletion of coastal and inland fisheries, and other resource pressure (Repetto 1986). Resource management decisions in the past have been extremely biased towards meeting the needs of the world's powerful and little has been done to solve the problems and meet the needs of the urban and rural poor, the landless and marginal farmers, pastoral people and forest dwellers, especially in the Third World. As a result, natural and physical resources are continually destroyed and ecological processes are permanently disrupted.

2.2.2 **Conservation of the Earth's vitality and diversity**

Conservation of the Earth's vitality and diversity is a principle which should be explicitly considered if we are to achieve real improvement in the quality of life over long-term and satisfy ecological needs. A motivation must be developed towards the conservation of ecological processes and life-support systems that keep the planet fit for life, conservation of bio-diversity (plants, animals, and other organisms), and the range of genetic stocks within each species and the variety of ecosystems, and the sustainable utilization of renewable resources (IUCN 1991). With the Earth's vitality and diversity degraded, we can be sure that life on earth will disappear. In essence, development must therefore be based on conservation which includes deliberate action to protect the structure, function and diversity of the earth's ecosystems, on which our species absolutely depends.

2.2.3 **Utilization within carrying capacity limits**

This principle is supplementary to the conservation of the earth's vitality and diversity. Policies must be directed towards bringing the population and

lifestyle into balance with the nature's carrying capacity. Otherwise, sustainability will be futile. Policy formulation and analysis must recognize that there is the potential for a substantial margin between the total actual impact and the expected impact of the development or the utilization of natural resources. This is essential because while we know that the ultimate limits exist, we are seeking not just survival but a sustainable improvement in the quality of life of several billions of people, now and in the future (IUCN 1991).

2.2.4 **Respect and care for the community of life**

This principle sets an ethical base by which the concept of sustainable development can be fully achieved. It imposes an obligation for the human societies to live in harmony with the natural world on which they depend for survival and well-being (Engel 1990). It recognizes the interdependence of human communities, and the duty each person has to care for other people and future generations. It asserts that a responsibility must be assured towards the other forms of life with which we share this planet. They have to be cared for in their own right and not just as a means of satisfying human needs (IUCN 1991).

Such an ethical justification of sustainable development (as a new morality and a new economic strategy) is very significant because of the diverse cultural values and beliefs determining how well human societies adapt to the natural environment and what kind of political and economic relationships they maintain. Approaches in sustainable development must be designed based on these values and beliefs because cultural communities posses traditional practices which have been found to be harmonious with nature (Engel 1990). The belief in nature spirits in many cultures has provided a brake on over-exploitation of natural resources (McNeely 1988). When reinforced by peer pressure and limitations of technology, nature spirits effectively keep human greed under control. An example is the Samoan tradition of restricting the harvesting mullet at certain times of the year when they spawn on the reef. The taboo coincides with the spawning season because unlimited fishing

decimate breeding stock, and consequently overall catches. Furthermore, a number of Samoan myths maintain coconut, breadfruit, fish and kava to be gifts from the god and so to be treated with respect. Others imbue trees and animals with spirits which could turn against anyone abusing them. These types of techniques have managed the use of natural resources in Samoa over long periods of time, in which change came slowly or not at all (Templet 1986).

Another reason why the ethic for respecting and caring for the community of life is necessary is because it enhances the motivation of certain individuals to care for their natural resources (Engel 1990). It is through this process that people can be encouraged to protect their environment and participate in decision making. Thus, the ethic for respecting and caring for the community of life gives voice to people's moral conscience, providing language to express their feelings. It enables human societies to progressively change attitudes in accordance with the originating moral motivations (Engel 1990).

Furthermore, such an ethic of respecting and caring for the community of life enables the clarification of values in policy decisions and give moral reasons for alternative courses of action (Engel 1990). Concurrent environment and development issues are loaded with moral implications that need to be understood and weighed before intelligent choices can be made. Without these, the possibility of significant changes are foreclosed and actions are taken on the basis of current habits or customs, personal preferences, or political/technical feasibility (Engel 1990).

Lastly, changing ethic towards respecting and caring for the community of life also facilitates the resolution of some of the outstanding value conflicts that thwart the integration of conservation and development as recommended by IUCN (1991). It enables the reassessment of issues so that values which may be perceived to be in opposition, may ultimately, be conceived to be potentially reinforcing.

2.2.5 **Changing personal attitudes and practices**

Sustainable development requires a considerable support from the people to whom development is directed. Decisions are ultimately a political responsibility. However, best choices are made when there is a widespread knowledge and understanding of all issues at hand.

People must be made aware of their relationship and obligations to the natural world. They must be enlightened about the complex nature of the environment and the role played by a properly managed environment in economic development. In the formulation and evaluation of development policies and programs, this is important, because, it is only through a well informed and motivated people that the aim of sustainable development can be guaranteed (DENRc 1990). Therefore, development objectives should not be limited to only the improvement of the quality of life, but also to how it could be sustained by a particular community.

2.2.6 **Enabling communities to care for their own environment**

A better alternative for carrying out resource management is through the empowerment of the communities who are close to nature and peacefully co-exist with the environment. They possess an inherent capacity to improve themselves and, if recognized and organized, they can be a powerful and effective force, whether they are poor or rich (IUCN 1991). The strategy may focus on the decentralization of responsibilities to the people to manage their own resources. It is through this process that political will can be achieved in the implementation of a sustainable development of the environment and natural resources.

2.2.7 **Integration of development and conservation**

Human development and environmental conservation must be integrated if a society is to be sustainable (IUCN 1990). We need to maintain a healthy environment, learn about how natural ecosystems work, maintain the maximum possible diversity in natural ecosystems, and maintain the maximum

diversity in human uses of living natural resources (McNeely 1988). The environment serves as the fundamental resource on which human societies depends. It affects all sectors of social activity, and any action that alters the environment is likely to have repercussions. Therefore, the fragmented and sectoral approach to policy formulation and implementation must be replaced by new structures that ensure the integration. It requires that environmental policies must be based on safeguarding human rights, interest of the future and the productivity and diversity of the Earth (IUCN 1991).

2.2.8 **Creating a global alliance**

There is no nation that is self-sufficient (IUCN 1991). There are many problems common to most countries in the world, and some are inherently trans-boundary, or global in scope, in that action taken in one country directly affects the others. Thus, to achieve a sustainable society, new levels of cooperation and commitment among nations, as well as among governments, science, business, and groups of concerned people, must be developed (Repetto 1986). It requires a comprehensive and widespread planning and management scheme at the local, regional, national, and international levels. At the international and national levels, it requires the need for governmental and organizational collaboration to facilitate cooperative actions to resolve conflicts that arise between sectoral uses and between users (IUCN 1991). International organizations can also contribute strongly to the exchange of expertise, the process of scientific research, and the mobilization and allocation of important funding for important purposes. They also have an essential role in promoting international agreements to deal with problems that are beyond the power or outside the interest of individual countries.

At regional and local level, sustainable development requires participation and closer coordination among organizations, institutions, and the direct or indirect resource users in planning and managing the environment and natural resources.

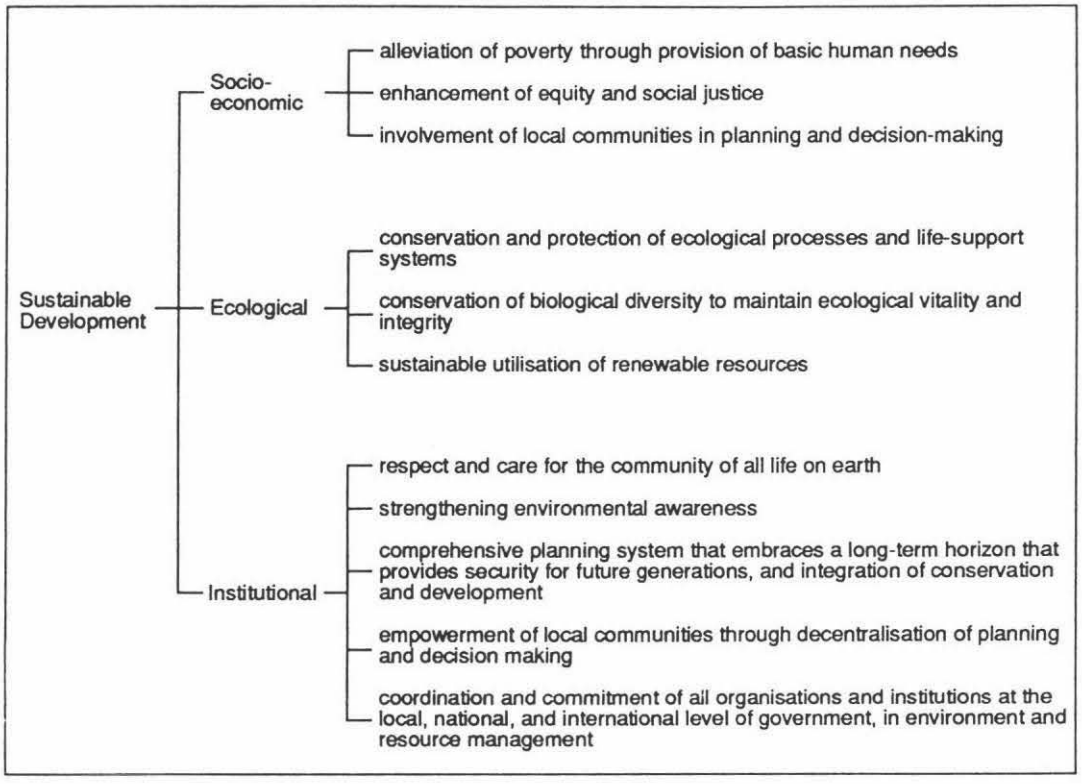
2.3 GENERAL GOALS FOR SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES

The concept of sustainable development implies drastic changes in the current modes of utilization, production and decision making as they relate to the environment and natural resources. As shown in Figure 2.2, the principles underlying sustainable development, suggest that sustainable development of natural resources should permanently achieve necessary conditions or goals: alleviation of poverty through the provision of basic human needs, enhancement of equity and social justice, and a local participation in planning and decision-making, all of which can be ensured in the long run by conservation and protection of ecological processes and life-support systems, conservation of biological diversity to maintain vitality and integrity, sustainability of natural resources, respect and care for the community of all life, environmental awareness, comprehensive planning (which embraces a long-term horizon and the integration of conservation and development), empowerment of local communities, and the strengthening of commitment and coordination at the local, national, and international level.

Sustainable development implies significant emphasis towards increased human concern for the conservation and preservation of the natural resources, which generally affect the future of all life. It requires that policies and programs about the environment and natural resources must be conservation-based as well as people-centered. Because of the vulnerability of environment and natural resources, conservation must be focused on maintaining their capacity for renewal, and the human communities which depend on them must adapt. In practical terms, ecological processes, life-support systems, biological diversity, animals and other organisms within an ecosystem should be conserved. They must be utilized within the ability of the resource to regenerate their production potential, avoiding irreversible damage and providing insurance for present and future generations. Communities which are dependent on the environment and natural resources must be made aware of their complex nature, and their importance in economic development. They

must be made responsible in caring for and protecting their own resource and environment.

Figure 2.2 General Goals for Sustainable Development of Natural Resources



Each individual, or group of individuals, and the government of each country should act responsibly, caring for other people and other forms of life, in present and the future generations. These ideals should be institutionalized to each individual or group of individuals and be included in policies about resource use. This cannot be achieved overnight by the expressions of visions on the part of world leaders, but through a change in attitudes and practices of each individual. Sustainable development requires that humanity must live harmoniously with the natural world. Obviously, this is more easily said than done since it requires drastic changes in our life style and development process that respect the limits of nature. It requires that development must be achieved not at the expense of others but for a real improvement in the quality of life of all, now and in the future.

Such goals for sustainable development of natural resources will be combined to those derived in Chapter 3 to develop a conceptual set of goals for sustainable mangrove development.

CHAPTER THREE
MANGROVE ECOSYSTEMS

This Chapter discusses mangrove ecosystems and to identify general goals for mangrove management. These goals will be combined with the identified goals for sustainable development of natural resources development identified in Chapter 2 to develop a conceptual set of goals for sustainable mangrove development.

The mangroves are self-maintaining and renewable ecosystem which consist of complex interrelationships of ecological and sociological factors. These factors need to be explicitly considered in policy formulation and evaluation to achieve sustainable development of mangroves.

3.1 ECOLOGY OF THE MANGROVES

The following discussion on the ecology of mangroves includes mangrove features and characteristics, mangrove tree and shrub species and their geographical distribution, mangrove functions and uses, mangrove zonation and structural formation, mangrove productivity, and the environmental factors which maintain the ecological processes of the mangrove ecosystem.

3.1.1 Mangroves features and characteristics

Mangroves are considered one of the most productive ecosystems in the world. They have been variously described as 'coastal woodland', 'tidal forest', and 'mangrove forest' (see Figure 3.1). They consist of intertidal salt-tolerant flora, dominated by broad-leaved trees with stilt roots or pneumatophores, adventitious roots and viviparous seedlings (see Figure 3.2). They occur in relatively sheltered lagoons, estuaries, and quiet backwaters in the tropical and subtropical coast. When left undisturbed, with mild tidal action and favorable soil conditions, the mangroves extend both inland and towards the sea (Rao 1991). Extensive mangrove areas are established in the estuaries of big rivers and sheltered coastline with great diversity of ecological structure. They range

from vast areas covering hundreds of hectares with high species diversity, to an isolated tree clinging to coral reefs, to mangroves which have been managed by man (Hellier 1988).

Figure 3.1 Picture showing a mangrove forest

Figure 3.2 Mangrove Penumatophores, stilt roots and adventitious roots

3.1.2 **Mangrove tree and shrub species composition and distribution**

There are two groups of mangrove tree and shrub species: exclusive species, which are restricted to the mangrove habitat, and non-exclusive species, which may be important in the mangrove habitat but are not restricted to it. Table 3.1 lists those species widely held to be mangroves and gives their geographical distribution (see Figure 3.3). Throughout the tropics there are about sixty species of trees and shrubs that are exclusive to the mangrove habitat (Saenger, et. al. 1983).

3.1.3 **Mangrove functions and uses**

Like tropical rainforest, mangroves have various functions and uses, namely: economic, ecological, recreation/scientific (Table 3.2). They have played a significant role in the economies of tropical countries for a long time. Mangrove trees provide direct economic uses, such as timber for construction and paper production, poles for fishing, charcoal for fuel, tanbark for textile and leather production, food, drugs and beverages, and as a fishery resource (Saenger, et. al 1983; PCARRD 1987).

Mangroves also serve as breeding, nursery and feeding grounds for commercially harvested fish, shrimps and shellfish and other marine organisms. The early stages of some fishes, shell-fish and other marine organisms are spent in the mangroves. The extensive prop roots and pneumatophore system of mangrove vegetation serve as an excellent sanctuary from predators. The detrital food chains that support fisheries production are fuelled by the food generating activities of mangroves (Helier 1988).

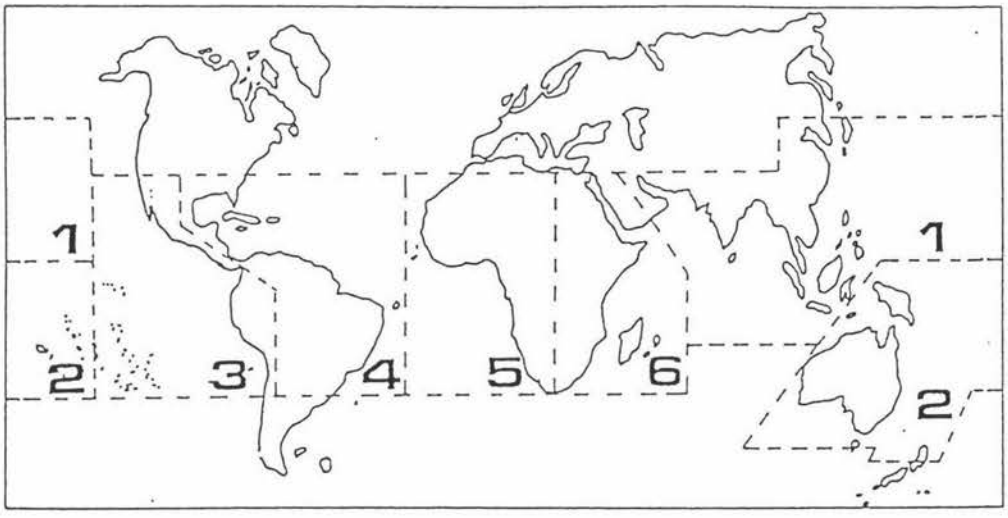
In some places like Florida in the US, the primary benefits or services are derived from the mangroves ecological role (Helier 1988). Research (Hellier 1988; Mercer and Hamilton 1984; Macintosh 1983) indicates that besides the productivity and valuable use of mangroves for various purposes, they also serve as a crucial coastal stabilizer. They act as an important buffer against

Table 3.1 World distribution of trees and shrubs associated with the Mangroves

Exclusive species	Life Form	Distribution	Non-exclusive species	Life Form	Distribution
Acanthus embracteatus	s	1,2	*Acrostichum aureum*	f	1,2,3,4,5,6
A. ilicifolius	s	1,2	*A. danaefolium*	f	3,4
A. volubilis	s	1	*A. speciosum*	f	1,2,6
Aegialitis annulata	s	2	*Barringtonia racemosa*	t	1,2,6
A. rotundifolia	s	1	*Brownlowia argentata*	t	1,2
Aegiceras corniculatum	s	1,2	*B. tersa*	s/t	1
Avicennia alba	t	1,2	*Cerbera floribunda*	t	1,2
A. bicolor	t	3	*C. manghas*	t	1,2
A. eucalyptifolia	t	2	*Clerodendrum inerme*	s	1,2
A. germinans	t	3,4,5	*Cynometra mannii*	t	5
A. inteemedia	t	1	*Dimorphandra oleifera*	t	4
A. lanata	t	1	*Dalichandrone spathacea*	t	1,2
A. marina	t	1,2,6	*Hibiscus hamabo*	t	1
A. officinalis	t	1,2	*H. tiliaceus*	t	1,2,3,4,5,6
A. rumphiana	t	2	*Mauritia flexuosa*	p	3,4
A. tomentosa	t	4	*Maytenus emaginata*	s	2
A. tonduzii	t	3	*Myristica hollrungii*	t	2
Bruguiera cylindrica	t	1,2	*Oncosperma filamentosa*	p	1
B. exaristata	t	2	*Pemphis acidula*	s/t	1,2,6
B. gymnorhiza	t	1,2,6	*Pterocarpus officinalis*	t	4
B. hainesii	t	1,2	*Thespesia acutiloba*	t	6
B. parviflora	t	1,2	*T. populnea*	t	1,2,4,5,6
B. sexangula	t	1,2	*T. populneoides*	t	2
Compostemon philippinensis	t	1			
C. schultzii	t	1,2			
Ceriops decandra	t	1,2			
C. tagal	t	1,2,6			
Conocarpus erectus	t	4,5			
Cynometra iripa	t	1,2			
C. ramiflora	t	1			
Exoecaria agallocha	t	1,2			
Heritiera littoralis	t	1,2,6			
H. fomes	t	1			
Kandelia candel	t	1			
Laguncularia racemosa	t	3,4,5			
Lumnitzera littorea	s/t	1,2			
L. racemosa	s/t	1,2,6			
Nypa fruticans	p	1,2,5			
Osbornia octodonta	s	1,2			
Pelliciera rhizophorae	t	3			
Phoenix paludosa	p	1			
Rhizophora apiculata	t	1,2			
R. harrisonii	t	3,4,5			
R. x lamarckii	t	2			
R. mangle	t	2,3,4,5			
R. mucronata	t	1,2,6			
R. racemosa	t	4,5			
R. x selala	t	2			
R. stylosa	s	1,2			
Scyphiphora hydrophyllacea	t	1,2			
Sonneratia alba	t	1,2,6			
S. opetala	t	1			
S. caeseolaris	t	1,2			
S. griffithii	t	1			
S. ovata	t	1,2			
Xylocarpus australasicus	t	1,2			
X. gangeticus	t	1			
X. granatum	t	1,2,6			
X. moluccensis	t	1,2,6			
X. parviflorus	t	1			

Legend: S - shrub, T - tree, P - palm, F - fern
Source: Saenger, et. al., (1983)

Figure 3.3 Geographical zones used to describe distribution of mangrove forest: 1, Asia; 2, Oceania; 3, West Coast of the Americas; 4, East Coast of the Americas; 5, West Coast of Africa; 6, East Coast of Africa and the Middle East. (Adopted from Saenger, et. al., 1983).



typhoons and cyclones, and prevent coastal erosion. In Florida, mangroves provide some degree of protection to local people, preventing loss of life and damage to property and public utility structures further inland areas. Mangroves also assist in natural reclamation. They trap sediment, litter, debris and other decomposed foreign materials along the shoreline and mangrove edges. This process of soil accretion increases the gradient and extent of the land (Macintosh 1983).

Mangroves also possess a rich genetic diversity, necessary for the development of salt-tolerant plant species both for the immediate purpose of protecting coastal areas and for meeting long-term needs for suitable donors of genes for sea water tolerance. Recent development in bio-technology research, for example, has made it possible to isolate mangrove species genetic material conferring tolerance to sea water intrusion and transfer them into other plants growing near coastal areas (Swaminathan 1991).

Table 3.2 Mangrove functions and uses

Economic	Ecological (for human use)	Recreational/ Scientific
timber for construction and paper production	coastal protection	tourism
pole for fishing	land builder	education
fuel wood/charcoal	nursery/feeding ground for fish	scientific research
tannin for textile and leather production	source of genetic material necessary for developing salt-tolerant plant species	
source of food, drugs, beverages		
fishery resource		

In addition, mangroves likewise possess a variety of sub-habitats in which natural and aesthetic values offer a range of recreational opportunities. The bird life, for example, provides valuable opportunities for tourism, education and scientific study. While it is difficult to put monetary value on these wildlife based-activities, they are nonetheless significant uses which add to the importance of the mangroves (Saenger, et. al. 1983).

3.1.4 **Mangrove zonation/structural formation**

Research has revealed that mangrove forest varies greatly in its structural development (Citron & Novelli 1979; Snedaker & Getter 1985; Rodriguez 1987). In the warm regions this structural variability is the trees' response to environmental factors which vary both their integrity and frequency of occurrence. These environmental factors, which will be discussed in section 3.1.6, include physiography, water salinity, tidal intrusion, precipitation, river discharge, shelter, and the availability of allocthonous sediments, etc. They develop poorly in temperate regions with temperatures ranging from 8°C and below (Citron and Novelli 1979).

Mangrove communities show a characteristic structure according to their habitat. Some species are found predominantly in the seaward portion of the shore, and other species on the higher and more landward portion of the shore (Rodriguez 1987). This structure is reflected in successive landward zones of *Rhizophora, Avicennia, Laguncularia*, and *Conocarpus*. This zonation results from natural processes in which the shoreline extends in a seaward direction due to the land-building role of mangroves in a continuous process of accretion and succession. This process is interrupted only when hurricanes, storm flushing, or other natural destructive forces reverse it. Similarly, in areas where weak currents and tidal energies allow the accumulation of sediments, mangroves will follow land formation and accelerate the rate of accretion, and consequently, allowing the succession of mangrove species. On stable coastlines, mangroves will maintain themselves over a long period and succession would not necessarily be a recapitulation of zonation, but the result of some environmental factors independent of soil accretion (Rodriguez 1987).

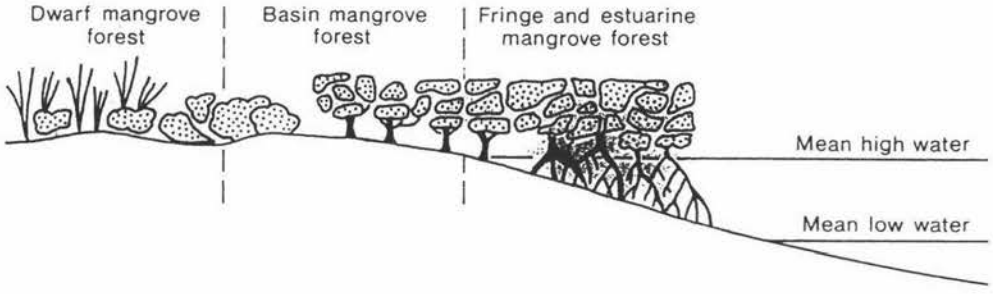
Mangrove zonation is also explained in the gradients created by the tidal factors, particularly salinity (Rodriguez 1987). They respond physiologically to these gradients so that each mangrove plant species has a preferred area within the shore. Mangroves as facultative halophytes are able to develop in fresh water but can also tolerate salinities as high as 2.5 times that of sea water (Jiminez 1985). It is also possible that mangroves dominate in the coastal zone not because they require salt, but rather because they are able to maintain a higher metabolic efficiency in the saline portions of a salinity gradient, to the exclusion of plants adapted to lower salinity approximating freshwater (Snedaker & Getter 1985).

The dynamics of mangrove community structure within any specific region is also determined by the prevailing direction of changes in landform. These changes in landform could be due to several factors. Firstly, a high sediment influx is a clear zonation of the plants. Secondly, erosion by waves, tidal

currents or river channels may occur, leading to the destruction of communities and local deposition of regrowth. Thirdly, steady state conditions may prevail, perhaps involving cyclic short-term instability or long term self maintenance and persistence of a specific community.

This physiographic point of view is also reflected in the various types of the mangrove forest, namely: riverine, fringe, basin and dwarf forest, as shown in

Figure 3.4 Idealized diagram showing the zonation/types of mangrove forests



The riverine forest develops along the edges of river estuaries, often as far inland as the top of the saline intrusion. In this environment, water flows and nutrient inputs are high. Floor water bring in silts and mineral nutrients and these are rapidly incorporated into plant tissues. On the periphery of the forest, an area of high kinetic energy due to tidal motion and river discharge is mostly dominated by *Rhizophora* species, which develop a complex maze of adventitious roots. This root maze allows the establishment of well developed trees in spite of the strong water flows. Inland from the fringe are

stands of *Avecinnia* species. Usually, riverine forest are more luxuriant in the lower and middle part of the estuary. In general, the interstitial salinities of these forest are lower than that of other types. They are lowest at times of floods when the salt wedge is driven seaward. During the times of low flow, salt intrudes into the innermost part of the estuary, raising the salinity temporarily. The interstitial salinities ranges from 10 - 20 ppt or less (Citron and Novelli 1979).

Fringe forest occurs mainly along protected shores, over shoals, or spits, often forming overwash islands. Fringes usually have pronounced gradients in topography, turbulence and tidal amplitude. Hampering the variation in tidal amplitude and turbulence inside the stand may result in high interstitial salinities in the inner parts of the fringe, further affecting the growth of plants. There, the soil elevations are high and the terrain is less often flooded. The fringe forest are mostly dominated by *Avicennia* species and *Rhizophora* species on the outer edge, where the level of kinetic energy is high.

Basin forest is characterized by sluggish laminar water flows over wide areas of very small topographic gradients. The water turnover rates here are slow. Basin forest receives and stores water seasonally. Because of the uniform sheet flows, strong salinity gradients do not develop within the basin forest. Usually, the salinity ranges from 30 - 40 ppt. Basin forest is usually dominated by *Avicennia* and *Laguncularia* species although mixed stands may be found. Tidal creeks and drainage channels within the basin are often lined with *Rhizophora* species.

The structural characteristics of the basin forest depend on the hydro periods. Where flows are weak but constant, forest develops well. In stagnant basins there may be oxygen depletion which incites slow nutrient recycling and reduces plant growth.

Dwarf forest occur where growth is limited by edaphic factors. Stands of dwarf *Rhizophora* species develop in peat substrate in basins that do not receive substantial amounts of terrestial run-off. Dwarfed and black mangroves are often found on the landward side of the fringes and basins in seasonally dry areas, immediately adjacent to salt flats or hypersaline lagoons. The dwarfing factor here is extremely high levels of salt in the soil.

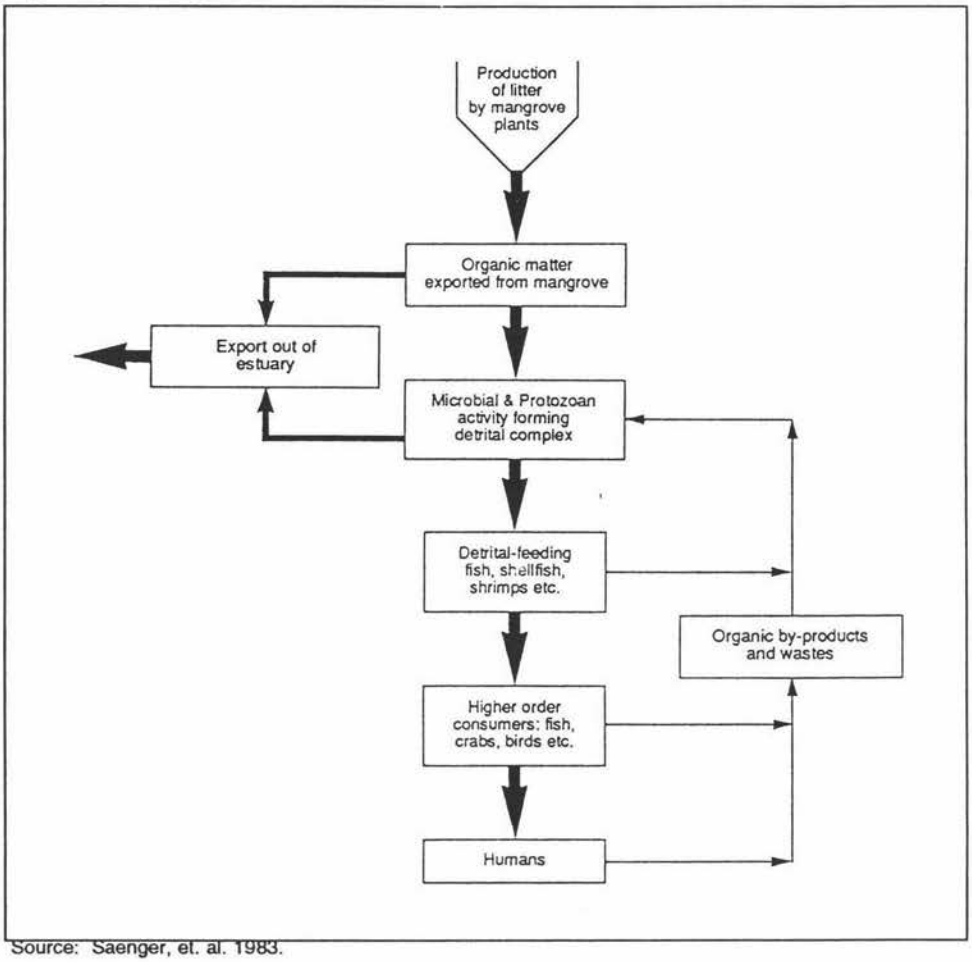
3.1.5 **Mangrove Productivity**

Studies (Cintron & Novelli 1979 & Randial 1991) on the productivity of the mangrove forest show they are among the richest ecosystems on earth. Their productivity is controlled by physical factors and biological processes. The former includes rivers, daily tides, terrestial run-off, etc. Biological processes, on the other hand, are leaf fall, decomposition, mineral uptake and cycling of faunal activities. However, the most important source of energy in the mangroves are detritus particles originating from plant material that drains into the body of water. They make up a large percentage of detrital material in a mangrove area that serves as energy budgets of fisheries within the mangroves and offshore (Randial 1991), as presented in Figure 3.5. Research on the daily rate of the above ground biomass has disclosed that some of the mangroves could be as much as 20 g. OM/sq. m./day, about 70 times the maximum value reported for marine flagellate bloom in neritic waters in the Caribbean (Citron & Novelli 1979).

Because of the enormous and continuous availability of large amounts of detrital materials in the mangrove-lined areas, large numbers of organisms aggregate and utilize it. The sheltered nature of these areas also make them important as nurseries. The mangroves thus export protein to coastal areas in the form of aquatic organisms that use the mangrove areas for their early development and then migrate offshore. Well known are the massive migration of mullets and shrimps from these areas. This is high quality protein

that links mangroves directly to other coastal systems like coral reefs, seagrass beds, and ultimately to man (Cintron & Novelli 1979).

Figure 3.5 Mangrove detrital food chain



Source: Saenger, et. al. 1983.

Analysis of the list of marine fauna that are associated with the mangrove areas in Florida, the Caribbean and the Philippines (Citron & Novelli 1983; Philippine National Mangrove Committee 1986), showed that there are more than 273 species of fish belonging to 68 families, 54 species of crustaceans, and 63 species of mollusc in some way associated with mangroves.

The mangrove forest also houses several species of wildlife. This includes some species of birds, wild ducks, monkeys, lizards and snakes. These animal species are seasonal estuarine residents, especially the migratory

birds, consistently dependent upon the estuarine environment for food. In some areas, mangroves are maintained to safeguard the extinction of marine turtles.

3.1.6 **Environmental Factors which Maintain the Ecological Processes of Mangroves**

Considering the complex ecological processes and productivity of the mangroves, studies (Citron and Novelli 1979; Snedaker, et. al. 1985, Saenger, 1983 & 1987), show that they are vulnerable to a number of environmental factors, such as, physiography, soil water salinity, tidal intrusions, precipitation, river discharges, shelter, and the availability of allocthonous sediments.

These environmental factors, which largely determine the structural formation and extent of the mangroves, are important in assessing the potential of mangroves for production of one or another resource and probably in determining the ability of a certain species to regenerate. For example, where vegetation is cleared from high tidal sites that are seldom inundated by either tides or rains, evaporation will rapidly increase the water and salt stress to the species being established. The new conditions may not permit replacements by plants or life-forms that previously existed there, and this may necessitate change in management objectives to be in line with the new ecological status quo (Snedaker, et. al., 1985).

3.1.6.1 ***Suitable physiography***

Mangroves develop where topographic gradients are very small and where saline intrusions penetrate far inland, e.g. broad coastal plains. They also develop best in sheltered depositional environments where, in the absence of drastic resculpturing of the coastline, there is a steady accretion of sediments. This results to gradual elevation of the sediment surface in relation to the sea level and gradual change in soil water characteristics. However, such gradual and directed changes rarely occur since the coastal environment is a dynamic one where erosion, occasioned by storms or flooding, can rapidly reverse the

biologically mediated depositional phase. The likelihood of such disrupted change depends on the geography of the coast and on its geomorphological history (Citron & Novelli, 1979).

Topographic gradients particularly affect tidal inundation, the salinity of the water, and consequently the extent and nature of plant cover.

3.1.6.2 ***Soil water salinity***

Salt water liberates mangroves from competition with plants that are not adapted to saline water. However, salinity level of the interstitial soil water is an important, regulating growth, height, survival and zonation. Mangroves are only able to tolerate salinity as high as 2.5 times that of sea water (Saenger, et al. 1987).

Soil water salinity is regulated by a number of factors including tidal inundation, amount and seasonality of rainfall, fresh water discharge of rivers, soil type and topography, run-off from adjacent areas, etc.

3.1.6.3 ***Tidal intrusion***

Tidal intrusion is one of the environmental factors that may cause severe damage to the mangroves and consequently to the coastal communities for it largely affects the extent and formation of mangroves. Where tidal amplitudes are large and the topographic gradient is small, the mangrove extends several kilometers landward. Where tides occur no less that one per day and there are no modifying influences, the salinity of the surface soil will, in most cases, equilibrate to approximately that of the adjacent water body (ocean or estuary). Though mangrove plants and animals are capable of making use of water at this salinity, reduced root aeration or temperature stress may inhibit their water uptake (Citron & Novelli 1979).

3.1.6.4 *Precipitation in excess of evapotranspiration*

Mangroves are said to develop best in moist regions where there are fresh water surpluses. This results in abundant land drainage and extensive development of forest in the areas subject to saline intrusions (Citron & Novelli 1979). Where there are no diluting factors, e.g. rainfall and the frequency of tidal influence is less than one per day, the effect of atmospheric evaporation and transpiration of water by plants causes soil salinities to rise very rapidly. As salinities rise, there is a corresponding increase in the osmotic potential of the interstitial soil water, which makes water uptake by the plant root more difficult (Saenger, et. al. 1983). Under these conditions, the exclusion, storage or excretion of excess salt increases the expenditure of energy by the plant. The efficiency with which each species deals with high soil salinities largely determines its position in the intertidal zone.

In the absence of any freshwater addition to the upper intertidal sites by rainfall or seepage, the concentrations of salts in the soil solutions may exceed the physiological tolerance of all the plant species (Saenger, et. al. 1983). In these conditions, mangrove communities are restricted to a narrow band on the coastline, and much of the tidally affected coastline is bare of vegetation.

3.1.6.5 *River discharges*

Rivers are important geomorphic agents, shaping the earth's surface and creating deltaic features over which mangroves develop. In some regions, their discharge may allow mangroves to develop in very dry regions where evapotranspiration greatly exceeds precipitation. In these areas mangroves develop as riverine forest backed by intensive salt flats. Mangroves may develop in areas where there is no permanent river discharge (coastal fringe), but their development in these areas may be limited. The absence of river discharges may be mitigated by the availability of run-off or freshwater upswelling (Citron & Novelli 1979).

River discharges also transport nutrients from the clay fraction of sediments which are necessary to maintain growth and formation of the mangrove ecosystem. Thus, the unimpeded flow of fresh water into the mangroves is of paramount importance (Saenger, et. al. 1983).

3.1.6.6 ***Shelter***

Mangrove seedlings and mature trees are vulnerable to uprooting by waves and current scour. They therefore develop best in low energy environments. They reach the sea only on protected segments of the coast, on the lee of offshore reefs, shoals, or other protective structures. They line sheltered estuaries and coastal lagoons.

3.1.6.7 ***Availability of allocthonous sediments***

Sediments from outside areas are essential for land building and encroachment. Terrestially-derived sediments carried by river discharges bring nutrients that are incorporated by the plants. Although mangroves may develop in areas where there are very low allocthonous sediment inputs, the best developed forests are those of riverine environments that are subjected to periodic deposition of silts.

Allochtonous sediments also facilitate the formation of landforms and the development of intertidal flats which may promote pro-gradation of mangroves.

3.1.7 **Management Implications of the Ecology of Mangroves Ecosystem**

The literature review of the ecology of the mangrove ecosystems implies several issues that should be considered in policy formulation and analysis. First is the fragility and uniqueness of the mangrove ecosystem. Unlike the terrestial rainforest, they only occur in the coastal areas either in abundance or in bands of trees, and are vulnerable to the adverse impact of several environmental factors. They have evolved in environments subject to great change and dynamism and as a result they have developed adaptations that allow rapid colonization and maximal resource use in relatively ephemeral

environments. This selection process has led to the development of a resilient and highly malleable ecosystem. Their resilience is expressed in the rapid recovery of the vegetative cover after a disturbance, given that site conditions remain unaltered (Novelli, et.al. 1991). It is this resilience that allows their management through the concept of sustain yield management.

Secondly, the species distribution, as shown in Table 2.1 indicates that mangrove species are not widely distributed. Most of them occur only in Asia, where a large number of the impoverished population have been dependent on them for survival. This rarity of mangrove tree species therefore implies the necessity of protecting them in a particular area where they have established themselves.

Thirdly, mangroves are one of the most productive ecosystems in the world and so need to be protected and conserved. They possess a rich genetic diversity, including tolerance to sea water intrusion. Research on new transgenic plants for adaptation to climate change will only be possible if naturally growing plant species are conserved to donate the necessary genes. In this context, mangrove species assume particular significance. Recent developments in biotechnology, for instance, have made it possible to isolate mangrove species genetic material conferring tolerance to sea water intrusion and transfer to other plants growing near coastal areas. Thus, the conservation of mangrove species and other coastal plant material is important both for the immediate purpose of protecting coastal areas from the adverse impact of storms and cyclones, and for meeting the long term need for suitable donors for sea water tolerance (Swaminathan 1991).

Fourthly, the productivity of the mangrove forest is largely controlled by physical factors and biological processes. The former includes rivers, tides and terrestial run-off. The biological processes comprise leaf fall, decomposition, mineral uptake and cycling, and faunal activities. For example, in a mangrove forest, leaf fall makes up a large percentage of the detrital

material which serves as energy budgets of fisheries within the mangroves and offshore.

The fifth issue is the relevance of the mangrove forest as the last frontier in our defense against the adverse consequences of sea level. The predicted change in temperature of 2°C per decade and a sea level rise of 40 centimeters by 2090, at the Second World Conference held in Geneva in 1990 (Swaminathan 1991), seems alarming and it will be a tragedy if we lose this defence. Thus, it is necessary that a considerable extent of mangrove forest will be maintained along coastal areas to serve as a barrier to the impacts of climatic and environmental changes.

Lastly, mangroves must be protected as a nursery and feeding ground for fish species to maintain the sustainability of fish catches offshore and within the mangroves. The mangrove species composition and structure has to be maintained in order to sustain the continuous production of detritus particles necessary for the survival of the aquatic organisms that use the mangrove areas for their early development.

3.2 SOCIOLOGY OF THE MANGROVE ECOSYSTEM

Mangroves are complex and diverse, and important to many human populations. They are complex not only in the conventionally defined biosphere but in the broader sphere of human-mangrove interactions. Mangroves serve a multitude of functions and they have been noted to be inhabited, for example, by about 25 million impoverished people in Southeast Asia, relying on the mangrove forest, fisheries, aquaculture and allied industries (Leekpai 1991).

Historically, mangroves have been favored for human settlement because of their selected situation (Macintosh 1989). Mangroves provide local populations with an immense variety of products such as timber, thatching,

charcoal, tannin, resins, oils, medications, animal fodder, and food in the form of fruits, honey, fish, shellfish and other forms of marine products.

It is noted that traditional mangrove dwellers, who are mostly subsistence fishermen, shell catchers and nipa gatherers, have their own concept of preservation and utilization. They are aware of the importance of mangroves and the products they derive from them. Mangrove trees has been traditionally used only for the construction of their houses and fish pens, for firewood, and for the extraction of minor forest products like tannin, dyes, resins, fodder for their animals, medicine and food. Their subsistence fishing practices which occur on a small scale (through the uses of gill nets, cast nets, hood-and-line or bamboo stake traps) have always been considered sustainable even they involve mostly the juvenile and young stages. The catches are either sold to the market or salted and sun dried for home consumption (Zamora 1982).

The traditional uses of mangroves have been considered to have a positive effect on the cultural and socio-economic conditions of the coastal inhabitants since their economic activities intrinsically require the containment of the mangrove areas to a sustainable level (Cabahug, et. al. 1986). However, mangrove utilization has became uncontrollable with the population explosion in these areas, caused by migration to the area for commercial interest, or by poverty harvesting protected mangrove forests. Mangroves have been under constant threat from a variety of fronts (Saenger, et.al. 1983). They are subjected to many biological and physical stresses because of several reasons. One is that policy decisions have been made which either ignore the value of the mangrove resource, or which place a significantly higher value on the alternative land or resource use. Second is the over-exploitation of traditional users, pushed by poverty into a desperate struggle for survival, so having no choice but to exploit mangrove resources for survival. And lastly, is the conflicting interest and limited commitment of different organizations in the management of the resource.

3.2.1 **Causes and Consequences of Mangrove Destruction**

As discussed above, mangroves are being destroyed intentionally by poor people, or as a secondary result of other activities. In research made on the global destruction of the resource (Saenger, et. al. 1983), the causes of mangrove destruction can be further subdivided by the scale of impacts encountered with destructive uses as seen in Table 2.3.

The table implies that repeated or simultaneous action in a region increases the total impact. For example, one traditional exploiter is significant, however, 10,000 exploiters focusing on one area would have an even more significant impact. Furthermore, a combination of actions imposed on a local area would have an accumulative impact on the total mangrove ecosystem (Saenger, et. al. 1983).

Table 3.3 Scale of Land Use Impacts within the Mangroves

ACTIVITY	SCALE OF IMPACT IN HECTARES
Clear felling	10,000 - 500,000
Diversion of fresh water	1,000 - 500,000
Conversion to agriculture	100 - 100,000
Conversion to aquaculture	100 - 10,000
Conversion to urban development	100 - 1,000
Conversion to salt ponds	100 - 100
Mining and mineral extraction	10 - 100
Waste disposal (liquid and solid)	1 - 10
Exploitative traditional use	1

Source: Saenger, et. al. (1983).

Some of the major causes of destruction of mangroves are forest exploitation, conversion to agriculture and aquaculture, salt pond construction, diversion of fresh water, mining/mineral extraction, waste disposal and coastal development.

3.2.1.1 ***Forest exploitation***

Mangrove forests are intensively exploited for firewood, or for conversion to charcoal for domestic or small industrial use. In Asia and the Pacific region,

for example, mangroves have been managed under the concept of sustained-yield management. In areas where the annual extraction is less than the annual growth increment, the mangrove forest serves as a sustainable resource and could exist in perpetuity. However, in many areas like India, the Philippines and the African countries, the extraction far exceeds the annual growth increment and the forest is rapidly being degraded (Saenger, et.al. 1983).

The other form of timber exploitation which occurs on a very large scale is the commercial cutting for construction and pulp and paper production, as in the case of Kalimantan, Indonesia (Saenger, et. al. 1983). In most cases, large scale exploitation has resulted in a complete loss of certain areas, mainly due to poor natural regeneration and a great demand for conversion to other uses. The massive deforestation due to conversion of mangrove areas to other forms of uses have resulted in a considerable decrease of mangrove areas and decline of timber productivity as a result of changes in the floristic composition to favor non-commercial species. These changes affect the ecological functions of mangroves, as a breeding and feeding ground for marine life, as a buffer zone against tidal waves, and as an erosion control belt to protect the coral reefs and even the fish ponds further inland (Zamora 1989; Cabahug, et. al. 1986).

Furthermore, the destruction of the mangroves has also caused a substantial reduction in fish catches within the mangroves and in the coastal areas, and indirectly affected the livelihood of the coastal communities who have been dependent on the resource.

3.2.1.2 ***Conversion to agriculture and aquaculture***

In many areas of the World such as Asia, Southeast Asia, and Africa, the pressure on arable lands has led to efforts to convert mangrove lands into agricultural lands for the production of both small grains and aquatic animal protein (Saenger, et. al. 1983). This usually involves the clear felling of the

mangrove trees, diggings to form the banks, construction of canals, diking to control the drainage of fresh water and the inflow of salt water.

Research in the Philippines (Zamora 1989; Primavera 1991; Cabahug, et. al. 1986; Camacho & Bagarinao 1986) on the impact of the conversion of mangroves into aquaculture showed it had contributed to the total destruction of the ecosystem, affecting not only the ecology, but the socio-economic livelihood of the coastal communities. The ecological role of mangroves in supporting the faunal population of the adjacent estuarine and marine ecosystems in the form of detritus, nutrients and as a breeding or nursery ground is disrupted and this effect continues up the food chain to man (Zamora 1989). The destruction of mangroves as a buffer zone against destructive wind, wave action and as an erosion control mechanism, also destroys coral reefs and even aquaculture ponds further inland.

A further environmental repercussion of the construction of aquaculture ponds within mangrove areas is the flushing of effluent within the neighboring mangroves and coastal waters (Primavera 1991; Camacho et.al. 1986). The massive extraction of fresh water from underground aquifers for salinity control on fish ponds also drains aquifers, which are consequently subjected to salt water intrusion which is detrimental to the quality of water for human consumption. The water level also declines and attendant compaction of aquifer eventually leads to land subsidence and vulnerability to floods (Primavera 1991).

Severe acidification, due to the exudation of sulfides within these aquaculture ponds and agriculturally developed farms, also causes soil problems inhibiting algal growth, retards the growth of fish during heavy rains after the dry season, thereby reducing productivity (Camacho & Bagarinao 1986).

The social implications of agriculture and aquaculture, on the other hand, have been recorded as being the cause of reductions in the quantity of food fish

and domestic agricultural water supplies, marginalization of coastal fishermen, displacement of labor, and credit monopoly by big businessmen (Primavera 1991). In general, such commercial exploitative activities have not improved the living standards of the local coastal communities. Instead, they have brought social displacement and marginalization of these communities, as well as high ecological costs discussed previously.

The economic consequences of commercial exploitation of mangroves, e.g. aquaculture, indicates lucrative returns and benefits and likewise contributes to the escalation of protein production in the Philippines. However, research on the long term viability of this economic venture shows that they may be beneficial only for a very short time since the industry is highly dependent on static market conditions (Primavera 1991). Instead, the mangrove resource which is supposed to be supporting the people for a long period of time has been utilized for a quick return, depriving future generations of their options for use.

3.2.1.3 ***Salt pond construction***

Salt ponds are built on mudflats or more commonly in basin type of mangrove forest. Their construction requires a complete eradication of trees and shrubs, levelling and diking of the land, construction of flooding canal systems and intensive mechanical compaction of the soil surface, and their operation is facilitated by the solar heat input. Under operation, salt ponds are subjected to an inundation regime dependent on local evaporation rates and labor available for gathering the raw salt. The repeated inundation and drying of the soil surface increases the salt content of the soil and also alters the soil structure. Such ponds may later be abandoned for various reasons and will therefore remain a waste land, because of the difficulty of rehabilitating these areas (Saenger, et. al. 1983).

3.2.1.4 **Diversion of fresh water**

Fresh water flow into the mangroves is altered by various upstream activities (e.g. irrigation, hydro-electric dams), which may cause significant damage to the mangroves and associated fauna in a variety of ways. The dominant effects results from progressive increases in dry season soil salinity and result in the gradual displacement of mangrove species by others more tolerant of the increased salinity. This can have severe consequences when a local industry is dependent on a sustained supply of the species being replaced, e.g., the *Rhizophora* species which are commonly used for fuel.

Reduced dry season fresh water in the mangrove environment also affects terrestial fauna, dependent on both a source of fresh water and sufficient food during the dry season. Mangrove-dependent fisheries are also affected by less favorable habitat conditions imposed by higher water salinities and by reduced production and export of leaf detritus. The reduced flushing may result in the accumulation of detritus where it is unavailable to dependent communities offshore. Although this debris may be ultimately flushed into nearshore water during the rainy season, the modified amount and/or timing may cause changes in the dependent communities. Consequently, this causes sparse and stunted growth of mangrove trees (Saenger, et. al. 1983).

3.2.1.5 ***Mining/mineral extraction***

Globally, there are rich alluvial deposits of minerals within the coastal areas, such as tin, chromium, etc. The exploitation of these minerals in the coastal zone takes place upstream and downstream and within the mangrove ecosystem. Mining within the mangroves results in its complete destruction, whereas mining in adjacent areas causes variable adverse effects. The dominant effect is the deposition of large materials (such as rocks and trees) which are transported to and within the mangroves. Excessive sedimentation is detrimental to mangroves through its blocking role in the exchanges of water, nutrients, and gases within the substrate and between the substrate and overlying water. When this exchange is totally blocked, the mangroves

usually die. Partial cessation of exchange imposes a stress on mangroves which is manifested in reduced productivity and reduced survival as a result of being made significantly more susceptible to any further stress (Saenger, et. al. 1983).

The turbidity and increased siltation caused by dredging and overburdened disposal also results in the destruction of local corals, sea grasses, and their associated faunas. It may also disrupt detrital-based food webs which may reduce fish catches.

Therefore, as can be expected, potential short-term economic gains from mining generally exceed short-term economic or natural value of the mangroves. However, mining could be viewed as a temporary land use in areas, which if not rehabilitated will remain unproductive.

3.2.1.6 ***Waste disposal***

Where human population and industrial development have been doubling in some urban areas, waste (solid and fluid) have usually increased three to four times. These wastes have been dumped where they would not be visible to people and/or transported through the water systems. Since most major tropical and subtropical urban centers are located on coasts or estuaries, and since mangrove areas have been traditionally regarded as wasteland, much garbage and effluent has been dumped into these areas (Saenger, et. al. 1983).

Disposal of waste to the mangrove ecosystem causes severe damage. Though the area affected is very small in global scale, these areas are very important because of their proximity to population centers.

3.2.1.7 ***Coastal development***

The destruction and the conversion of mangrove lands for domestic and industrial development is a major problem in high income countries and is

beginning to become a problem of consequence in developing countries. The most common forms of conversion are to housing and residential development, tourism and industry (Saenger, et. al. 1983). These activities, like those previously discussed, require modification of the mangrove ecosystem and therefore alter the ecological process.

3.2.2 **Management Implications of the Sociology of Mangrove Ecosystem**

The sociology of the mangrove ecosystem implies several social issues that need to be considered in the formulation and implementation of mangrove policies and programs. Firstly, the incidence of poverty within the coastal areas need to be recognized as basic consideration of policies about mangrove development. The mangroves as a common resource, have been considered as the ultimate source of livelihood of some coastal dependent people in most Asian countries. Because of poverty, mangrove resources have been continually depleted causing life more miserable for those dependent on the resource. Mangrove development policies need to understand poverty problems because it has grown as one of the main causes of mangrove destruction.

Secondly, there is an inequitable utilization of mangrove resources that needs to be considered in order to promote sustainable utilization of the resource. Policies about the management of mangroves should recognize traditional communities or users of a particular mangrove area. They should encourage local utilization of mangrove resources by reducing or eliminating commercial exploitation. If possible, utilization within carrying capacity of the resource should be promoted in order to sustain the benefits derived from them.

Thirdly, formulation of policies and programs about the management of mangroves should recognize existing socio-cultural factors within a particular mangrove area. The people who are directly dependent on the resource should be involved in deciding what is best for them. In such a situation, the

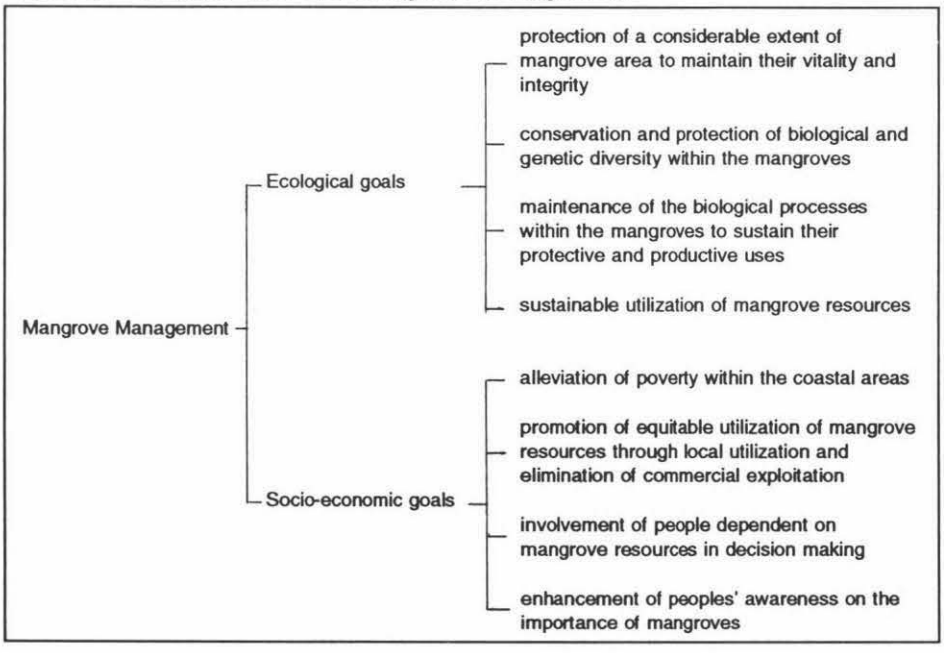
mangroves are supposed to be utilized and managed by the people for their own sake.

Lastly, there exist conflicting views or interests in the management of mangroves. Apparently, they have been viewed as an economic resource that needs to be utilized, with limited consideration of their ecological importance. As such is the case, value reorientation is required both from the government and the people to consider the interrelationships of economic and ecological uses of mangrove forests.

3.3 **CONCLUSION**

The discussion of the ecology and sociology of the mangrove ecosystems suggests several management goals that may be considered in the management of the resource. These are summarized in Table 3.4

Table 3.4 General Goals for Mangrove Management



CHAPTER FOUR

CONCEPTUAL SET OF GOALS AND CRITERIA FOR SUSTAINABLE MANGROVE DEVELOPMENT

The objective of this chapter is to combine the general goals for sustainable development of natural resources identified in Chapter 2 and the general mangrove management goals derived in Chapter 3 to develop a conceptual set of goals for sustainable mangrove development and criteria in evaluating mangrove policies and programs. The conceptual set of goals and criteria may not be considered universal set. Rather specific goals vary with different types of ecosystem (e.g. coral reef or tropical forest). However, the set of goals and criteria will be tested in the evaluation of mangrove policies and programs in the Philippines, a challenging case wherein mangrove management is fully influenced by the existing reality of the interrelationships of three types of issues that must be considered - the socio-economic, ecological and the institutional issues.

4.1 THE CONCEPTUAL SET OF GOALS FOR SUSTAINABLE MANGROVE DEVELOPMENT

Discussions of mangrove ecosystems have disclosed that mangroves are unique and fragile ecosystem. They are complex and diverse and serve various functions in the tropical and subtropical parts of the world, including vital coastal protection, breeding and feeding grounds for marine fauna, as a source of genetic material, recreation and education, and as important components of the economic resource base, especially in Asia and the Pacific regions.

In the past, mangroves in Asia and the Pacific regions have been generally viewed as an alternative source of timber, an alternative agricultural land and a fishery resource. They have been managed under the concept of sustained-yield management for the production and sustenance of a maximum volume of timber and charcoal for local and export purposes, and the provision of livelihood and employment opportunities for the mangrove dependent

communities. The system aims to harvest the maximum benefits from the mangrove forest without necessarily sacrificing the loss of ecological balance (PCARRD 1991).

As defined, sustained-yield management is the continuous and periodic production of forest products to achieve an approximate balance between growth and harvest at the earliest practicable time (PCARRD 1991). In other words, the mangrove forest is managed in such a way that it would provide a sustainable harvest with economic returns and at the same time renew itself naturally or with minimal help. In natural mangrove forest, the sustained yield concept takes a 20-40 year cutting cycle. The system permits the clear-cutting of mature trees in batches, leaving a considerable number of seed trees to regenerate the area. If there are no natural regenerations in three years, replanting is done with the desired species suited for a specified purpose, or in this case, commercial species (PCARRD 1991).

With the implementation of the sustained-yield concept of mangrove management, researchers (Snedaker & Getter 1985) believe that some mangrove forests in Asia are the best managed in the World. However, while sustained-yield is a success in mangrove forest management in some areas, most mangrove areas in most countries in the tropics have been overexploited and some high quality mangrove forest have been consigned to unsustainable uses, such as the wood chip production in Indonesia (Saenger, et. al. 1983). Large tract of the mangrove areas were also alienated and converted to single uses such as aquaculture ponds, agriculture, human settlement, and industrial development, which eventually cause severe destruction of the resource.

Mangroves have been continually depended on for economic development in these countries and have, likewise, assumed the nature of the commons. They have served as home to most of the world's impoverished population which depends on their resources, largely determining its state of ecological diversity and resilience. These pressures, linked to ever increasing resource utilization

and the impact of expected environmental and climate change, will generally have major effects on the mangroves and the coastal zone.

The situation has become so alarming that a reorientation of mangrove policies and programs is required. The concept of sustainable development discussed previously provides a new development paradigm that may be considered in mangrove management. It emphasizes the interrelationship of three development perspectives, namely, the socio-economic, ecological, and institutional issues, wherein mangrove policies and programs may be formulated and evaluated.

The implications of the concept of sustainable development, the ecology and the sociology of the mangrove ecosystem suggests that mangrove policies and programs must provide particular attention to human concerns as a basic imperative in the protection and conservation of mangroves. Most importantly, mangrove policies and programs should be directed towards the alleviation of poverty or the improvement of the quality of life within the coastal areas, at the same time conserving and protecting the resource for ecological uses and future generations. The sustainable utilization of the resource must be encouraged to achieve present needs and to provide adequate reserves suitable for the protection of the diversity of floral and faunal species within them, for scientific research and for future generations.

Given the acceptance of the concept of sustainable development and the severe social and ecological impacts of commercial exploitation of mangroves, policies and programs also need to resolve such exploitation scheme in order to achieve sustainability. Such management scheme should be rationalized by considering the people who have co-existed with the resource for some time. Their rights and dignity as traditional users/occupants of the mangroves must be recognized in order to achieve their commitment and support in the conservation and protection of the resource. In some places, for example, as

in the case of Samoa, their traditional fishing taboos have served as an effective management technique in conserving their coastal resources.

There should also be participative planning and decision making on mangrove programs or land uses that are implemented in a particular mangrove area. The socio-cultural and ecological factors shall serve as the basis of making decisions that best suits the needs of the communities concerned and the sustainable development of the mangroves. Effective and well-supported environmental programs have always been known to have the full participation of concerned and affected individuals.

On the other hand, protection of a completely unexploited mangrove forests in some locality or protection of part of an extensive mangrove forest may also be desirable policies. Such unexploited areas may serve as a refuge for flora and fauna and as a resource for restoring areas in which management policies have failed. They could serve as a baseline in studying the effects of human activities in unexploited areas. Protected areas could also serves as a source genetic material in the development of more salt-tolerant mangrove species for adaptation to climatic changes. Likewise, protection of some portion of a mangrove area could buffer the area generally and form an advantageous part of an overall sustainable managed area by serving as a barrier to severe environmental conditions.

Considering the geography and structural formation of mangroves, they should also be viewed as a part of complex coastal ecosystem of interrelated habitat and dependent biota, which in turn is maintained by physical processes such as natural drainage patterns and rates of freshwater discharge from the rivers, and tidal and salinity regimes. It is the natural movement of the water that provides the essential link between terrestial and aquatic elements of the coastal ecosystem. Thus, in policy formulation and analysis for mangroves, it is important to recognize that some activities in mangroves have far-reaching effects on associated coastal areas. Clearly, then, mangrove areas should be

considered as a significant part of the coastal ecosystem and mangrove policies and programs must be coordinated with the overall aims of coastal planning.

In addition to the above policy imperatives and as implied by the concept of sustainable development, the potential for implementation of sustainable mangrove policies relies on the institutional and administrative system in which mangroves are regarded. To effectively achieve the sustainable development of mangroves, coordinated efforts and strengthened commitments in the management of the resource must be achieved. Foremost, it should be clarified to all individuals or groups of individuals including the government agencies concerned that they are responsible for caring for the human, plants and animals within the mangroves. Social values that strongly support mangrove conservation must be developed through the strengthening of environmental awareness of the complex nature of mangrove ecosystem and its role in providing economic development.

It must also be ensured that the people are given an opportunity in decision-making and implementation of programs. To achieve this, IUCN (1991) recommends an integrated scheme of management which requires planning and management at the community, regional, national, and international levels (Figure 4.1). Such a management scheme requires the complete participation of all sectors of the government and community to ensure decisions are directly related to the specific needs of the people and the mangrove ecosystem. Therefore, mangrove policies and programs also need to be comprehensive so as to protect the needs of future generations through the integration of conservation and development.

To summarize, mangrove policies and programs must therefore be directed towards the achievement of the following goals:

4.1.1 **Socio-economic Goals**

- alleviation of poverty within the coastal areas through the provision of basic human needs and the strengthening of social services in these areas;
- enhancement of equitable distribution of benefits from the mangroves through reforms of access rights in the utilization of the mangrove resource;
- involvement of local communities in planning and decision-making;

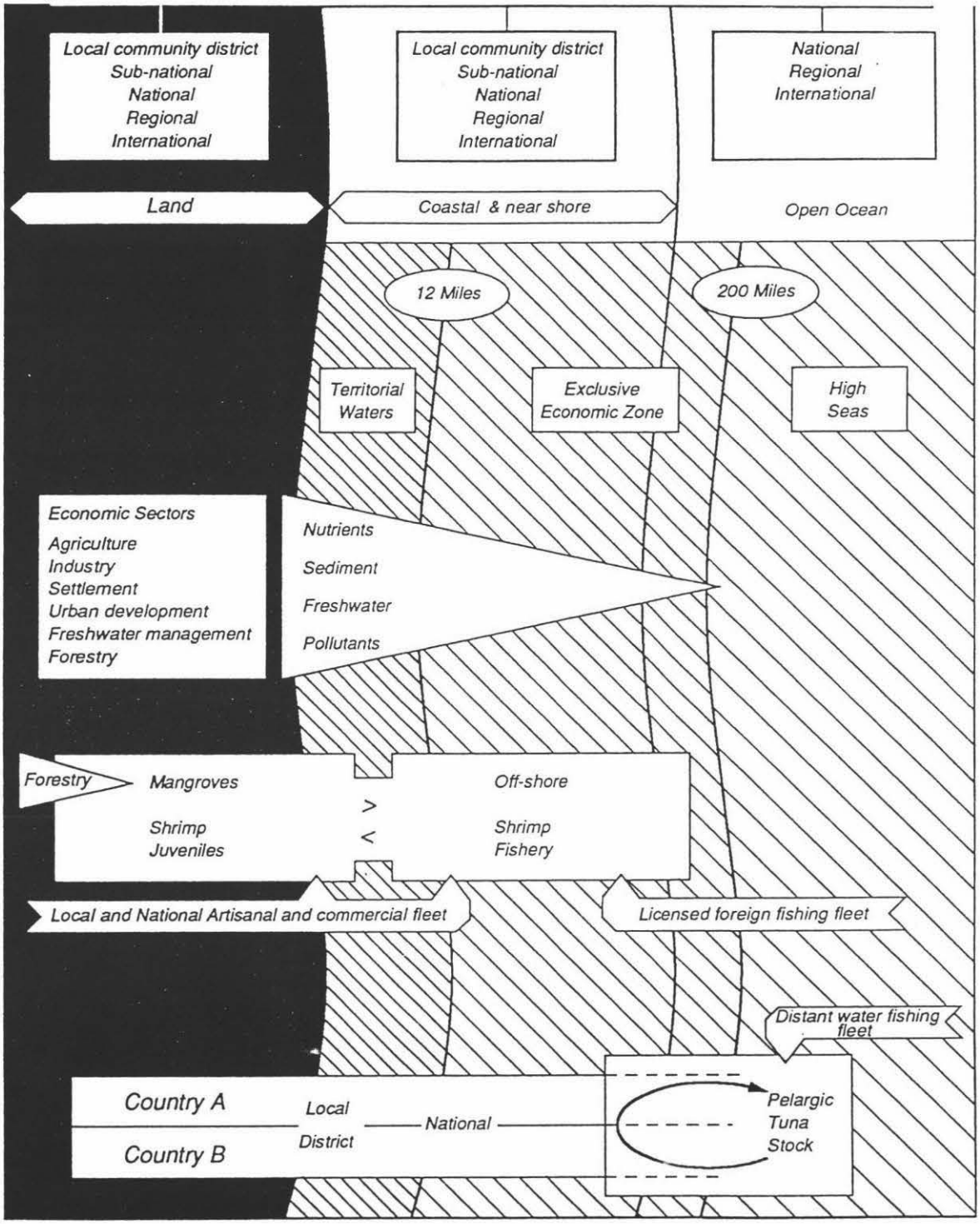
4.1.2 **Ecological goals**

- conservation and protection of ecological processes and the life support system within mangroves;
- conservation of biological diversity in the mangrove areas to maintain ecological vitality and integrity;
- sustainable utilization of mangroves resources to meet present and future needs;

4.1.3 **Institutional Goals**

- value reorientation of concerned individuals towards a responsibility in respecting and caring for human, plants and animals within mangrove areas;
- promotion of awareness about the complexity of mangrove ecosystems and their role of the mangrove forest in providing resources for economic development to develop social values that are strongly supportive of mangrove protection;
- a comprehensive planning system which embraces a long-term horizon and the integration of mangrove conservation and development;
- empowerment of the local people through the decentralization of decision making and implementation of mangrove policies and programs; and,
- strengthening of commitment and coordination of individuals and institutions devoted to the cause of conserving the mangrove.

Figure 4.1 Planning and management scheme for coastal resources (Source: IUCN 1991)



This conceptual set of goals for sustainable mangrove development is largely based on the conviction of several authors concerned with sustainable development as discussed in Chapter 2. Improvement of the quality of life of poor people serves as the basic imperative in the conservation and protection of natural resources. As emphasized, such goals of sustainable mangrove development should be accompanied with institutional goals that need to be considered not only as a strategy, but also as fundamental goals of sustainable mangrove development.

The framework developed for the management of mangroves may not be the most ideal for all the mangroves and a particular management system may be developed for a specific mangrove area or ecosystem, depending on the given set of socio-economic, ecological and institutional conditions. Meanwhile, criteria of sustainability or effectivity of mangrove of mangrove policies and programs can be discerned from this set of goals, to be discussed in the succeeding section.

4.2 CRITERIA FOR SUSTAINABLE MANGROVE DEVELOPMENT IN EVALUATING MANGROVE POLICIES AND PROGRAMS

In the development of a conceptual set of goals for sustainable mangrove development discussed above, several criteria may be identified to evaluate of national mangrove policies and programs. Such sustainable mangrove development criteria provide information, directly or indirectly about future mangrove sustainability of specified levels of socio-economic, ecological and institutional goals. In this study, sustainability of mangrove policies and programs refers to the extent to which the goals of sustainable mangrove development are achieved in the implementation of a particular program. To facilitate identification of such criteria, the conceptual set of goals for sustainable mangrove development discussed above will be synthesized, as follows.

4.2.1 **Socio-economic Criteria**

The identified socio-economic goals for sustainable mangrove development express the need to alleviate poverty, enhancement of equitable mangrove utilization, and local participation in planning and decision making. These socio-economic goals have some implications on both the ecological and institutional goals and are being recognized in the developing countries as significant factor in mangrove management.

4.2.1.1 ***Alleviation of Poverty***

To achieve sustainable development of mangroves, goals and objectives of policies and programs should be the alleviation of poverty within coastal areas through the provision of basic needs of the entire population dependent on the resource for survival. This includes not only their economic needs but also a wide range of social goods (e.g. food, clothing, shelter) and social services (e.g. education, health services, etc.). Basic needs further include the right of individuals to participate in their own development and free access in the utilization of their own resources (Barreiros 1988). Achieving these needs contributes to the preservation of coastal communities as well as a real improvement of the overall quality of life, the basic goal of sustainable development.

In the policy analysis, some of the criteria for the alleviation of poverty are indicated by parameters such as the income earning opportunity or capacity offered by the implementation of a certain program and the access of coastal communities to public services. These criteria are relative. However, because of their simplicity they are realistic indicators of the status of the different sectors of a certain community (Barreiros 1988). Providing income opportunities and basic services, for example, would alleviate poverty within the coastal areas, which is the basic goal of sustainable development. Income serves as the basic resource by which such individuals can satisfy their need for basic goods and services, and provides a sense of personal satisfaction to each individual (Conyers 1989).

The provision of public services, such as education, health, etc., may also be an important criterion in alleviating poverty within coastal areas. These services have some implications in the community's welfare. Education, for example, affects the communities' economic development through the provision of skilled manpower as well as being of social benefit to the people who receive the education. Similarly, the improvement of health in the labor force can increase productivity and result in a better life for the community (Conyers 1982). In essence, a particular mangrove program should not only be limited to provision of income opportunities, but also provision of basic services to coastal communities.

4.2.1.2 ***Enhancement of equity and justice in mangrove utilization***

The extent of social and economic inequalities among coastal communities and big businessmen operating within the mangroves has an important implication on the nature of policies and programs towards mangroves. In most developing countries, like the Philippines, poverty and the capital intensive utilization of mangrove resources have caused disorganization of coastal communities and even destruction of mangrove areas. The advancement of a few rich individuals, which drains the mangrove resource base, has further pushed the coastal inhabitants into a desperate struggle for survival, having no choice but to illegally utilize mangrove resources even, up to their carrying capacities.

Self regulation in the exploitation of natural resources can be achieved by assigning secure access rights, perhaps even private ownership over mangrove resources to responsible individuals and communities. Through secure access rights, the individuals or community establish a lasting relationship with the mangroves and a long-term stake in its protection for sustained productivity (DENRc 1990).

Therefore, mangrove policies and programs must recognize the need to develop creative and secure instruments such as stewardship contracts,

community forest management agreements, etc., to ensure equitable access and tenurial security in the utilization of mangrove resources. It has to be noted, however, that an essential condition for transferring control over mangrove resources or distributing resources rights is for the recipients to demonstrate their capacity for sustainable development of such resources.

4.2.1.3 ***Local participation in planning and decision making***

Decentralization of decision making would also increase the efficiency of mangrove policies and programs because they would be better suited to the needs of the coastal inhabitants. Local level decision making provides a means of obtaining information about local conditions, needs, attitudes, and without this, mangrove policies and programs are likely to fail. People are more likely to be committed to a development program if they are involved in its planning and preparation because they see it as their project and are more likely identified with it. Furthermore, popular participation must be encouraged because it is a basic democratic right (Conyers 1989). People have the right to decide the sort of development which should take place in their locality.

In the sustainable development of mangroves, policies and programs should, therefore, encourage local participation in planning and decision making in order to ensure the acceptance or adaptation of coastal communities, particularly if a change in the values and preferences of these people is required.

4.2.2 **Ecological Criteria**

The identified ecological goals for sustainable mangrove development are maintenance of the mangrove ecological processes and life-support system, conservation of biological diversity, and sustainable utilization of mangrove resources. There are no widely accepted criteria of achieving these goals. However, the Environmental Monitoring and Assessment Program of the United States (1990) on wetlands indicated five categories of effects of ecological changes serving as the basic reference in identifying ecological

criteria. With specific reference to mangroves, these are: changes in standing biomass; decline of abundance, diversity and composition of mangrove species; changes in net or gross primary production; changes in pathways and nutrient cycling; and, retrogression.

4.2.2.1 *Standing biomass*

Change in standing biomass is indicated by the extent and structural patterns of mangroves. The mangrove areal extent provides a quantitative measure of available habitat for fish, shellfish, wildlife, and the quantity of goods available to man in a certain area. The more extensive a mangrove area is, the more productive it is.

Their size and structural patterns are also an important measure of their ability to maintain the stability of the mangrove ecosystem and adjacent areas. Changes in areal extent and structural pattern indicates areas of detrimental impact, wherein measures could be initiated for rehabilitation or the mitigation of such activities.

In essence, to maintain mangrove ecological processes and life-support system, policies and programs must be directed to maintaining a considerable area of mangroves along the coast. Policies and programs should promote sustainable utilization of the estuarine, basin and dwarf mangrove forest; protection of fringe mangrove forest or strips of vegetation near the coast, and areas which are susceptible to storms and considered relevant in protecting marine species; and, rehabilitation or reforestation of already degraded areas.

4.2.2.2 *Abundance, diversity and composition of mangrove species*

Decline of abundance, diversity and composition of mangrove species is actually indicated by the vegetative characteristics of major species (e.g the ratio of indigenous vegetation to exotic species), life form and density. They also indicate ecological productivity, water salinity, landscape aesthetics and animal habitat suitability.

Mangrove plant diversity and related ecological functions (e.g. nursery and breeding ground) are not the only aspects of mangroves that are valued. The importance of habitat - a major component of which is vegetation - in maintaining populations of endangered animal species must also be recognized. Mangrove vegetation is the most common reliable measure to determine changes in the ecological condition of the mangrove ecosystem (US Department of Commerce and Technology 1990).

Thus, to maintain vitality, integrity and sustainability of the mangroves, policies and programs should therefore be directed towards conservation of indigenous species and maintenance of species diversity. This could be through absolute preservation, sustainable utilization, or replanting of such species, depending on prevailing socio-economic and ecological needs of a certain mangrove area.

4.2.2.3 ***Net or gross primary production***

Mangrove primary productivity refers to benthic productivity of the intertidal zone, aquatic productivity of the plankton community and tree productivity. Information on mangrove primary productivity provides indication of the ecosystems' ability to support life vitality, integrity and sustainability. It provides an understanding of mangroves contribution to coastal fisheries and other forms of life within the ecosystem (Gong Wooi-Khoon 1984).

However, primary production is considered an ambiguous measure of mangrove condition (US Department of Commerce and Technology 1990). Measurement needs to consider various components of productivity, which is oftentimes impossible. Net production, for example is measured through tree-ring analysis. A problem, however, is many ecosystems do not exhibit net production, whereas others indicate significant accumulation of biomass in early stages of succession, followed by declines to no net growth during later climax phases. Gross production, which involves the measurement of a twig

with leaves, a whole tree, or a portion of the community, is also affected by many variables.

This ecological criteria is largely influenced by the environmental conditions prevailing in a particular mangrove area. In the evaluation the productivity of a certain mangrove area may ultimately be based on standing biomass or abundance, diversity, and composition of a certain mangrove area. These factors enable the maintenance of a favorable condition suitable for the growth of mangrove trees and other related animal species.

4.2.2.4 ***Pathways and Nutrient Cycling***

Direct measurement of nutrient cycling is difficult to achieve. Nutrient export from a river system, either via forest clear cutting or because of altered hydrologic regimes, leads to significantly modified nutrient pathways. Similarly, declines in abundance of consumers and decomposers can significantly alter nutrient cycling and may impair the overall ecological function of mangroves.

Organic matter and sediment accretion are the surrogates of nutrient cycling which may indicate sustainability of mangroves. Rates of organic matter and sediment accretion integrate both the hydrologic processes and vegetation response of the primary productivity of mangroves. The rates of organic matter and sediment accretion may also indicate habitat quality for growth of fish and shellfish and the long-term sustainability of mangroves. Significant changes to these rates further indicate an early warning of deteriorating mangrove condition. For example, the rate of sedimentation, along with the sediment source and distribution within a certain mangrove area, can indicate hydrologic processes, as well as changes in the surrounding landscape that result from the interruption of drainage or erosion. Sediment accretion rates also provide a good indication of trends in trophic status and long-term sustainability of a mangroves ecosystem. Changes in environmental process on surrounding landscapes, such as disrupted rates of drainage or erosion,

are often reflected in altered mangrove hydrology and subsequent sediment accretion rates.

Hydrologic processes or the flow of water to and from the mangroves is an important determinant for the establishment and maintenance of mangrove areas. Changes of the hydrologic process are probably the most common impact associated with human alteration of the mangrove ecosystem. Ecosystems' level of response to an altered hydrology are changes in species composition, habitat quality and in water salinity, among others. Because hydrologic process affect nutrient availability, soil salinity, sediment properties, pH, and species composition, changes in hydrologic periods can bring about changes in nearly all other components of mangroves, both biotic and abiotic.

Pollution of water flows is also one of the major causes of changes in nutrient cycling. Polluted water and sediments deleteriously affect plant species composition and consequently fish and shellfish species.

Thus, to maintain ecological vitality and integrity of mangroves, policies and programs must be committed towards the maintenance of natural processes within the mangrove ecosystem. This may be carried out through sustainable utilization of mangrove trees and prohibition of land uses which disrupt stream flows, such as the construction of fish ponds. Rehabilitative measures may also be introduced to restore the natural mangrove ecological processes.

4.2.2.5 ***Retrogression***

Retrogression is a large-scale ecosystem change in the direction of earlier stages of succession (US Department of Commerce and Technology 1990). Retrogression is determined through indicators like community organization and species composition measures which indicate the sustainability of a particular mangrove area. Community organization refers to the presence of all ages of mangrove trees in a particular mangrove area, from the mature, to the sapling and young stages of growth. Their variability indicates the degree

to which utilization of mangroves is sustainable. Strip cutting with the retention of a considerable number of seed trees, has been the general silvicultural practice adopted in most mangrove stands in Asia and the Pacific Region. In some areas, this practice has shown favorable result. However, it has failed in areas where cutting is motivated by commercial interest.

Species composition, on the other hand, refers to the diversity of species within a particular mangrove stand. The more diverse the mangrove tree species are, the more a mangrove stand is able to withstand biological or physical stress, up to a certain limit.

Thus, to achieve the goals of maintaining integrity and sustainable utilization of mangrove resources, policies and programs must recognize the carrying capacities in the utilization of the resource and the maintenance of an uneven-aged mangrove stand.

4.2.3 **Institutional criteria**

The institutional goals identified in the proposed set of goals for sustainable mangrove development are: the value reorientation of concerned individuals towards caring for the human, plants and animals within the mangrove areas; promotion of awareness of the complex nature of mangrove ecosystem; a comprehensive planning system which embraces a long-term horizon and the integration of conservation and development; the empowerment of the local people through decentralization of decision making and implementation of policies and programs for mangroves; and, the strengthening of coordination of individuals and institutions devoted to the cause of conserving the mangrove. These sets of institutional goals appear to be strategies in achieving both socio-economic and ecological goals. However, they could be considered as criteria in evaluating the sustainability of policies and programs in achieving the sustainable development of mangroves.

4.2.3.1 ***Respect and care for the community of life***

In general, mangrove policies and programs must impose an obligation on coastal inhabitants and other coastal users to live in harmony with the mangrove ecosystem, on which they depend for survival. Mangroves must be utilized, with due consideration of their carrying capacities, through community-based arrangements that encourage localized utilization of the mangrove resource. With such a policy, the coastal inhabitants are able to have progressive social change, while conserving and protecting their own environment. Such a policy also enables the clarification of values at stake in decision making and gives moral reasons for alternative courses of action.

Achievement of this goal is indicated by changes in attitudes, with individuals' caring for other people and the protection of mangroves. Goal achievement levels of this criteria requires a survey about individuals perception on mangroves. However, this study is limited by only projecting impacts of mangrove programs in changing attitudes of coastal communities.

4.2.3.2 ***Environmental awareness***

Mangrove policies and programs must also be geared towards promotion of environmental awareness among individuals who are dependent and/or concerned with mangroves. Coastal inhabitants must be made to understand and appreciate the complex nature of the mangrove ecosystem, as well as the role played by a properly managed environment in their socio-economic development. They must develop social values supportive of environmental protection and create the political will to deal with difficult environmental issues. This is because only a well informed and motivated citizenry could provide the popular support necessary for the sustainable development of mangroves.

This goal, like caring and respecting the community of life, requires a social survey. It is indicated by the changes in individuals' perception of conservation and protection of mangrove resources. At this stage, however,

goal achievement may be measured in terms of the programs inclusion of environmental awareness strategies as a component of the program in the management of the mangroves.

4.2.3.3 *Comprehensive planning system*

To achieve sustainable development of the mangroves, policies and programs must be cognizant of the promotion of a widespread development, for present and future generations. Mangrove development programs must be based on both the achievement of basic needs of coastal communities and the protection of mangrove productivity and diversity. In so doing, reactive programs may be developed to achieve short-term goals which are consequently directed towards the attainment of the long-term goal of building a constituency for the sustainable utilization and protection of mangroves. The achievement of this goal is measured in terms of the program's commitment in providing widespread development and in recognizing both the human needs and the ecological needs as a part of the mangrove development strategy.

4.2.3.4 *Administrative decentralization*

A decentralized form of government must be adopted to improve policy formulation and implementation and to enhance participation in decision making and development. This form of government also redress inequalities between rich businessmen (who have more access and benefits from mangrove resources), and the coastal inhabitants (who have been considered illegal occupants but are largely dependent on mangrove resources for survival). It enable the desire to utilize mangrove resources in the interest of achieving sustainable development and the need to maintain political support from the local people, who are the main agent of development.

The achievement of this goal in indicated by the level of local participation being encouraged by a certain program in the planning, decision making and implementation of programs towards development of mangroves.

4.2.3.5 *Strengthening commitment and coordination in mangrove development*

Considering the nature of the mangrove as an open ecosystem, non-exclusive and a common resource, policies and programs must form part of an integrated scheme of management which requires planning and management at community, regional, national, and international levels. An effort should be made to collaborate with local people, other government agencies, non-governmental and international organizations concerned with protecting mangroves. As discussed earlier, this is to strengthen the commitment of the different sectors concerned with mangroves and to facilitate the exchange of expertise, the process of scientific research and the mobilization and allocation of funding for important purposes. The achievement of this goal is indicated by the level of commitment and links developed between organizations and individuals responsible in the management of mangroves.

4.3 **CONCLUSION**

Based on the above discussions, the criteria for sustainable mangrove development in evaluating mangrove programs are presented in table 4.1. They are considered to be general criteria. However, they may be effective in anticipating program impacts to be considered in the evaluation of mangrove policies and programs and may be applied in the framework provided by the Goal Achievement Matrix methodology.

Table 4.1 Conceptual goals and criteria for sustainable mangrove development

DEVELOPMENT PERSPECTIVE	GOALS	CRITERIA
Socio-economic	Alleviation of poverty	increased income earning opportunity and social services (e.g. education, health, etc.)
	Equity and justice in resource use	reformed access rights or security of tenure in resource use (e.g issuance of stewardship contract)
	Local participation in planning and decision making	increased involvement of local people in planning and decision making
Ecological	maintenance of mangrove ecological processes and life support system	maintenance of extensive mangrove area and structural pattern (e.g. sustainable utilization of the estuarine, basin and dwarf mangrove forest; protection of fringe mangrove forest or strips of vegetation near the coast, and areas which are susceptible to storms and are considered relevant in protecting marine species; and, rehabilitation or reforestation of already degraded areas)
	conservation of mangrove diversity	maintenance of diversity and species composition (e.g. absolute preservation, sustainable utilization or replacement of indigenous mangrove tree species)
	sustainable utilization of the mangroves	maintenance of organic matter and sediment accretion (e.g. sustainable utilization of mangroves, reforestation of denuded portions, and limitation of destructive land uses which disrupt mangroves ecological processes and life-support system)
		maintenance of mangrove community organization and species composition (e.g. presence of uneven-aged mangrove forest trees)
Institutional	Respect and care for the community of life	increased individuals' inclination in caring and protecting human, plants and animals
	Environmental awareness	increased individuals' perception on the importance of mangroves
	Comprehensive planning system	increased recognition of basic human needs and ecological needs in planning
	Administrative decentralization	devolution of mangrove management responsibility to coastal communities
	Integrated mangrove management	increased coordination and commitment of concerned individuals and agencies in mangrove development

CHAPTER FIVE

THE GOAL ACHIEVEMENT MATRIX AND ITS APPLICATION IN MANGROVE PROGRAMS EVALUATION

This chapter discusses Goal Achievement Matrix (GAM) as the appropriate technique to achieve the objective of this study to emphasize the relevance of policy evaluation in sustainable development of natural resources. It includes the discussion of the advantages and disadvantages of using GAM as a decision making technique and its application in the evaluation of mangrove policies and programs.

As discussed in the previous chapter, sustainable development of mangroves deals with the achievement of goals of three interrelated issues: the socio-economic, ecological, and institutional. Development criteria are identified, based on these issues, to be considered in both the formulation and evaluation of mangrove policies and programs. Traditionally, decision making about management of mangroves has viewed these issues either independently, or jointly, with one being considered as the dominant view. Obviously, the process compromises the rationality of policy formulation and evaluation. The Goal Achievement Matrix, as a decision making technique, enables analysis of the three interrelated issues simultaneously, to provide decision makers with better policy options and understanding of issues at hand in mangrove management.

5.1 THE GOAL ACHIEVEMENT MATRIX

The Goal Achievement Matrix developed by Hill (1968), in an urban planning context, is an analytical technique that attempts to determine the extent to which alternative plans or policies achieved predetermined development goals or criteria (Hill 1968). GAM provides the relative ranking of each alternative policy considered, and the extent to which development criteria are fulfilled (Patton 1986). To achieve this, each policy alternative is designated with

accounts to measure the degree to which it achieves a particular development criterion, and its overall performance in relation to the development criteria.

To illustrate, Table 5.1 shows an example of a goal achievement matrix. For each development criterion and resource user group, accounts are established to distinguish between the impacts that represent a progression and regression from a development criterion. The impacts on a development criterion are measured in the same units to permit an objective comparison between positive and negative impact, and to facilitate the comparison of alternative polices.

In this study, the ordinal scaling will be used in the measurement of the impacts of each policy alternative to each development criterion. Each policy alternative will be analyzed with respect to each criterion to determine whether it increases, decreases, or leaves development criterion at about the same level for the community as a whole and for groups within it (McAllister 1982). To facilitate this, similar but arbitrary values could be assigned, say **3** if a development criterion is highly satisfied, **2** if moderately satisfied, **1** if fairly satisfied, **- 1** if dissatisfied, and **0** if there is no effect on goals achievement. A detailed discussion on impact indicators is provided in section 5.2.2.

Value weights are also determined for each criterion in terms of their relative importance, and the importance of each development criterion to various groups is ranked. The weightings are the key to policy analysis because they represent the interests of various groups in the distribution of benefits relating to a particular goal, objective or criterion. In a democratic way, the determination of weightings on each development criteria should involve a general consensus of all the interest groups, which requires considerable research. This is not an easy task and the planners' intuitive knowledge and experience of a community's objectives is necessary in the development of an initial hypothesis concerning the community's goals and objectives (Hill 1968). In this study, for example, the weightings to be discussed later in this chapter

are assumed, based on the comprehensive review of the concept of sustainable development and the development issues of mangroves. This is done by assuming an equal weightings on each of the mangrove sustainable development goals or criteria to give emphasis to their interrelationships with each other. On the other hand, equal ranking is also assumed for each of the resource users dependent on the mangrove resource.

Table 5.1 The Goals Achievement Matrix

Development Criteria →	Weights ↓	Socio-Economic	Ecological	Institutional
Weights →		wa	wb	...
Resource Users ↓				
	w1	IS1=eixwaxw1	...	...
	w2	IS2=eixwaxw2	...	...
	w3	...	...	...
	...	...	...	...
Goal Achievement Score (GAS)		GASa=IS1+IS2+...	GASb	GASc
% Goal Achievement (%GA)		GASa/PGS	GASb/PGS	GASc/PGS
Goal Achievement Score Based on Weight (GASW)		%GAaxwa	%GAbxwb	%GAcxwc
Program Sustainability Score (PS)		%GAa+%GAb+%GAc		
% Sustainability		PS/PGSW		

where:

wa, wb, ... = relative weights of each development criterion

w1, w2, ... = relative weights of each resource user group

ei = the estimated impact of certain programs to each development criterion and resource user group

IS = reflect the extent of impact of a certain policy to each development criterion and by a particular resource user group (high score = high achievement)

GAS = reflect the extent of impact each program alternative to each category of development criterion and by the resource user groups (high score = high achievement)

%GA = reflects the ratio of the goal achievement scores to the perfect goal score that may be achieved in a particular criterion

PGS = the perfect goals score that may be achieved in a particular criterion

GASW = reflects the goal achievement score based on the weightings assumed for a particular development criterion

PS = reflects the overall goal achievement score of particular program based on weightings

PGSW = reflects the perfect goal score based on weightings

% Sustainability = reflects the ratio of the program score to the perfect goals score based on the weightings. It provides an indicator on how a particular program achieves the goals for sustainable mangrove development. The higher the ratio is, the more a particular program is sustainable.

In the evaluation, estimated impacts are multiplied by the weightings of both development criteria and resource user groups to derive the impact score (IS) of a particular program. As presented in Table 5.1, IS = ei x wa x w1. Then the Impact Scores (IS) will be totalled to derive Goal Achievement Score (GAS) or (IS1+IS2+...). GAS reflects the extent of impact of each program alternative to each category of development criterion and reesource user groups. The higher the score is, the higher the goal achievement is. The ratio of GAS to Perfect Goal Score (PGS) are then derived to determine Percent Goal Achievement (%GA). PGS is the achievable perfect goals score that may be derived in a particular criterion. %GA are then multiplied by the weightings assumed to a particular criterion to achieved Goal Achievement Score based on Weightings (GASW). GASW are also totalled to derived Program Sustainability Score (PS) which reflect the overall goal achievement score of particular program based on weightings. The ratio of PS to Perfect Goal Score based on Weightings (PGSW) are then derived to determine the Percent Sustainability (% Sustainability). % Sustainability indicates how a particular program achieves development goals or criteria. The higher the ratio is, the more a particular program is sustainable. PGSW is the achievable programs score based on weightings.

A separate goal achievement matrix evaluation is required for each program alternative to determine its relative importance. To complete the evaluation procedure, the results for each program alternative will be summarized, as shown in Table 5.2

5.1.1 **Advantages and disadvantages of using GAM**

In the survey of evaluation methods, GAM appeared to be the most desirable and practical methodology for use in this study. Compared with the Cost-Benefit Analysis (CBA) and the Planning Balance Sheet (PBS), GAM facilitates inclusion of multiple evaluation criteria, enabling comprehensiveness of environmental and natural resources planning in which unpriced environmental

Table 5.2 Results of GAM Evaluation

Program Alternatives → / Criteria ↓	Program 1	Program 2	Program 3
	% goal achievement		
% Sustainability			
Relative Ranking			

goods play an important role (Nijkamp, 1980; Shefer, et.al., 1990). GAM is derived from the concept of rational planning theory. Hill (1968), argues that PBS and other social cost-benefit analysis methods do not satisfy the requirements of rational planning. These requirements include the *a priori* formulation and weighting of development goals, objectives or criteria in advance of both the design of planning alternatives and an analysis of their consequences. Furthermore, GAM also possesses internal consistency which makes it easily understandable to interest groups, professionals and politicians (Patton 1986).

With the organization of impact information according to community goals, another advantage of GAM is its ability to be used in evaluating certain problems in terms of the community's values rather than those of a few individuals (McAllister, 1982). The organization of impact information into categories in GAM also facilitates an easier comparison of the advantages and disadvantages of the different policy alternatives. The statements of development criteria also provide important background information for selecting the best indicators of impacts. However, such criteria must be elicited from the majority of the people to determine particular weight of each criteria. Otherwise, GAM would not be very useful if weights are not objectively determined or assumed (McAllister, 1982).

Among the disadvantages of GAM, like CBA and PBS, is its inability to determine whether a certain policy or planning alternative should be executed or not. It is designed for the comparison and ranking of planning alternatives, rather that testing their absolute desirability. In all cases, the need for a proposed program or project is treated as a given.

Given these limitations, however, comparison of alternative plans with respect to community goals in view, and identification and analysis of the impacts of these plans with regard to the achievement of the goal, GAM may still be considered as the most rational way to approach a problem (McAllister, 1982). To overcome the problem of determining the absolute desirability of alternative policy, it must be assumed that development criteria are interrelated with each other in the interpretation of results. Wherein the failure of satisfying the other would jeopardize achievement of the whole development goals. This would somehow facilitate the problem of determining the absolute desirability of a certain policy alternative in relation to sustainable development criteria. The alternative policy to show the highest achievement score and which fairly achieved all the desired development criteria would likely be the most desirable alternative policy in the sustainable development of mangroves.

5.2 APPLICATION OF GOAL ACHIEVEMENT MATRIX (GAM) IN MANGROVE PROGRAM EVALUATION

Evaluation of mangrove policies and programs of the Philippines will be achieved in terms of their prospective impacts in achieving the goals of sustainable mangrove development identified in Chapter 4. With the use of qualitative indicators, program impacts will be determined to facilitate the GAM analysis. Initially, program impacts are determined as shown in Table 5.3, to describe the extent to which a particular program satisfies the goals or criteria of mangrove sustainable development. In GAM evaluation, these program impacts will be further analyzed with reference to the relative weightings assumed on each of the mangrove sustainable development goals or criteria and the resource users.

5.2.1 **Assuming weights on criteria for sustainable mangrove development**

Weightings assigned to criteria reflect their relative importance in terms of achievement of sustainable development of mangroves. Ideally, weightings are determined through a survey of the people concerned and the decision makers' perception of each of the goals identified. In this study, however, the weightings are assumed on each of the goals, based on the prevailing mangrove management situation in the Philippines, and the perspective of sustainable development discussed in Chapter 2, which emphasizes the interrelationships of the socio-economic, ecological, and institutional imperatives of natural resources management.

Thus, an equal weighting of 1 on each of the socio-economic, ecological and institutional goals is assumed. These goals should be equally considered because they are interrelated with each other. In a country like the Philippines, the coastal inhabitants are dependent on the mangrove resource for survival, and vice versa. In such a situation, there are no grounds to say that environmental degradation is caused by poverty, or otherwise. What may be more logical to consider is that poverty and mangrove degradation have been caused by development that requires institutional reforms. Thus, institutional goals should also be considered as fundamental goals and not only as a strategy in achieving mangrove sustainable development. Mangrove policies and programs in the Philippines have deliberately caused the degradation of mangrove forests in most cases, by putting more emphasis on the extraction of the resource, rather than conservation and protection.

Therefore, what is important in the evaluation is the interrelationships of such goals in achieving mangrove sustainable development. Failure to achieve one goal would inevitably affect achievement of other goals. There may be scepticism about these weightings that necessitates the testing of several weighting or management regimes that may affect the evaluation. Thus, sensitivity analysis will also be conducted by testing several weighting regimes

to determine whether such parameters would affect the results of the evaluation.

On the other hand, an equal weighting of 1 is likewise assumed on each of the resource users, considering the principles of equitable distribution of benefits from the mangroves.

The predicted performance of a particular program in achieving each of the several goals or criteria is regarded as the goal achievement score. The percent goal achievement are then determined based on the ratio of the goal achievement score to the perfect goal score that may be achieved in a particular criterion. However, to provide a clear indicator of the sustainability of a particular program, the percent goal achievement is multiplied by the weightings assumed on each goal and then totalled to determine the program sustainability score. The ratio of this to the perfect program score based on weights is then determined to derive the percent sustainability of a particular program. The higher the ratio is, the more a program is sustainable.

5.2.2 **Qualitative indicators in measuring program impact**

The qualitative impact indicators are those measures used to determine the programs' prospected impacts or expected output in achieving or satisfying the goals of mangrove sustainable development. Qualitatively, they may represent the expected impacts, or intentions, commitment and effort of a particular program in achieving or satisfying a particular development goal. The more they satisfy the goals or criteria of sustainable development, the more they are considered sustainable or desirable.

To facilitate the determination of the programs impacts for the GAM analysis, an ordinal scale is assigned to each of the qualitative indicators in defining the extent to which a particular goal or criterion of mangrove sustainable development is satisfied by a particular program. These are:

Qualitative Impact Indicators	Ordinal Scales
highly satisfied	3
moderately satisfied	2
fairly satisfied	1
not applicable	*
dissatisfied	-1

A particular program could be said to highly satisfy a particular goal or criterion if its impact would ensure an adequate benefit for the program beneficiary or a particular situation that could be sustained for a long period of time. It may be considered to be moderately satisfying a particular goal or criterion, if the program provides an adequate benefit but cannot be sustained for a long period of time. It is fairly satisfying a particular goal or criterion, if the program impact or benefits are enough and are only for the meantime. A program may be considered negative if its implementation does not cause any benefit to the beneficiaries and would only aggravate a particular situation. Lastly, the non-applicable indicator is considered if a particular program does not necessarily achieve or deal with particular goals in relation to a particular resource user.

Considering the above qualitative indicators, anticipating program impact would largely be based on a subjective perspective. Subjective perspective may be biased at one point. However, this depends on the evaluator and can be minimized with an explicit understanding of the goals of mangrove sustainable development, and by including a detailed discussion of the process of evaluation and assumptions of the evaluator.

The determination or projection of such program impacts will be guided by several questions, based on how a particular goal or criteria of mangrove sustainable development are satisfied by a particular program. These are as follows:

Code	Program Input Guide Questions
a	to what extent a particular mangrove program satisfies or achieves the need to increase income earning capacity and provide basic social services to mangrove dependent coastal inhabitants and other mangrove users?
b	to what extent a particular mangrove program satisfies or achieves the need to reform access rights or the security of tenure in the utilization of mangrove resources?
c	to what extent a particular mangrove program satisfies or achieves the need to involve coastal communities and other interested parties in planning and decision making?
d	to what extent a particular mangrove program satisfies or achieves the need to maintain an extensive mangrove area along the coast and other areas considered relevant for protection purposes? Does a particular program promote the sustainable utilization of the mangrove resource? Does it encourage rehabilitation of degraded areas?
e	to what extent a particular mangrove program satisfies or achieves the need to protect diversity, abundance and species composition of mangroves? Does it encourage planting and/or protection of indigenous mangrove tree species?
f	to what extent a particular mangrove program satisfies or achieves the need to maintain the natural processes of organic matter and sediment accumulation? Does it limit the mangrove disruption by rationalizing the cutting of trees or the conversion of mangroves into other land uses?
g	to what extent a particular mangrove program satisfies or achieves the need to maintain mangrove community organization and species composition? Does it promote sustainable utilization of mangrove resources or the maintenance of an uneven-aged mangrove stand?
h	to what extent a particular mangrove program satisfies or achieves the need to increase individuals' inclination to care for all forms of life within the mangroves?
i	to what extent a particular mangrove program satisfies or achieves the need to enhance individuals' perception on the importance of mangroves?
j	to what extent a particular mangrove program satisfies or achieves the need to confront both the basic human needs and the ecological needs in mangrove decision making?
k	to what extent a particular mangrove program satisfies or achieves the need to decentralize management responsibilities to the coastal communities or local communities in the management of mangroves?
l	to what extent a particular mangrove program satisfies or achieves the need for strengthening the commitment and coordination of concerned organizations and groups of individuals in the management of mangroves?

Table 5.3 Guide in projecting program impacts

Mangrove Programs →		ISFP	NFP	CFP	FSP
Sustainability Goals/Criteria ↓	**Weights** ↓				
increased income opportunity and basic services	1	a	a	a	a
reformed access rights/security of tenure	1	b	b	b	b
increased involvement of local people in planning/decision making	1	c	c	c	c
maintenance of extensive mangrove area and structural pattern	1	d	d	d	d
maintenance of diversity and species composition	1	e	e	e	e
maintenance of organic matter and sediment accretion	1	f	f	f	f
maintenance of mangrove community organization and species composition	1	g	g	g	g
increasing individuals' inclination for caring and protecting human and mangroves	1	h	h	h	h
enhancing individuals' perception on mangrove importance	1	i	i	i	i
confronting both basic human needs and ecological needs in planning and decision making	1	j	j	j	j
devolution of mangrove management responsibilities to local communities	1	k	k	k	k
increased level of commitment and coordination	1	l	l	l	l

Table 5.3 serves as a guide in anticipating impacts of a particular program in relation to the identified goals or criteria for sustainable mangrove development, using the set of questions identified above. Although Table 5.3 is presented vertically, with the evaluation criteria on the left side and the mangrove programs at the top, it will be used horizontally in the actual evaluation as presented in Chapter 6. The vertical position is made to present the criteria used.

CHAPTER SIX

MANGROVE POLICIES AND PROGRAMS OF THE PHILIPPINES: DISCUSSION AND EVALUATION

This Chapter provides the presentation and discussion of national mangrove policies and programs of the Philippines and their GAM evaluation to determine their sustainability. The GAM evaluation includes a sensitivity analysis, by testing several weightings or management regimes, whether they affect the evaluation with an equal weightings assumed on each of the criteria of mangrove sustainable development, as considered in this study.

Evaluation of each program is presented in a GAM table to provide quick reference of the analysis. The formulas of computing program impact and goal achievement indices are introduced in Table 5.1.

6.1 MANGROVE POLICIES AND PROGRAMS IN THE PHILIPPINES

The policies and programs for the environment and natural resources in the Philippines took a new direction during the promulgation of the new Constitution of the country in 1987. The new Constitution explicitly recognized the need to manage the environment by linking the better use of natural resources to the goals of expanded productivity, sustainability and equity through open democratic processes. The control of all natural resources was placed under the State by Article 12 of the constitution, which states:

> ... the exploitation, development and utilization of the natural resources shall be administered under the full control and supervision of the State. The State may directly undertake such activities or it may enter into co-production, joint venture or production sharing agreements. It also encourages small-scale utilization of natural resource (Philippine Constitution 1987).

During the establishment of the Department of Environment and Natural Resources (DENR) in 1987, the State declared a policy to ensure sustainable use, development, management, renewal and conservation of the country's

forest, mineral, land, offshore, and other natural resources, including the protection and enhancement of the quality of the environment, and equitable access of the different segments of the population to the development and use of the country's natural resources, not only for the present generation, but for future generations as well (Executive Order 192, 1987).

In particular to the mangroves, the DENR declared several policies through the Master Plan for Forestry of the Philippines (DENRa 1990). These are:

Socio-economic Policies

- enhancement of equitable access to mangrove areas on a multiple use, multiple user basis;
- production of adequate supply of mangrove products and services to various end users, while at the same time conserving and expanding the resources;
- promotion of economic development in areas around mangrove resources, especially in ways which enhance mangrove protection and management;

Ecological Policies

- preservation of remaining mangrove forests, bringing them under effective management and enhancing their biological productivity;
- preservation of parts of remaining mangrove areas for protection of the diversity of plant and animal life within the mangrove ecosystem;
- expansion of mangrove forest through reforestation and plantation development; and,

Institutional Policies

- strengthening of institutional arrangements for ensuring sustained management of mangrove sources.

In accordance with these policies, there are three programs administered by DENR in the management of the resource, and two programs are being

proposed. T ·se are: the Integrated Social Forestry Program (ISFP), the Fisheries Sector Program (FSP), the National Forestation Program (NFP), the Forest Land Management Agreement (FLMA), and the Community Forestry Program (CFP). Such programs are all community-based and focused towards achieving the above-mentioned national mangrove policies, but with different approaches or management schemes (Table 6.1).

Table 6.1 Matrix of Mangrove Policies and Programs

Policy Area	Mangrove Policies	Programs
Socio-Economic	enhancement of equitable access in mangrove areas through multiple use, multi user basis	ISFP, FSP, NFP, FLMA, CFP
	production of adequate mangrove products while conserving and expanding the resource	ISFP, FSP, NFP, FLMA, CFP
	promotion of economic development within coastal communities in ways that enhance mangrove protection and management	ISFP, FSP, NFP, FLMA, CFP
Ecological	preservation of remaining mangroves for biological productivity enhancement	ISFP, FSP, NFP, FLMA, CFP
	preservation of remaining mangroves for biodiversity protection	ISFP, FSP, NFP, FLMA, CFP
	reforestation/rehabilitation of denuded mangrove areas	ISFP, FSP, NFP, FLMA, CFP
Institutional	strengthening of institutional arrangements for ensuring mangrove sustainable development	ISFP, FSP, NFP, FLMA, CFP

6.2 DISCUSSION AND EVALUATION OF MANGROVE PROGRAMS OF THE PHILIPPINES

The mangrove programs will be directly evaluated, rather the policies on mangroves because they provide more tangible, if not more adequate information in projecting impacts in achieving the goals or criteria of mangrove sustainable development. In the evaluation, the National Forestation Program (NFP) and the Forest Lease Management Agreement (FLMA) will be treated as one program. FLMA consequently cover reforested areas under NFP in order to provide continuity in the management of mangroves.

6.2.1 **Integrated Social Forestry Program (ISFP)**

ISFP is principally concerned with upland forests and is now being implemented in the management of the mangroves. It is based on the issuance of a 25-year stewardship contract (renewable for another 25 years) to landless people or communities for lands that remains public property but on which people depend for survival (ISFP Primer, Appendix 2). As provided by DENR Administrative Order No. 15, series of 1990 (Appendix 3), the program aims to manage mangrove resources for the economic and social progress of the nation through involvement of traditional small-scale mangrove users, who shall be made effective agents of the state in the protection and management of permanent mangrove forest and in the production of forest and marine products. The program endeavors to achieve the following objectives:

- improve quality of life of the participants, through increased income and sustained basic human needs;
- provide long-term security of tenure through the issuance of Mangrove Stewardship Agreement (MSA), (see Appendix 4) to participants who will develop and/or maintain mangrove forest;
- ensure regular supply of mangrove forest and marine production in the market place;
- establishment of a long-lasting partnership between the government and participating small-scale mangrove users in promoting sustainable use of public lands through a resource management system that is environmentally sound, productive and culturally appropriate;
- rehabilitation and effective management of the existing mangrove forest and planting of new mangrove forest;
- maintenance of a permanent mangrove forest which shall provide improved shoreline protection, a wildlife habitat, spawning and nursery grounds for marine life, and nutrient supplies to support marine life within and outside mangrove areas;

- improve the capability of coastal communities in mangrove areas to address their own development needs through cooperative efforts;
- promote a participatory management strategy through increased coordination and commitment of different government agencies in the implementation of the program.

Mangrove areas with existing forest and contiguous denuded areas may be allocated to individuals or communities for management. Management will involve harvesting of mangrove trees on a sustainable basis for their livelihood. Furthermore, the participants will be obligated to reforest denuded areas. It will also be their responsibility to provide protection for the area. When the plantation under their area is mature then they will shift harvesting to this area and allow the rehabilitation of the natural mangrove forest.

The GAM evaluation of implementing ISFP in achieving the goals for sustainable development of mangroves is presented in Table 6.2.

6.2.1.1 **Socio-economic impact of ISFP**

As indicated in the GAM evaluation in Table 6.2, the implementation of ISFP in the management of mangroves provides an opportunity for the landless mangrove dependent coastal inhabitants to achieve their basic needs through an increased earning opportunity. With the ISF program, their average income, which is about PHP 15,000 per year (Crown Agents 1991), could be augmented from the sales of pole wood and fuel wood from the mangrove forest. In cases where stewardship contracts are granted in unmanaged, understocked mangrove stand, for example, wood products can provide an additional income of about PHP 1,050/ha/yr, or PHP 2,625 with an area coverage of 2.5 ha (the average area issued under MSA). This is based on the average mean annual growth of 3.5 cu.m./ha/yr, valued at PHP 300/cu.m (see Appendix 9).

Table 6.2 GAM EVALUATION OF THE INTEGRATED SOCIAL FORESTRY PROGRAM (ISFP)

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	3	3	3	3	3	3	3	3	3	3	3	3
Fish Pond Operators	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Timber Licensees	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Indirect Users													
Municipal Community	1	3	*	3	3	3	3	3	3	3	3	3	3
Regional/National Community	1	3	*	3	3	3	3	3	3	3	3	3	3
Future Generations	1	*	*	*	3	3	3	3	3	3	3	3	3
GOAL ACHIEVEMENT SCORE		9.0	3.0	9.0	12.0	12.0	12.0	12.0	12.0	18.0	10.0	10.0	18.0
PERFECT GOAL SCORE		9.0	3.0	9.0	12.0	12.0	12.0	12.0	12.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	55.6	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	55.6	100.0
PROGRAM SUSTAINABILITY SCORE	1111.1	PERFECT GOAL SCORE BASED ON WEIGHT 1200.0											
% SUSTAINABILITY	92.6												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

The above income estimates, which provides the participants with a total income of PHP 17,625 is rather low compared to the poverty threshold of PHP36,000 set for the Philippines. However, such income could be increased after about 6 to 10 years from fish harvesting and after 12 years, wherein the wood harvest could be doubled. At the most, such income could be increased up to PHP 39,250/2.5 ha, based on an average fish harvest of 667 kg/ha/yr, valued at PHP 13,450/ha/yr and the wood harvest of 7.5 cu.m./ha/yr in a managed naturally regenerated stand (see Appendix 9). This income, however, is relative to various parameters, like production efforts and the ecological vitality and integrity of a particular mangrove area. In the long run, it could increased or decreased, depending on the sustainability of mangrove resource and harvesting schemes.

Consequently, the ISFP would also be beneficial to the adjacent municipal communities, and even to the regional/national communities through the sustainable supply of basic needs, such as fuel wood or charcoal and protein from the fish harvest in the mangroves.

The ISFP also recognizes the importance of providing basic social services to the participants to enhance the communities' self-sufficiency. Several line agencies of the government must be linked up and coordinate their activities to extend education, health services, marketing assistance and other programs to the coastal areas.

On the other hand, reforming access rights in the utilization of mangrove resources is likewise highly satisfied by the ISFP. A 25-year Mangrove Stewardship Contract (MSA), renewable for another 25 years is issued to qualified mangrove dependent coastal communities to provide access in the utilization of the mangrove resources. In essence, the provision of access rights to the coastal communities would also enhance the involvement of such individuals in mangrove planning and decision making. Consequently, this also enhances the role of a particular municipal community in governing their

resources within its jurisdiction, for the benefit of a larger community (regional and national and future generations.

From the perspective of the timber licensee and the fish pond operators, however, one of the disadvantages of the ISFP is its exclusiveness to only one sector of resource user. It is only particular with the needs and interest of the coastal communities - the direct users. However, considering the prevailing situation of mangrove utilization in the Philippines, there has been an increasing disparity between these poor individuals and the few rich individuals that demand a deeper understanding in mangrove management. As emphasized by the concept of sustainable development considered in this study, it is imperative to address the plight of poor individuals who are facing the ill consequences of environmental degradation in order to achieve true sustainable development.

6.2.1.2 **Ecological impact of ISFP**

Conservation and protection of mangroves vitality and integrity is also one of the main objectives of ISFP. Under the stewardship contract, program recipients are encouraged to develop and/or maintain their area as permanent mangrove forest and to enjoy such harvests that are sustainably derived. It is a prerequisite of the stewardship agreement that a management plan is developed by the recipients in coordination with the DENR and NGO representatives. The plan shall include areas for reforestation, enrichment planting, improvement of existing stands to maintain stem density and species composition, and the marking of and protection of the upper canopy of seed trees to ensure the regenerative capability of a particular mangrove area. The program recipients are also obliged to protect their areas from unauthorized, unregulated cutting or other activities destructive to the mangrove on the stewardship area and other adjacent areas.

In essence, ISFP, as presented in the GAM evaluation in Table 6.2, enables the maintenance of a considerable extent of mangrove forest. One of its

implications is its restraining effect on the coastal inhabitants from further exploitation or destruction of other critical areas, such as the fringing mangrove forest, which are necessary for coastal protection.

In the reforestation activities, although the participants are expected to plant more diverse species in their respective areas, they are also encouraged to plant indigenous mangrove tree species in order to maintain diversity and species composition. The marking of seed trees would also be important since cutting operations would only be limited to commercial species which are dominant in the area. An example is the *Rhizophora* species with a diameter breast height of at least 15 cm, which are usually dominant in any mangrove area. With these policies and the religious adherence of individual participants, the mangroves although inhabited could still function naturally, maintain their diversity, and be able to produce nutrients or organic matter necessary for their growth and other related marine species, such as fish. They are also able to maintain their sustainability through maintenance of an uneven-aged mangrove stand.

With such requirements of the program and if properly implemented, it can be expected, as shown by the GAM evaluation in table 6.2, that the ISFP would consequently benefit not only coastal inhabitants themselves with a sustainable harvest, protective, educational and recreational benefits but also municipal, regional/national communities. Maintenance of the ecological processes through the diversity and integrity of the mangroves would also be advantageous to the future generation, to meet their own needs.

6.2.1.3 **Institutional impact of ISFP**

The GAM evaluation in Table 6.2 indicates that the implementation of ISFP enhances the willingness of individual participants and adjacent municipal communities in caring for their own resource and consequently the whole mangrove environment and other people. In addition to the issuance of MSA, which has a positive impact on their behavior towards the mangrove, the

program is also supplemented with training, information and educational campaign strategies to encourage protection and respect for the mangroves. Such strategies are expected to strengthen individual perceptions about the importance of the mangroves, and consequently, enhance their attitude and commitment to sustainable development of mangroves. As emphasized in the set of goals for sustainable mangrove development developed in this study, the impact of such efforts in building responsible and well-informed communities about the relevance of the mangroves is necessary in order to achieve real sustainable development of mangroves. Although it may take time to influence the values of such individuals who have been possessed by their struggle for survival, it is believed that this will take place as they realize the importance of mangroves from their experiences in managing the resource.

ISFP is also considered to have a positive impact on the goal of decentralizing government's responsibility in the protection and management of mangrove resources. The ISFP recognizes that the best caretakers of the environment are the people who are indigenous in these areas and dependent on the resource for survival. Although the program dissatisfies the timber licensees and the fish pond operators this does not necessarily affect the sustainable development of the mangroves. The devolution of management responsibilities, instead ensures a well accepted and supported mangrove programs.

In implementing the program, a network of non-governmental organizations is envisioned to provide material, moral and persuasive assistance. This assistance takes the form of advice and consultations, the transfer of technology and expertise learned through experience. Similar effort is also envisioned with local government units, like the barangay and the municipal councils under whose jurisdiction a particular project is located. However, such effort should be accompanied with a commitment to the real implementation of the program. The ISFP is a self-help program that

requires an enormous support from the government to ensure the achievement of its intended goals and objectives.

In essence, the above-mentioned institutional objectives of the ISFP are immediately favorable to the mangrove coastal inhabitants and the adjacent municipal communities, as shown in Table 6.2. They facilitate the development of more responsible resource users, who would likewise have a positive institutional impact on regional/national communities, as well as future generations. This enables the conservation and protection of mangrove forests to maintain their sustainability and to continually provide socio-economic and ecological services.

6.2.2 **Fisheries Sector Program (FSP)**

FSP is another program that is currently implemented in the management of mangroves for a period of 5 years, up to 1996. It is funded under the Asian Development Bank (ADB) and the Overseas Economic Cooperation Fund (OECF) funds and is being implemented within selected mangrove areas (e.g. critical bays). The general objective of the program is to develop fisheries productivity through the development of coastal resources with emphasis on: coastal resources management through community participation; provision of financial and technical assistance and alternative livelihood to small fishermen to upgrade their standard of living; lessening competition between small and commercial fishermen through the application of the exclusive economic zone for commercial fishermen; and, availability of adequate information on the critical bays in a data bank to be used as basis for the formulation of bay wide/area wide management plan (FSP Briefing Kit, Appendix 5).

The mangrove rehabilitation component of the FSP has the following objectives:

- rehabilitation of the denuded portion of mangrove forest in critical bays and support areas through reforestation, afforestation, assisted natural regeneration, forest or timber stand improvement, and other

forms of rehabilitation to provide the essential productivity and protective values derived thereof;

- provision of alternative sources of livelihood through contract reforestation and non-invasive forms of utilization (e.g. aqua-silviculture) to augment the income generating capacity of coastal communities;
- provision of information transfer and technical assistance, preparing communities to assume their role in the sound management of mangrove resources; and,
- protection of areas (wilderness areas, buffer zones, ecological zones, etc.) which provide support to wildlife and land stabilization through the active support of communities and other government and non-government agencies.

FSP is like the National Forestation Program (discussed in the following section) wherein reforestation activities are contracted to the local communities, or to non-government organizations. The program also envisioned that reforestation contracts will mature into Mangrove Stewardship Contracts (MSA) for areas which were traditionally occupied and used by coastal communities for their livelihood, and other areas into a Forest Lease Management Agreement (FLMA). Decisions are not yet finalized concerning the management scheme to be implemented. However, for the purpose of this study, it will be assumed that such reforested areas will be issued under a mechanism similar to the ISFP's stewardship agreement.

FSP is also complemented with technical training, information and education campaigns, in order to develop a coastal communities into a responsible resource managers. Also envisioned, is the close coordination of DENR field and central offices, as well as with the Department of Agriculture.

The GAM evaluation of implementing FSP in achieving the goals for sustainable development of mangroves is presented in Table 6.3.

Table 6.3 GAM EVALUATION OF THE FORESTRY SECTOR PROGRAM (FSP)

MANGROVE SUSTAINABLE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
GOALS/CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS --->		1	1	1	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	3	3	3	3	3	3	3	3	3	3	3	3
Fish Pond Operators	1	3	3	3	3	3	3	3	3	3	3	3	3
Timber Licensees	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Indirect Users													
Municipal Community	1	3	3	3	3	3	3	3	3	3	3	3	3
Regional/National Community	1	3	*	3	3	3	3	3	3	3	3	3	3
Future Generations	1	*	*	*	3	3	3	3	3	3	3	3	3
GOAL ACHIEVEMENT SCORE		12.0	9.0	12.0	15.0	15.0	15.0	15.0	15.0	18.0	14.0	14.0	18.0
PERFECT GOAL SCORE		12.0	9.0	12.0	15.0	15.0	15.0	15.0	15.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8	77.8	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8	77.8	100.0
PROGRAM SUSTAINABILITY SCORE	1155.6	PERFECT GOAL SCORE BASED ON WEIGTH 1200.0											
% SUSTAINABILITY	96.3												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

6.2.2.1 Socio-economic impact of FSP

Implementation of the FSP in the mangroves will absolutely achieve the government's objective of alleviating poverty among the mangrove dependent coastal communities, as well as promoting more participative planning and decision making and equitable utilization of the mangrove resource. Contracting people in the reforestation activities and the issuance of MSA provides them with an increased income earning opportunity (as previously discussed in the evaluation of ISFP) to sustain their basic needs and a security of tenure over their land.

Although the program would involve a high initial cost of reforesting mangrove areas for the issuance of stewardship agreement, it is still advantageous to the government over the long term in achieving the objective of conserving and protecting the mangroves' vitality and integrity. The program's intention of providing an increased income earning opportunity does not only intend to alleviate conditions in coastal communities, but will also stop them from illegally cutting fuel wood. On the other hand, the issuance of MSA does not only recognize the rights of people over their land, but would also prevent them from moving to other areas and causing destruction. The FSP, therefore, provides a restraining effect that regulates the destructive activities of coastal inhabitants.

Furthermore, the program also asserts a holistic approach in the management of mangroves. It concentrates not only on the provision of livelihood programs for the coastal communities, but also on the improvement of opportunities for fish pond operators, through the intensification of existing aquaculture ponds within mangrove areas.

Because of its ultimate objective of allocating reforested areas under MSA, the program asserts an effective program for the mangroves. Thus in the GAM evaluation demonstrated in Table 6.3, FSP enables the achievement of the socio-economic goals of the coastal communities, fish pond operators, and

adjacent municipal communities. Regional/national communities are, likewise ensured with sustained supply of basic needs, such as fuel wood and protein from fish.

6.2.2.2 **Ecological impact of FSP**

The program's objective of reforesting denuded mangrove areas in selected areas, like critical bays and shelter areas would have a positive ecological impact on the sustainable development of mangroves. Such initiative from the government is necessary in order to ensure a faster rate of reforesting or rehabilitating degraded mangrove areas. A reforested area, ultimately managed by the coastal inhabitants, would ensure the planting of diverse species necessary to maintain species composition and bio-diversity in mangrove areas. This is because people tend to plant different kinds of species to suit their varied needs, e.g. for food, fuel wood, or for construction purposes.

Under the program, mangroves would most likely be used sustainably through localized utilization of the resource. The program recipients are also required to protect their stewardship areas and adjacent areas from unauthorized, unregulated cutting or other activities destructive to mangroves.

If the conditions of the program are properly implemented, the GAM evaluation in Table 6.3 shows the program would consequently benefit not only coastal inhabitants with sustainable harvest, but adjacent municipal communities, the regional/national communities, and future generations, who are particularly interested not only in the productivity of mangrove areas, but also the protective services offered by mangroves to coastal areas and fish nursery areas.

6.2.2.3 **Institutional impact of the FSP**

Like the ISFP, the implementation of the FSP enhances individuals' inclination in caring for their own resource and consequently the whole mangrove

environment and other people. The program is also reinforced with training, information and educational campaign strategies about the protection and importance of the mangrove. This would not only enhance individuals' perception about the complexity and importance of the mangrove forest but would also prepare them for assuming their role in the management of the resource.

The program is also based on the concept of devolving the government's role in the protection and management of the mangroves in favor of the coastal communities. It also encourages active support and participation from other government agencies and non-government organizations in its implementation.

Therefore, the GAM evaluation in Table 6.3 indicates that the FSP highly satisfies the institutional goals of mangrove sustainable development in terms of the mangrove coastal inhabitants, fish pond operators, adjacent municipal communities, and consequently regional/national communities and future generations. However, the devolution of management responsibilities to coastal communities and the emphasis in achieving basic human needs and ecological integrity in mangrove management have disadvantageous effects to the timber licensees. This will inevitably affect their interest of gaining more benefit or profit in mangrove utilization.

6.2.3 **National Forestation Program and Forest Lease Management Program (NFP/FLMA)**

NFP is also one of the major programs designed for the uplands, now currently implemented in the management of mangrove areas. The main objectives of the program are to establish and manage forest plantations for the production of timber, pulp wood, fuel wood and other forest products, and to rehabilitate denuded watershed and forest areas, such as mangrove forests (DENR Memo 11, Appendix 6). The program is not only concern with environmental enhancement but also the provision of employment opportunities to interested individuals.

Like the FSP, NFP is based on a contract reforestation scheme, which aims to tap not only private corporations, but also competent partnerships, local government units and individuals who have the necessary technical as well as financial capabilities to establish, manage, maintain and protect forest plantations over a period of three years. In this way, the government is freed from the burden and administrative difficulty of implementing reforestation programs.

NFP is also funded with foreign loans from the ADB and OECF. This situation, therefore, imposes an extractive type of management in order to repay the said loans. To achieve this, the DENR promulgated the issuance of the Forest Lease Management Agreement (FLMA), whereby a reforestation contractor may be given 25 to 50-year harvesting privileges.

FLMA is based on a production sharing scheme, wherein the FLMA holder will repay DENR the equal amount of the contract initially used in the reforestation of their area covered. This amount will be turned over to DENR on a yearly instalment basis, starting on the 7th year of the FLMA up to its 25th year (DAO No. 70, Appendix 7).

With this scheme of management, the participants are then expected to be provided with a long-term source of income and are developed as permanent forest managers. The issuance of the FLMA may also be a good way of cultivating their commitment to protect and conserve the trees they plant.

The implementation of NFP and FLMA in relation to the achievement of sustainable mangrove development is evaluated in Table 6.4.

6.2.3.1 **Socio-economic impact of NFP/FLMA**

The contract reforestation scheme, sometimes referred to as 'business reforestation' provides immediate income opportunity for coastal inhabitants, private organizations from the municipal communities, local government units

Table 6.4 GAM EVALUATION OF THE NATIONAL FORESTRY PROGRAM AND THE FOREST LEASE MANAGEMENT AGREEMENT (NFP/FLMA)

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	1	2	2	1	1	1	1	-1	-1	-1	1	1
Fish Pond Operators	1	2	3	3	1	1	1	1	-1	-1	-1	2	2
Timber Licensees	1	2	3	3	1	1	1	1	-1	-1	-1	2	2
Indirect Users													
Municipal Community	1	2	2	2	1	1	1	1	-1	-1	-1	1	1
Regional/National Community	1	1	*	*	1	1	1	1	-1	-1	-1	1	1
Future Generations	1	*	*	*	-1	-1	-1	-1	-1	-1	-1	1	1
GOAL ACHIEVEMENT SCORE		8.0	10.0	10.0	4.0	4.0	4.0	4.0	-6.0	-6.0	-6.0	8.0	8.0
PERFECT GOAL SCORE		15.0	12.0	12.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		53.3	83.3	83.3	22.2	22.2	22.2	22.2	-33.3	-33.3	-33.3	44.4	44.4
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		53.3	83.3	83.3	22.2	22.2	22.2	22.2	-33.3	-33.3	-33.3	44.4	44.4
PROGRAM SUSTAINABILITY SCORE	297.8	PERFECT GOAL SCORE BASED ON WEIGHT						1200.0					
% SUSTAINABILITY	24.8												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

and even non-government organizations (NGO's). Under the provisions of the program, contractors are given with three years in which to establish 80 percent stocking of seedlings, at 1.5 x 1.5 spacing, at a cost of PHP 11,680 per hectare (DENR Memo Circular No.15). On an average, depending on accessibility of the area and the source of seeds, an income of about 20 to 25 percent of the cost per hectare can be realized by a particular contractor at the end of three years (NPCO Staff 1991, pers. com.).

Thus, in the first three years, a participant issued with 5 hectares reforestation contract would already be able to earn an income of about PHP 14,600 per year in addition to their average income of PHP 15,000. The issuance of FLMA to the reforestation contractors may also be a good incentive for the participants. However, the contract reforestation scheme is apparently more favorable to those individuals capable of maintaining larger areas. It may also be considered that FLMA would only be strengthening or renewing the traditional corporate scheme of forest utilization, undermining the general intentions of the government in providing access rights to the actual occupants of mangrove areas. This is considering that it may be more convenient for the government to award reforestation contracts to corporate entities which covers larger areas.

Furthermore, the application of the FLMA program in the mangroves may not be feasible in the long run. The program requires extensive cutting operations which may not be possible, considering the slow growth of mangrove trees. At the most, mangrove trees may only be harvestable every 12 years for fuel wood production and 30 to 40 years for timber production (PCARRD 1991). Furthermore, there are no enough mangrove areas to permit sustainability of such commercially motivated cutting of mangrove trees. Under this situation, contract reforestation within the mangroves is, therefore, basically a rehabilitation activity rather than a viable economic activity. To treat them as business undertakings will only create tremendous social inequities, especially with the involvement of coastal communities.

Thus in the GAM evaluation presented in Table 6.4, the implementation of NFP with the application of FLMA is considered to be only fairly satisfying the goals of providing income opportunities for coastal communities, and the basic needs of municipal and regional/national communities. However, NFP/FLMA moderately satisfies private individuals or groups of individuals, like fish pond operators or timber licensees. Such programs are likewise considered in the GAM evaluation to be more favorable to fish pond operators and timber licensees than coastal communities and municipal communities, in terms of the issuance of lease agreements and involvement in planning and decision making.

6.2.3.2 **Ecological impact of NFP/FLMA**

The objective of NFP in rehabilitating critical and denuded mangrove areas is extremely favorable to all the coastal residents, municipal and regional/national communities and future generations. However, its ultimate objective of establishing industrial plantations through the application of FLMA will have severe ecological repercussions. In mangrove areas, most especially within the coastal fringe and in the estuarine, a considerable extent of mangrove vegetation needs to be maintained and protected to serve as protection from the severe impact of storm and tidal waves, and as a nursery and feeding ground for fish species and other wildlife. Apparently, this ecological imperative of mangroves, emphasized by the goals of mangrove sustainable development, cannot be guaranteed by the commercially oriented objectives of the FLMA program. Its policy of using the resource in securing funds for further reforestation activities in the mangroves may only exacerbate the degradation of mangroves.

There is also a great possibility that the diversity and composition of species, supposed to be planted in a reforestation area would not be satisfied. NFP contractors who become the ultimate managers of the area would likely be more interested in maximizing their income through commercial or monoculture plantations, which are more unstable, than diverse plantations.

The productivity of mangrove areas would also be disrupted, consequently affecting the growth of trees and fish species through the alteration of nutrient cycling or detrital food chain.

With the above circumstances, the GAM evaluation in Table 6.4 shows the implementation of NFP and FLMA in the management of mangroves is not sustainable. They only fairly satisfy the goals of mangrove sustainable development in maintaining mangroves' vitality, integrity and sustainability, which do not guarantee the continuous provision of benefits and protection to the coastal communities, municipal and regional/national communities. Fish pond operators and timber licensees are likewise fairly satisfied with their objectives of maintaining mangrove productivity. The needs of future generations are consequently affected, considering the unsustainable utilization of the mangrove resource.

6.2.3.3 **Institutional impact of NFP/FLMA**

The application of FLMA may have a positive effect in encouraging its participants to conserve and protect the mangroves. However, participants would become more profit oriented, rather than long-time partners in the management of mangroves, considering its fate of favoring corporate utilization. This creates a limited perspective of the participants, by considering the mangroves purely as an economic resource. Thus, the GAM evaluation in Table 6.4 shows that the program dissatisfies the objectives of enhancing individuals' inclination to care for the mangroves and other people and increasing perceptions of its participants about the importance of mangroves. The program also dissatisfies the goal of considering both human and ecological needs in mangrove management.

NFP/FLMA has good intentions to devolve mangrove management responsibilities. However, its benefits may only be felt by few individuals who are issued with FLMA or harvesting privilege. Furthermore, coordination in the management of mangroves would be limited to its few corporate participants

and DENR, thereby excluding coastal communities. Thus the GAM evaluation of the program in Table 6.4 shows such goals are fairly satisfied in terms of the coastal and municipal communities and moderately satisfied fish pond operators and timber licensees. These institutional impact of the program to the coastal communities consequently have similar effects to indirect users, such as regional/national communities and future generations.

6.2.4 **Community Forestry Program (CFP)**

CFP is also a community-based forestry program which commenced in the uplands and now also considered appropriate for mangroves. Considered as an expansion of the social forestry concept, this system provides a stable source of income to upland and coastal communities. It allows small-scale timber cutting or logging by coastal communities, primarily through community forest leases and in direct contrast to the old practice of giving forest leases to big corporations. Sites are intended to be 50 percent forested and part of an expired, abandoned, or cancelled timber license agreement. The program also anticipates motivating forest dwellers to conserve, develop and manage the mangrove forest which is their ultimate source of livelihood (DAO No. 123, Appendix 8).

In each project, community residents are awarded with a 25-year Community Forestry Management Agreement (CFMA), which may be renewed for another 25 years. CFP is based on a co-production sharing agreement, wherein participants are required to pay a certain share to the government on a yearly basis, or may be required to reforest the degraded portion of their area at their own expense or from profit. To ensure this is possible in the future, the community is required to deposit, in a trust fund, 30 percent of gross revenues from timber sales and 10 percent of gross revenues from sales of minor forest products. Furthermore, to acquire CFMA, an application fee of PHP 5 per hectare or PHP 1,000, whichever is higher, and an annual fee of PHP 500 are also required.

CFP also enjoined the participation of non-government organizations (NGOs) in its initial implementation. In the first three years, they are contracted to assist a particular community issued with CFMA in the management of their area. NGOs are likewise required to train coastal communities in relation to forest management operations as required and leave them after they have developed their forest management capabilities.

The GAM evaluation of CFP in relation to sustainable mangrove development is presented in Table 6.5.

6.2.4.1 **Socio-economic impact of CFP**

Undoubtedly, the program provides mangrove dependent coastal communities with an additional source of income. With their occupation in a forested area issued under a particular community lease agreement (CFMA), they may be able to increase their income from the sale of pole wood and fire wood which is estimated up to about PHP 2,250/ha/yr. Thus, if a particular participant was allocated with a 5 hectare (50% forested) share from the total area issued to a particular community, that person may be able to increase his/her income to PHP 5,625/yr, in addition to his/her average annual income of PHP 15,000. This additional income is based on an average mean annual increment of 7.5 cu.m./ha/yr in a managed naturally regenerating mangrove forest (see Appendix 9). However, such income with a total of PHP 20,625 may be insufficient to provide the needs of a family of five.

Economic investment in planting mangrove trees is a long-term venture which may only disappoint the coastal communities. The earliest possible time that participants could benefit from sales of pole wood and fuel wood is in the 12th year. Thus, within the 50-year duration of their community lease agreement (CFMA), they may only be able to harvest 4 times, with a very minimal income. In such a situation, coastal communities and other participants in the program end up having difficulties in paying the government share, thus

Table 6.5 GAM EVALUATION OF THE COMMUNITY FORESTRY PROGRAM (CFP)

MANGROVE SUSTAINABLE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
GOALS/CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	1	3	3	1	1	1	1	1	3	1	3	2
Fish Pond Operators	1	*	*	*	*	*	*	*	-1	3	-1	-1	2
Timber Licensees	1	*	*	*	*	*	*	*	-1	3	-1	-1	2
Indirect Users													
Municipal Community	1	1	3	3	1	1	1	1	1	3	1	3	2
Regional/National Community	1	1	*	*	1	1	1	1	1	3	1	3	2
Future Generations	1	*	*	*	1	1	1	1	1	3	1	3	2
GOAL ACIEVEMENT SCORE		3.0	6.0	6.0	4.0	4.0	4.0	4.0	2.0	18.0	2.0	10.0	12.0
PERFECT GOAL SCORE		6.0	6.0	6.0	12.0	12.0	12.0	12.0	18.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		50.0	100.0	100.0	33.3	33.3	33.3	33.3	11.1	100.0	11.1	55.6	66.7
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		50.0	100.0	100.0	33.3	33.3	33.3	33.3	11.1	100.0	11.1	55.6	66.7
PROGRAM SUSTAINABILITY SCORE	627.8	PERFECT GOAL SCORE BASED ON WIEGHT						1200.0					
% SUSTAINABILITY	52.3												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

creating a community or individual liability, rather than creating successful livelihood.

Furthermore, unlike the upland forest there are no longer enough mangrove areas to be issued to communities for their cutting operations to be sustainable. The data on remaining mangrove forest in the country disclosed only about 139,725 hectares remaining, sparsely distributed around the country. If there are available areas, they are most likely preserved or declared as wilderness areas, closed from any form of utilization such as in Palawan Province. Thus in the GAM evaluation in Table 6.5, CFP is considered to be only fairly satisfying the goal of providing increased income earning capacity to coastal inhabitants, and consequently the needs of the adjacent municipal and the regional/national communities. The program likewise lacks the necessary basic government services, such as education, health services, housing, etc. that would make them self-reliant communities.

However, despite the program's inability to provide successful source of income and basic services to coastal communities, it would still be extremely important in terms of recognizing their rights and dignity as owners of the land. This gives people hope and pride and would, in effect, reinforce their traditional perception towards the mangroves as a resource that must be conserved for their own life and survival. It enables them to decide and manage the mangrove forest themselves, with the support of non-governments organization at the initial stage.

In essence, CFP is therefore considered a very laudable project in the GAM evaluation (Table 6.5), in terms of involving the coastal communities in planning and decision making, and reforming access rights in the utilization of the mangrove resource. Like ISFP and FSP, CFP fully satisfied such goals of sustainable mangrove development. Consequently, this will also have a positive socio-economic impact on the participation of adjacent municipal communities in management of the resource.

6.2.4.2 **Ecological impact of CFP**

The requirement of CFP to reforest 50 percent of the area issued under a particular community lease agreement and/or the payment of a share with the government, may have some negative ecological repercussions. Although the program is considered extremely ecologically-sound in principle with its use of indigenous cutting tools and operations, its implementation in the mangroves may only aggravate mangrove destruction. There is a great possibility the participants will resort to over-cutting the forested areas issued to them in order to subsidize their expenses.

In the formulation of such a program for mangroves, ecological constraints (e.g., the time period needed for mangroves to reach maturity) need to be realized. Otherwise, the program may only aggravate the destruction of mangroves. Instead, the government should be making a priority in implementing such a program in winning the hearts of this people in order to develop them as long-term partners in mangrove protection and conservation.

Considering the above discussion on the ecological impact of CFP, the GAM evaluation in Table 6.5 shows the implementation of the program with its commercial orientation was considered to fairly satisfy the needs of dependent coastal communities, municipal, regional/national communities, as well as, future generations in maintaining the vitality, integrity, and sustainability of the mangroves.

6.3.3 **Institutional impact of CFP**

As discussed in the socio-economic impact of the program earlier, the recognition of the rights of coastal inhabitants through the application of CFMA would have a positive psychological impact on their behaviour to care for mangroves. However, with the commercial orientation of the program, there is the possibility that participants may become exclusively interested in maximizing their profit, rather than conserving the resource for the long-term needs. In essence, the GAM evaluation in Table 6.5 shows the program fairly

satisfies the goal of building more responsible coastal and municipal communities to care for mangroves, and providing a comprehensive sustainable development plan that addresses both human and ecological needs. However, such failure of the program may be compensated by its intentions of enhancing awareness of its participants on mangrove's importance. With the assistance of NGO's, the program provides training, information and educational campaigns that would develop them as real forest managers. Information campaigns, for example, not only include the relevance of protecting mangroves, but training on how they are best managed, to maximize benefits derived from them.

The GAM evaluation likewise shows the program highly satisfies the goal of devolving management responsibilities to coastal and adjacent municipal communities. The evaluation also shows the program moderately satisfies the goal of strengthening the commitment and coordination of concerned organization and individuals in the management of mangroves. Community organization and mobilization being one of the services of NGOs at the initial stage of the program, enables a particular community to link themselves with the government and other individuals interested in sustainable development of mangroves. Likewise, as shown in Table 6.5, the institutional impact of the to the coastal communities may consequently have similar effect to indirect users, such as regional/national communities and future generations.

6.3.4 **Results of GAM Evaluation**

Results of GAM evaluation of mangrove programs of the Philippines, summarized in Table 6.6, disclosed that FSP and ISFP appeared to be the most sustainable or desirable programs for mangroves. Evaluation of NFP/FLMA and CFP, on the other hand, disclosed their unsustainability or inefficiency in achieving the goals of sustainable mangrove development. A detailed discussion of the evaluation results is provided in Chapter 7.

Table 6.6 Result of the GAM Evaluation

Mangrove Policies/Programs →	ISFP	FSP	NFP	CFP
Sustainability Goals/Criteria ↓				
increased income opportunity and basic services	100	100	58.3	50
reformed access rights/security of tenure	100	100	83.3	100
increased involvement of local people planning/decision making	100	100	83.3	100
maintenance of extensive mangrove area and structural pattern	100	100	22.2	33.3
maintenance of diversity and species composition	100	100	22.2	33.2
maintenance of organic matter and sediment accretion	100	100	22.2	33.3
maintenance of mangrove community organization and species composition	100	100	22.2	33.3
increased individuals' inclination for caring human and other living things	100	100	-33.3	11.1
increased individuals' perception on mangrove importance	100	100	-33.3	100
confronting both basic human needs and ecological needs in planning and decision making	55.6	77.8	-33.3	11.1
devolution of mangrove management responsibilities to local communities	55.6	77.8	44.4	55.6
increased commitment and coordination in mangrove management	100	100	44.4	66.7
% Sustainability	92.6	96.3	24.8	52.3
Ranking	2nd	1st	4th	3rd

6.3 **SENSITIVITY ANALYSIS**

Considering the uncertainties in assuming weights for different goals of sustainable mangrove development, the GAM evaluation of mangrove policies and programs of the Philippines in this study includes a sensitivity analysis. The aim is to determine the sensitivity of GAM evaluation results to different management or weighting regimes and how they affect the evaluation of mangrove policies and programs.

The sensitivity analysis, therefore, involves several management or weighting regimes such as assuming higher weight on the socio-economic criteria,

assuming higher weights on the ecological criteria, and assuming higher weights on the institutional criteria, as presented in Table 6.7. The sensitivity analysis are presented in Appendix 10, Appendix tables 6.9 to 6.20.

The result of the sensitivity analysis as shown in Table 6.8 reveals different management or weightings regimes assumed on each of the goals or criteria of sustainable mangrove development does not affect the relative ranking of the program. The sensitivity analysis in this study also disclosed that FSP and ISFP appeared to be the most sustainable or desirable program for the mangroves, irrespective of what particular weighting regime was used. The result of sensitivity analysis appears to be more dependent on estimated impacts, rather than on the

Table 6.7 Management or weighting regimes for sensitivity analysis

Development Goals →	Socio-economic			Ecological				Institutional					Remarks
	1	2	3	4	5	6	7	8	9	10	11	12	
Weighting Regimes ↓													
A	2	2	2	1	1	1	1	1	1	1	1	1	higher weightings on socio-economic goals
B	1	1	1	2	2	2	2	1	1	1	1	1	higher weightings on ecological goals
C	1	1	1	1	1	1	1	2	2	2	2	2	higher weightings on institutional goals

weighting regimes. Therefore, it may be appropriate to infer that what is important in the formulation or evaluation of policies and programs for sustainable development of mangroves is the interrelationships of the identified goals or criteria of sustainable mangrove development.

Table 6.8 Relative Ranking of Programs based on Sensitivity Analysis

Weighting Regimes →	A	B	C
Programs ↓			
ISFP	2nd	2nd	2nd
FSP	1st	1st	1st
NFP/FLMA	4th	4th	4th
CFP	3rd	3rd	3rd

CHAPTER SEVEN

DISCUSSION OF THE RESULTS OF EVALUATING MANGROVE PROGRAMS OF THE PHILIPPINES

This chapter provides the discussion of the results of evaluating mangrove policies and programs of the Philippines. From the discussion, observations and recommendations are made about improving mangrove policies and programs to achieve sustainable development of the country's mangrove resource.

7.1 RESULTS OF THE GAM EVALUATION

The result of GAM evaluation presented in Table 6.6, shows the FSP and ISFP as the most sustainable programs with sustainability indices of 96.3 and 92.6 percent, respectively. From a closer look, however, they could be treated equally as sustainable because the reason ISFP has a lower sustainability index than FSP is its exclusiveness to the coastal communities. The program is largely focused on the needs of coastal communities and its objective of devolving management responsibilities of mangroves to them may have a negative impact on other mangrove users. A communally managed resource may, for example, preclude commercial uses of the resource to the disadvantage of the timber licensees and the fish pond operators.

The evaluation indicates that ISFP and FSP appear to have a very desirable impact on socio-economic, ecological and institutional goals of sustainable mangrove development. They recognize mangrove development is not only satisfying the alleviation of poverty or the conservation and protection of mangroves, but also the development of a strong social value that promotes sustainable utilization of mangroves.

ISFP and FSP also recognize that coastal inhabitants themselves are a significant component of the ecosystem to be considered in the management

of mangroves. Recognition of their rights in the management of their own resources provides a positive psychological influence on their attitudes towards the government and its development programs. As noted by development experts (Sajise 1984) in the Philippines, the ISFP provides a better opportunity to the nearly century old struggle of the forestry sector in putting forestry in order. It also creates a new dimension in forestry management where people also become the central focus and indicator of development aside from the forest itself. Moreover, it initiates the realization that the battle for sustainable mangrove development can only be won through a collective and sustained effort by the government and the people whom it serves.

However, the problem with the implementation of the ISFP is it is a self-help project which needs a critical institutional support in its implementation. Although the program highly satisfies the objective of strengthening institutional commitment and coordination, it must be noted that one of the main problems in managing mangroves in the Philippines has been political interventions. Thus the program requires value reorientation not only from its participants, but also from the individuals who are concerned with the implementation of the program. It must be stressed to them their obligation in the protection of coastal resources such as mangroves, upon which the people depend for survival. Furthermore, the implementation of the ISFP does not only need good links from each of the concerned agencies, but also their commitment to supporting the program.

In the implementation of FSP, on the other hand, decisions on which management scheme to be implemented after its initial 5-year implementation should embrace the principle of ISFP in the issuance of Mangrove Stewardship Agreements (MSA) to the coastal communities themselves. Such a scheme ensures the local or sustainable development of the resource. Otherwise, the good intentions of FSP would become futile to the detriment of the mangrove ecosystem. The reason is, implementation of NFP/FLMA and

CFP in mangrove management does not promote sustainable mangrove development.

NFP/FLMA and CFP confront the socio-economic and ecological goals of sustainable mangrove development. However, such programs fail to acknowledge the ecological peculiarities of the mangrove ecosystem. As a result, the GAM evaluation discloses they are not totally feasible for the mangroves with a sustainability indices of 24.8 and 50.9 percent, respectively. The reason is the evaluation reveals such programs only strengthen the previous orientation of commercial utilization through the principle of community-based strategies. They both have a significant aim to alleviate poverty within coastal areas. However, the reality still remains that they are not building long-term partners for sustainable mangrove development but economic partners. In a sense, such programs are building a community which will become more commercially dependent on the mangroves.

As a consequence, their implementation may only increase the incidence of poverty and mangrove degradation in the coastal areas. Instead, NFP/FLMA and CFP may be more desirable if they are mainly rehabilitative in nature, rather than treating them as an economic venture.

7.2 GENERAL OBSERVATIONS AND RECOMMENDATIONS

The programs of the Philippine government evaluated generally indicate a disintegrated approach in the management of the country's mangrove areas. As summarized below, they have the common goal of solving the problems of poverty and mangrove degradation in the coastal areas, but with different approaches. Different types of changes to each program are necessary to ensure that it plays an appropriate role and is coordinated adequately at various levels of government:

ISFP - is a community-based self-help development program that promotes the welfare of the people and the development of the mangrove areas through

the people's initiative. In the evaluation, ISFP is considered sustainable for management of mangroves. However, the program being a self-help project requires commitment, not only from the individual participants, but also from the government agencies responsible for mangrove management;

FSP - is a capital-intensive and community-based development program to promote sustainable development of mangroves in order to sustain basic human needs. A short-term program like this needs to be considered under the principles of the ISFP. Like ISFP, it requires strong commitment from its participants and the government, in order to achieve its goals sustainable mangrove development;

NFP and FLMA - is a capital and resource-intensive program that also promotes the welfare of the people and the development of mangroves through the profits derived from the resource. Such programs need to prioritize the coastal communities in the issuance of the forest lease management agreement (FLMA). As much as possible, the corporate scheme of management should be eliminated. Programs in the management of mangroves should not be considered as an economic ventures, but as programs promoting the welfare of coastal communities and the conservation and protection of mangroves' vitality and integrity. The program likewise needs the reorientation of its institutional objectives, such as the development of more responsible and long-term partners in sustainable mangrove development;

CFP - is a resource-intensive and community-based development program that promotes the welfare of the people and the development of mangroves from profits derived from the resource. Such a program needs to recognize the peculiarities and limitations of mangroves, in order to promote its sustainability. It may not be feasible to treat the mangrove resource as the ultimate source of funding to enable reforestation of the other degraded areas. In essence, like the ISFP, it requires government support or capital to initially

provide a better environment for the coastal inhabitants, and consequently sustainable development of mangroves.

The diversity of programs being implemented may not necessarily provide an effective approach in the sustainable development of mangroves. Maintaining many programs may be more expensive than having one program which encompasses all the goals of sustainable mangrove development.

Considering the discussions above and the result of GAM evaluation, it is therefore recommended that all mangrove policies and programs need to be combined to create a single program, or group of integrated programs which would achieve the goals of sustainable mangrove development.

7.3 SPECIFIC OBSERVATIONS AND RECOMMENDATIONS

The following are detailed observations and recommendations, that may be considered in developing a sustainable mangrove development program of the country, along with the general recommendations discussed above.

7.2.1 Socio-economic

The socio-economic issues in the management of mangroves must be considered as a serious matter that would also affect the ecology of the resource. As provided in the discussion of the problems of mangrove management in the Philippines and the discussion of principles underlying sustainable development, poverty has been considered as one of the root causes of resource destruction, such as mangroves. Mangrove policies and programs, therefore, need to deal with the grinding issue of poverty in coastal areas, at the same time with the conservation and protection of mangroves.

Coastal inhabitants also need to be prioritized in the implementation of development programs, in order to limit the influx of more people into the mangrove areas. The issuance of stewardship agreements, for example, need to prioritize coastal communities who are directly dependent on the resource

for survival. As discussed in Chapter 2, they possess inherent capacity to improve themselves and, if recognized, they can be a powerful and effective partners in sustainable mangrove development.

Production sharing or joint-venture programs are laudable management schemes. However, long-term economic and ecological viability should be considered. As provided in Chapter 3, the fragility and uniqueness of the mangrove ecosystems do not permit intensive utilization. Community-based programs promoting localized utilization may be more viable.

7.2.3 **Ecological**

The utilization of mangrove resources should be limited to fulfil local needs, or should be based on the sustainable limits of a particular mangrove area. They should not be treated as the ultimate source of funds needed in reforesting other denuded mangrove areas. The ecological importance (e.g. coastal protection, source genetic material, feeding and nursery ground for fish) of mangroves need to be considered at the same time with their economic importance.

To maintain mangrove vitality and integrity, goals of mangrove rehabilitation and reforestation activities should not be limited to area expansion, but also include the maintenance of mangrove stability through the planting of indigenous and diverse species. As discussed in Chapter 3, the diversity of plants species within mangrove areas indicates their resilience and their ability to regenerate, thereby sustaining their economic and ecological services to the people. The more extensive and diverse a mangrove ecosystem is, the more it is sustainable.

7.2.3 **Institutional**

Mangrove programs directed to both alleviating poverty and protection of the resource requires critical government support. Management efforts should first be directed towards winning the hearts of coastal communities, in order to

generate acceptance and support towards a particular program. It should be emphasized that sustainable mangrove development can only achieved through collective and sustained efforts by the government and the people concerned.

Mangrove policies and programs should also be based on a comprehensive approach, with long-term goal of providing the needs of present and future generations. They need to consider both the achievement of better life for coastal communities and the integrity and vitality of mangroves.

Sustainable mangrove development requires strong environmental values, not only of coastal communities themselves, but also of policy makers and managers of mangroves. It should be stressed upon them, their obligation in conserving and protecting of coastal resources, such as mangroves on which people depend for survival.

Lastly, achieving sustainable development of mangrove does not only require good links from each of the concerned agencies, but also their commitment to support and implement a combined program.

CHAPTER EIGHT

CONCLUSION AND RECOMMENDATIONS OF THE STUDY

This chapter provides the conclusion of the study and its recommendations for further research. This includes a brief summary of the problem and objectives of the study, the result of evaluation, the benefits and difficulties confronted in undertaking the study.

The mangroves are unique and fragile ecosystems which have been devastated despite an escalated concern for their conservation and protection. In the case of the Philippines, there are adequate policies and programs for the sustainable development of mangroves. However, there is an inadequate conceptualization of the real mangrove management problems and issues. Most often, they have been considered either independently, or jointly, with one being considered as the dominant view.

This study applies policy evaluation as a technique for resolving inefficiency of policies and programs in achieving sustainable development of mangroves. A conceptual set of goals and criteria for sustainable mangrove development is developed, emphasizing the complex interrelationship of the socio-economic, ecological, and institutional issues that need to be considered in policy formulation and evaluation. The conceptual criteria for sustainable mangrove development are tested in the case of the Philippines, using the Goal Achievement Matrix (GAM) to elicit and examine mangrove management issues and identify recommendations in order to improve mangrove policies and programs of this country.

The case study emphasizes the relevance of policy evaluation in considering policies and programs formulated and administered by the Philippine government in the management of the country's mangrove resources. One of the benefits of the study is the presentation and understanding of the anticipated impacts and of a particular program in achieving the goals or

criteria of sustainable development. It enables not only the determination of which programs are best suited for mangroves, but also the changes needed to improve a particular program. The set of goals developed provided a framework in examining and understanding the critical management issues, such as the socio-economic, ecological and institutional issues, which are often neglected in the formulation of mangrove policies and programs.

The evaluation of mangrove programs of the Philippines provide several observations and recommendations which may be considered to improve the country's mangrove policies and programs, in order to achieve the sustainable mangrove development. Such recommendations are deem necessary considering the increasing efforts of the Philippine government to address both the issues of poverty in coastal areas and mangrove degradation. These mangrove management issues are interrelated that need to be considered equally in policy formulation and implementation.

In the evaluation, the implementation of the Integrated Social Forestry Program (ISFP) and the Forestry Sector Program (FSP) provides a good example of programs that necessarily achieve sustainable development of mangroves in the Philippines. Such programs are strongly geared towards achieving not only the socio-economic and ecological goals, but the institutional goals of sustainable mangrove development. The institutional goals as emphasized by the conceptual set of goals for sustainable mangrove development need to be considered as fundamental goals themselves rather than merely as operational goals. These goals are mutually reinforcing, and as such, they all need to be considered as fundamental goals and operational goals, interrelated with each other.

However, the good intentions of ISFP and FSP if combined with programs that are not socially and ecologically feasible in managing mangroves would only become futile. For example, the evaluation revealed that the implementation of Forest Lease Management Agreement (FLMA) and Community Forest

Management Agreement (CFMA) in the management of mangroves is not sustainable. These programs may destroy the good start already introduced by the ISFP to help coastal communities manage the mangroves.

FLMA and CFP are based on a management principle that is not economically and ecologically feasible in the long term management of mangroves. They both consider mangroves as a viable source of income and funds, to satisfy the needs of the people and the rehabilitation of other degraded mangrove areas. They are perpetuating a management principle that is ultimately influenced by commercial interest that may consequently build an economically dependent coastal communities rather than long term partners of protecting the mangroves. Although it is considered that economic development may be the solution to mangrove degradation, such management schemes introduced by FLMA and CFP are not feasible because of the ecological peculiarities of the mangrove ecosystems. They are unique and fragile ecosystem wherein such commercially-intensive management schemes are unacceptable.

Thus, in the management of mangrove resources of the Philippines, it is imperative that any evaluation of policies and programs needs to include an examination of how these issues relate to each other, and how they will affect the resolution of each other. This also needs to be considered through policy and program formulation and during the course of implementing a particular policy or program.

In general, the study highlights the relevance of policy evaluation in achieving sustainable mangrove development. The study reinforces the increasing efforts of natural resource management to concentrate on sustainable development. It enables the improvement of resource management policies and programs through the examination of their flaws and strengths in achieving their intended goals.

The study introduces conceptual goals and criteria derived from sustainable development concept and applied in the mangrove ecosystem. These set of goals and criteria embracing the interrelationships of socio-economic, ecological and institutional issues may serve as guide or framework in managing mangroves and other similar ecosystems, now and in the future.

In the debate about sustainable development as a concept, the study emphasizes the importance of not limiting fundamental goals of sustainable development to socio-economic and ecological goals of development. Institutional goals need to be considered as well. Such goals are mutually reinforcing and should be treated both as fundamental and operational goals, interrelated with each other.

The study also illustrates the usefulness of GAM in dealing with complex issues of environment and natural resource management. GAM which have been traditionally used in urban context, ranking alternative programs, is shown to be useful in evaluating mangrove programs of the Philippines through the introduction of sustainable development criteria into its methodology. With the introduction of such criteria in GAM, the evaluation does not only provides a relative ranking of mangrove programs, but an index on how well a particular program achieves the goals of sustainable development of mangrove.

Another contribution of the study in using GAM to evaluate policies and programs is that the results of evaluation prove to be more dependent on the anticipated impacts of the programs, rather than to the weightings assumed on each goal or criterion. This runs counter to what Hill believed, that the weightings are the backbone of the GAM. The sensitivity analysis conducted in the study proves otherwise. The weighting does not significantly affect the evaluation. Thus, the burden of gathering information about the decision makers priorities in development by which weightings are assumed may become trivial in policy evaluation, especially in using GAM.

In achieving the objectives of this study, however, there are several difficulties worth considering when undertaking such research. Foremost is the availability of primary information to be considered in evaluation. This study relies on secondary information which may affect the validity of findings in some situations. For example, the assumption of weighting (although it was proven otherwise) on the development criteria used in the evaluation was based on an ideal scenario inferred from the literature review concerning the concept of sustainable development and the characteristics of mangrove ecosystems. It does not necessarily have the first hand information about the actual needs of the individuals concerned or the mangroves in the Philippines. Rather, assumptions are made about the general needs of communities and for the sustainable development of mangroves.

Another difficulty confronted in this study is the determination of the prospective impacts of the mangrove programs on communities in achieving a particular development criterion or goal. The study deals with purely qualitative socio-economic, ecological and institutional information which requires an extensive knowledge of mangrove development problems and issues. There is a need for further research about specific communities and the characteristics of specific mangroves systems being utilized.

Policy analysis and evaluation, as mentioned in the introduction of this study, needs an empirical examination of the impacts of policies and programs. It also requires integration about quantitative and qualitative information approaches, problems from various perspectives, and the use of appropriate methods to test the feasibility of different program options.

With the potential of policy or program evaluation in natural resource management realized in this study, it is hoped that resource managers, researchers, and other concerned individuals are motivated to undertake program evaluation in order to achieve sustainable development of natural resource systems, such as mangroves in other countries.

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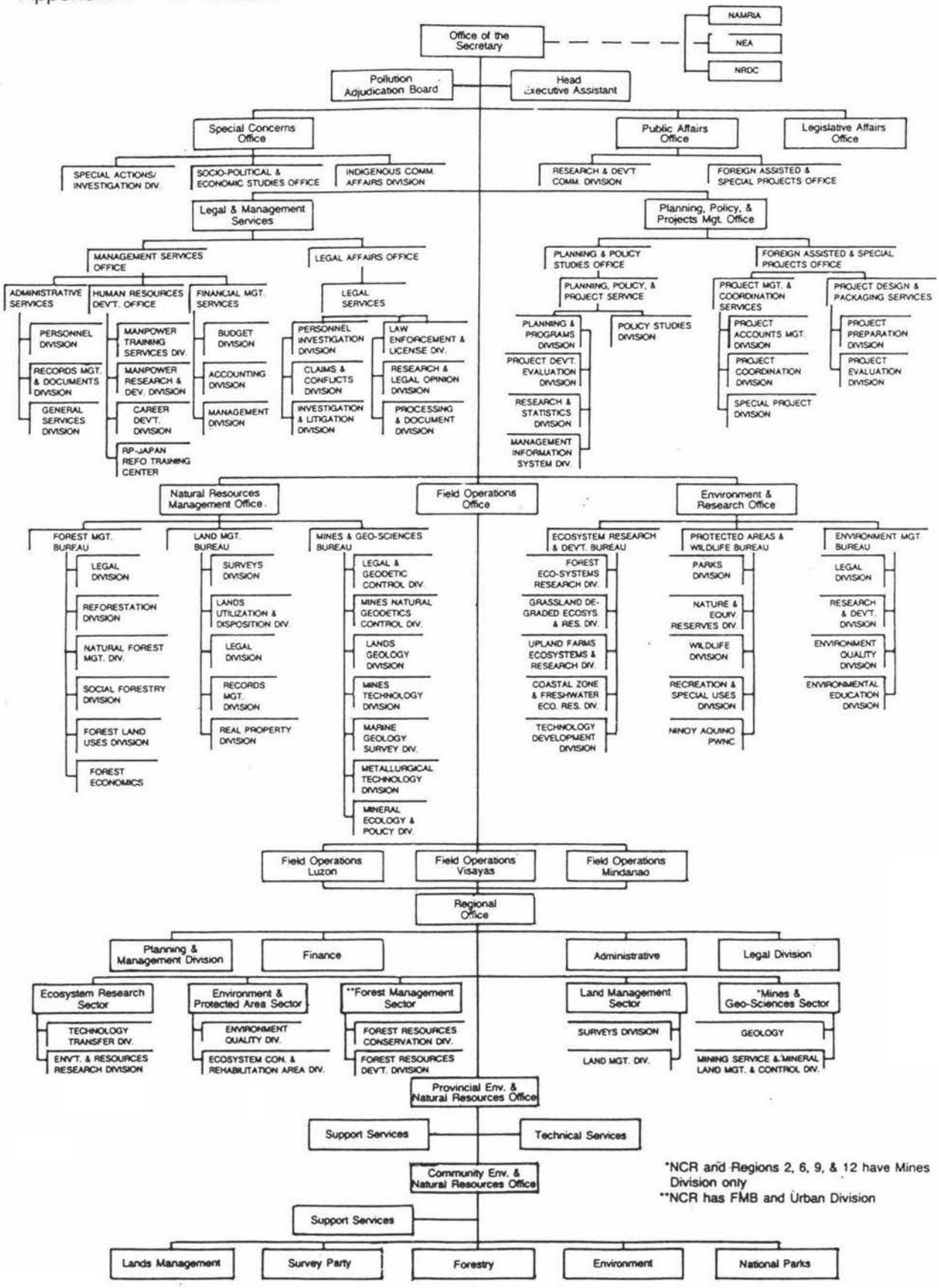
Appendix 1 - Organizational Structure of the DENR



Appendix 2 - PRIMER OF INTEGRATED SOCIAL FORESTRY PROGRAM

BACKGROUND

The concept of Social Forestry in the Philippines started as early as 1971 when the "Kaingin Management and Land Settlement Regulations" was passed by the government. In effect, the less-privileged and economically depressed upland farmers were integrated in the mainstream of forest conservation.

In the same decade, several socially-oriented programs were implemented, which included, Forest Occupancy Management (FOM) in 1974, Family Approach to Reforestation (FAR) 1976 and the Communal Tree Farming Program (CTF) in 1979. Based from the lessons and experiences learned from the implementation of these programs, refinements of policies were made including the pooling of resources and manpower. Thus, the launching of the Integrated Social Forestry Program (ISFP) in 1982 by virtue of LOI 1260 which became the umbrella program of the DENR for all socially-oriented/community-based upland development projects.

INTEGRATED SOCIAL FORESTRY PROGRAM (ISFP)

It is a national people-oriented program launched in 1982 by virtue of LOI 1260, designed to maximize upland productivity, enhance ecological stability and improve the socio-economic conditions of forest occupants and communities.

BASIC POLICY AND OBJECTIVES OF ISFP

ISFP was launched based on the policy of the government to democratize the use of public lands and to promote a more equitable distribution of forest bounty under the stewardship principle in order to achieve the national objective of environmental protection, poverty alleviation and promotion of social justice.

QUALIFIED TO PARTICIPATE IN THE ISFP ARE:

Individuals, families, or forest communities/associations including indigenous cultural communities with the following qualifications may enter into Stewardship Agreement under the ISF program:

a. Filipino citizens;
b. Must be of legal age;
c. Must be actual tillers or cultivators of the land to be allocated;
d. Must be living in the project area or adjacent barangay/sitio.

DISQUALIFIED TO PARTICIPATE IN THE ISFP

The following are disqualified from entering into a Stewardship Agreement:

a. Those who already have Stewardship Agreements or are married to Stewardship Agreement holders;

b. Those who have had previous Stewardship Agreement cancelled for cause, except when the cancellation was due to the demand of public interest as determined by the Secretary of the DENR.

AVAILABLE AREAS

a. Open and denuded forest lands (with less than 10 percent stocking) and suitable for ISF areas.

b. Areas covered by former projects on Forest Occupancy Management (FOM), Family Approach to Reforestration (FAR), Communal Tree Farm (CTF), and other suitable reforestation/afforestation projects;

c. Areas within existing TLA, PLA, ITP, or AFLA which have have been developed into productive farms as of 31 December 1981 and concurred by the Secretary, provided further that it is not in conflict with the reforestation obligation of license/lease holder;

d. Communal Forest, Communal Pasture or any other DENR projects which has ceased to serve its original intentions, neglected or abandoned as determined by a study team designated by the DENR Secretary.

PROHIBITED AREAS

a. Areas where continued occupancy of area would result to massive soil erosion, sedimentation of rivers and streams, reduction in water yield and impairment of other resources to the serious detriment of community and public interest;

b. Areas already covered by existing DENR reforestation projects, Community Forestry Project (CFP), Forest Land Management Agreement (FLMA), and such other similar projects;

c. Areas designated strictly for protection purposes such as virgin forests, areas for biodiversity conservation and areas beyond 50% slope and 1000 meters elevation.

PROGRAM COMPONENTS

A. Provision of Security of Tenure

Qualified program participants shall be provided with security of land tenure which depending on the options of the farmers could be: Certificate of Stewardship (CS) for individual participant or Certificate of Community Forest Stewardship (CCFS) for associations or communities including the indigenous cultural communities. The tenure is good for twenty-five (25) years renewable for same period.

Application for CS and/or CCFS shall be filed at the CENR Office having jurisdiction over the subject area.

Areas which are actually occupied and cultivated shall be allocated to individual participants, the size of which shall not exceed five (5) hectares.
If the area is more than the specified limit, the excess shall be divided among the participants next-of-kin whose allocation, if any, is less than five (5) hectares.

All applications for CS are subject to the approval of the CENR Officer

B. Extension Services

Under this component, there are three major sub-components namely: community organizing and development, training and provision of farm inputs.

1. **Community organizing and development.** Farmers participation is the key to the successful soil conservation. As such, project teams shall facilitate the formation of associations and/or cooperatives of program participants. Existing organization shall be recognized and strengthened.

2. **Training.** Project teams shall conduct periodic training for program participants to disseminate information on appropriate agroforestry technology, community organizing, financing and marketing. Among the major approaches in training farmers are:

   a. **Cross-farm visit.** Project teams shall arrange cross-visitation by farmers of their respective farms, to allow them to observe the different farm practices and technologies adopted and thereby learn from each other.

   b. **Model Site Development.** Selected ISF projects shall be established as model sites where different upland farming and soil conservation technologies shall be introduced. Once these areas are fully developed, they shall serve as show window of the various technologies for upland farmers to observe.

   c. **On Site-Training.** Farmers and technicians work together in implementing new technologies in demonstration farms or at the farmer's farmlot based on the principle of learning by doing.

3. **Provision of farm inputs.** In order to encourage the farmers to invest their time and scarce inputs on soil conservation measures, attractive incentives and appropriate inputs shall be provided which should be practical and service-oriented.

C. Agroforestry Development

Program participants shall be encouraged to develop their allocated land in accordance with their formulated development plan. Appropriate agroforestry technologies, and soil and water conservation measures shall be promoted to improve farm productivity.

D. Infrastructure

These include access roads/graded trails, water impounding structures and dams. Basically, this component is designed to:

1. assist the farmers to transport inputs and produce to and from the farm.
2. increase farm production through small water impounding and irrigation system.
3. enhance production through the promotion of soil and water conservation measures.

E. Credit Assistance

Farmers shall be advised to set aside portions of their income as their revolving fund wherein each member may borrow seed capital for other livelihood projects. The farmers may also avail of credit assistance from the Land Bank of the Philippines especially those farmers with strong organization or cooperatives.

RESPONSIBILITIES OF THE ISF PROGRAM PARTICIPANTS

Program participants are required to:

a. Participate in the delineation of project area and parcellary survey as a means to resolve boundary conflicts;

b. Develop their allocated lands to productive farms and make their families economically viable and self-reliant consistent with accepted scientific farming practices and with environmental protection;

c. Devote at least 20 percent of the land within the project area to tree farming of suitable species to contribute to the reforestation efforts of the government;

d. Protect and conserve the forest growth within the project area and cooperate with the Department of Environment and Natural Resources (DENR) in protecting forest areas adjacent thereto;

e. Preserve monuments and other landmarks indicating corners and outlines of boundaries within the project area in the course of implementing the project development plan;

f. Prevent and suppress fires within the project area and other areas immediately adjacent thereto;

g. Protect and preserve trees or other vegetation within a 20 meter strip of land from the edge of the normal high waterline of rivers and streams with channel of at least 5 meters wide, bordering or passing through their allocated land. In case of rivers less than 5 meters in width, the strip shall be 10 meters on each side of the river or creek;

h. Abstain from cutting or harvesting naturally growing timbers within and adjacent to social forestry areas except when authorized by DENR in accordance with existing forest regulations and guidelines; and

i. Refrain from transferring or assigning their allocated land or any portion thereof without prior approval from the DENR Secretary or his authorized representative.

INCENTIVES UNDER THE PROGRAM

To encourage qualified persons to participate in the Program, the following incentives are provided:

a. No fees shall be collected for the use of allocated land under the Stewardship Agreement;

b. All income/proceeds derived from the land shall accrue to Program participants;

c. Unless the law otherwise provides, forest products derived and/or harvested from the Project Area shall be exempted from the payment of forest charges;

d. Technical, legal, financial, marketing, credit and other needed assistance shall be extended to Program participants;

e. Program participants may avail of assistance provided by other government agencies and non-government and/or private organizations; and

f. Upon expiration of the Stewardship Agreement, Program participants or their direct next-of-kin shall have the right of pre-emption to any subsequent Stewardship Agreement covering their allocated land, and when for some reasons the government opts to allocate the land for other uses, the participants concerned shall be entitled to just compensation for permanent improvements introduced including trees.

TRANSFERABILITY OF STEWARDSHIP RIGHTS AND RESPONSIBILITIES

The transfer of stewardship rights and responsibilities shall be allowed in the following cases subject to the approval of the Secretary or his duly authorized representative:

a. death or incapacity of the original steward

b. movement outside of the area by the original steward

c. change of vocation by the participants from that of being an upland farmer.

The steward may nominate his heir to the stewardship rights and responsibilities for the remaining unexpired term of the agreement subject to Secretary's approval or his authorized representative. In the absence of such nomination, the heirs may nominate who among them shall inherit the Stewardship Agreement provided that the nominated heir possesses the necessary qualifications stated hereof.

GROUNDS FOR CANCELLATION OF THE STEWARDSHIP AGREEMENT

The Stewardship Agreement shall be cancelled for any of the following causes:

a. When a program participant fails to comply with the terms and conditions of the Agreement within one (1) year after being notified of his neglect in writing by the RED;

b. When a program participant had willfully used false information to obtain the Agreement;

c. Serious and continued violation of forestry laws, rules and regulations in the development of the area; and

d. When public interest as determined by the Secretary of DENR so demands.

If the cancellation is caused by conditions (a), (b) or (c), all the improvements introduced on the land shall be forfeited in favor of the government and the steward losses the right to nominate who among the heirs will inherit the Stewardship Agreement. On the otherhand, if the cancellation is due to condition (d), the steward aside from just compensation for all the improvements introduced on the land shall be resettled to other place the selection of which he/she may participate and upon the approval of the Secretary.

Appendix 3 - Department Administrative Order No. 15, Series of 1990. Regulations Governing the Utilization, Development, and Management of Mangrove Resources.

In accordance with the provisions of P.D. 705, as amended, otherwise known as the Revised Forestry Code of the Philippines, the following rules and regulations governing the utilization, development and management of mangrove resources are hereby promulgated for the information and guidance of all concerned:

SECTION 1. *Policy and Objectives*

Mangroves have multi-uses. As such, the utilization, development and management of mangrove resources shall involve as many uses as possible for the benefit of the greater number of users. To sustain optimum productivity, it shall be the policy of the government to conserve, protect, rehabilitate and develop the remaining mangrove resources of the country; give preference to organizations, associations or cooperatives over individual users in the utilization and development of the mangrove resources; stop the wanton exploitation of the mangrove resources; and enhance the replenishment of the denuded areas through natural or artificial means.

SECTION 2. *Definition of Terms*

For the purpose of this Order, the following terms are defined:

a. Alienable or Disposable Lands refer to those lands of the public domain which have been the subject of the present system of classification and certified as not needed for forestry purposes.

b. Communal Mangrove Forest refers to a tract of public forest set aside by the Secretary of the Department of Environment and Natural Resources upon the recommendation of the Director of the Forest Management Bureau for the exclusive use of the residents of the municipality from which said residents may cut, collect or remove mangrove forest products, such as firewood and mangrove timber for charcoal production for home consumption in accordance with existing laws and forest rules and regulations.

c. Denuded areas refer to mangrove areas which have been devoid of mangrove trees, shrubs and/or nipa palms. Treeless areas covered with weeds and vines fall under this definition.

d. Fishpond Lease Agreement is a privilege granted by the state to a person or group of persons to occupy and possess in consideration of specified rental any public lands for the raising of fish and other aquatic products.

e. Forest Lands include the public forest, the permanent forest or forest reserves, and forest reservations.

f. License is a privilege granted by the State to a person to utilize forest resources within any forest land, without any right of occupation and possession over the same, to the exclusion of others, or establish and operate a wood processing plant,or conduct any activity involving the utilization of any mangrove forest resources.

g. Mangrove area refers to the area found along the seacoast and estuaries whether sparsely or thickly vegetated with true and/or associated mangrove species, or open swampy areas, including brackish fishponds, extending along stream where the water is brackish.

h. Mangrove Buffer Zones are strips of land at least 50 meters in width fronting seas, oceans and other bodies of water and 20 meters on both sides of the river channels/banks maintained and developed to enhance the protective capability of the mangroves against strong currents, winds and high waves except in areas covered by Ministry Administrative Order No. 42, Series of 1986.

I. Mangrove Forest refers to forest stand found in the mangrove areas and composed primarily of mangrove and associated species.

j. Mangrove Plantation refers to a stand of mangrove trees and/or palms of true or associated species planted in the mangrove area.

k. .Mangrove Resources refers to all terrestrial and aquatic flora and fauna in the mangroves including land and minerals which could bestow any form of services, influences, and amenities to man and the environment.

l. Mangrove Swamp Forest Reserves are mangrove areas of the public domain which are declared as such under Presidential Proclamation 2152 and are determined to be needed for conservation and protection purposes.

m. Permit is a short term privilege or authority granted by the State to a person or group of persons to utilize any limited activity within any forest resources or undertake a limited activity within any forest land without any right of occupation and possession therein.

n. Protected Areas refer to mangrove areas declared as such under the Integrated Protected Areas System to be instituted by the DENR.

o. Timber refers to any piece of wood more than 1.5 meters long and having an average diameter of more than 15 centimeters.

p. Wilderness Areas refer to the mangrove areas which have been declared as such by the President of the Philippines under Presidential Proclamations for the preservation of the floral and faunal species found therein to prevent their extinction and to serve as genepool for the proliferation of said species.

SECTION 3. *Prohibition in the Issuance of License and Permit*

Upon the effectivity of this Order, the granting and/or renewal of mangrove timber license and/or permit of any kind that authorizes the cutting and/or debarking of the trees for commercial purposes in areas outside the coverage of Fishpond Lease Agreements and mangrove plantations shall no longer be allowed.

SECTION 4. *Conversion of Mangrove Areas into Fishponds*

Conversion of thickly vegetated mangrove areas into fishponds shall no longer be allowed. All mangrove swamps released to the Bureau of Fisheries and Aquatic resources which are not utilized, or which have been abandoned for five (5) years from the date of

SECTION 5. *Fishponds in Mangrove Forest Reserves and Wilderness Areas*

In accordance with the national policy fishponds will not be allowed within mangrove forest reserves and wilderness areas. However, in cases where legally acquired productive fishponds are within such areas, and the government opts to revert them to the category of forest lands and if public interest so dictates, the operator would be justly compensated.

SECTION 6. *Issuance of Certificate of Stewardship Contract*

A Certificate of Stewardship Contract may be issued covering mangrove areas to individuals, communities, associations or cooperatives, except in wilderness areas, provided that the activities shall be limited to sustainable activities as indicated in the approved Management Plan for such areas. Conversion of mangroves for, but not limited to, fishpond development, saltworks and paddy cultivation shall not be allowed under the Certificate of Stewardship Contract.

SECTION 7. *Cutting of Trees within FLA Areas*

No cutting of trees within existing Fishpond Lease Agreement (FLA) areas shall be allowed without the benefit of a permit from the Department of Environment and Natural Resources. The trees cut in FLA areas through a permit shall be turned over to the DENR for disposition through public bidding. FLA holders are given the right to equal the highest bidder, in which case the bid is automatically awarded to him.

SECTION 8. *Establishment, Development and Management of Communal Mangrove Forest*

Communal mangrove forests may be established in mangrove-endowed municipalities/cities in accordance with the policy guidelines as enunciated in Ministry Administrative Order No.48, Series of 1982, as amended. The development and management of the communal mangrove forest shall be the responsibility of the community people concerned under the concept of community-based forest management and in accordance with an approved Management Plan to be monitored closely by the Regional Offices of DENR. However, the DENR may disestablish a mangrove area as communal mangrove forest if the allowable activities thereat are found to be non-sustainable to the resource.

The DENR through its field offices shall conduct a sustained information dissemination campaign on the environmental aspect of mangrove management. Local immersion should also be used as a tool to train the people on the technical aspect of mangrove management. The substance of the training should be attuned to the policy as enunciated in this Order.

SECTION 9. *Fishpond Development*

Fishpond development shall only be allowed in denuded areas which have been zonified as suited for such activity. Estuarine mangroves which are predominantly, if not totally, vegetated with shrubs shall not be disposed for fishpond development as such areas still contribute to the productivity of the nearby marine ecosystem, hence, should also be extensively rehabilitated. Applications for fishpond development covering the estuarine areas shall be returned to the applicants immediately with a corresponding responsibility on the part of the Department of Environment and Natural Resources to assist the applicants in locating suitable areas as an alternative area for fishpond development in accordance with the provisions of this Order.

SECTION 10. *Responsibility and Authority on the Protection, Development and Management of Mangrove Areas*

The protection, development and management of mangrove areas shall be the

SECTION 11. *Continuing Assessment of Mangrove Resources*

There shall be a periodic assessment of the mangrove resources throughout the country. The National Mapping and Resource Information Authority (NAMRIA) shall be responsible in the interpretation of aerial photographs, Land Satellite (LANDSAT) and other remote sensing data while the Regional Land Evaluation Teams will do the ground verification activities. The involvement of interested Non-government Organizations shall also be solicited in the conduct of the assessment.

SECTION 12. *Establishment of Mangrove Plantations*

Mangrove plantations are allowed to be established in denuded or sparsely-vegetated mangrove forest lands and A & D areas through an approved permit in accordance with the relevant provisions of Forestry Administrative Order No. 8-3, Series of 1941, prescribing the revised guidelines governing the special uses of forest lands, as amended, and other related laws, rules and regulations. The initial maximum area allowed for mangrove plantation establishment shall be fixed at 50 hectares for corporations, cooperatives and associations and ten (10) hectares for individuals. However, additional areas may be subsequently granted to existing developers after thorough evaluation of accomplishments provided that the accumulated area does not exceed two-hundred (200) hectares for corporations, cooperatives and associations and fifty (50) hectares for individuals.

SECTION 13. *Cutting of Trees in Mangrove Plantations*

Mangrove plantation developers shall be allowed to cut the planted trees found within their respective plantations through clearcutting by strips system, whether such is intended for personal or commercial purposes: Provided, That they secure a permit from the immediate office of the DENR.

SECTION 14. *Silviculture*

Silvicultural practice allowed in naturally grown mangrove forest shall be a combination of seed- tree method and planting. In the course of harvesting, at least forty (40) healthy trees per hectare, spaced regularly over the area, and representative of the species in the area, shall be retained to provide the seeds necessary for regeneration purposes.

SECTION 15. *Penal Provision*

Violations of any of the provisions of this Order shall be penalized in accordance with existing laws and regulations.

SECTION 16. *Repealing Clause*

This Order supersedes radiogram message dated June 13, 1986; BFD Circular No. 13, Series of 1986; and all previous administrative orders, regulations, circulars, memorandum orders or instructions involving the disposition of mangrove resources inconsistent herewith.

SECTION 17. *Separability Clause*

Should any of the provisions of this Order be subsequently or otherwise revised, modified or repealed accordingly, the same shall not affect the validity or legality of the other provisions so far as they could stand independently of the provisions so revised, modified or repealed.

SECTION 18. *Effectivity*

This Order shall take effect fifteen (15) days after its publication in a newspaper of

Appendix 4 - FORESTRY SECTOR PROGRAM BRIEFING KIT

PROGRAM DESCRIPTION:

The Fisheries Sector Program - DENR Component is composed of two (2) projects namely: Mangrove Rehabilitation Project and Resource and Ecological Assessment Project.

The Fisheries Sector Program general obhective is to develop fisheries productivity thru the development of coastal resources with emphasis on:

a) Coastal resource management through community participation.

b) Provision of financial assistance, alternative livelihood and technical assistance to small fishermen to upgrade standard of living.

c) Their lessening of competition between small and commercial fishermen through the application of the exclusive economic zone for commercial fishermen.

d) Availability of adequate information on the critical bays in a dat bank to be used as basis for the formulation of bay-wide/area-wide management plan.

Mangrove Rehabilitation project is under the coastal resources management component of the program which is aimed to a particular coastal ecosystem; mangrove.

The vitality of mangrove ecosystem contributes to the protection of other coastal resources and to the productivity of fishery resources. The mangrove rehabilitation componentis tasked with the following:

a) To rehabilitate the denuded portion of mangrove forest in the critical bays and support areas thru reforestation, aforestation, assisted natural regeneration, forest or timber stand improvement and other forms of rehabilitation to provide the essential productivity and protective values derivd thereof.

b) To provide alternative source of livelihood thru contract reforestation and non-invasive forms of utilization (i.e. amatong, equasilviculture, etc.) to augment the income generating capacity of coastal communities.

c) To provide information transfer and technical assistance to prepare the communities to assume their role in the sound management of the mangrove resources.

d) To protect aeas (wilderness areas, buffer zone, ecological zone, etc.) which provides support to wildlife and land stabilization throug the active support of the communities and other government and non-government agencies.

Implementation shall be in coordination with the DENR field offices, forest management bureau, environmental management bureau, local government and Department of Agriculture.

Location of Project: Sites: Manila Bay, Tayabas Bay, Pagay Gulf, Calauag Bay, San Miguel Bay, Sorsogon Bay, Lagonoy Gulf, San Pedro Bay, Ormoc Bay, Carigara Bay, Panguil Bay and Sogod Bay.

Support Areas: Palawan Mainland, Zamboanga del Sur, Basilan, Bohol, Davao del Norte, Davao del Sur, Cebu and Negros Islands.

Date of Initiation: July 1990

Project Duration: 5 years

Operational Activities: July 1990 - July 1991

Prologue

The first year of implementation focussed on the conditions laid on the release of the first tranche, the activities were therefore centered on: 1) contract processing and warding; 2) survey and delineation and Forestation activities. Resource Inventory and assessment were second priority with the accomplishment of the target for the first tranche, the project now reorients the project activities.

Activities required for the second tranche

Project activities are implemented of three phases under the following basic assumptions:

1. Area approach method - This approach includes not only mangrove ecosystems but the whole coastal ecosystems. The interrelationships of coastal ecosystems is the basic notion of this approach.

2. The coastal dwellers are the real day-to-day managers of the resources and as such the responsibilities in conservation and managemnet should be transferred to these communities.

3. In support of assumption no. 2 coastal communities should be organized under a system of stewardship envisioned to increase their responsibility and awareness in actual management of the resources.

4. There are portions of mangrove forests which must be critically managed, preserved and delineated.

Areas classified as wilderness, parks and research areas should be given the most adequate protection by limiting those to be released to coastal communities to the following: 1) accessible to the people, 2) open areas (including tidal flats), 3) unproductive/illegally developed fishponds,4)Nipa stands and 5)those mangrove areas bordering traditional fishing

grounds.While those areas which is utilized /perform 1) soil stabilization, 2)Protection for infrastructure ,3) bordering riverbanks and fronting coastal areas which is susceptible to storm surges(200 meters) 4) research areas, wilderness areas ,parks, reservations and 5) areas delineated by DENR field offices for other projects /programs (not under CFP,ISFP, etc) shall be reverted back to Goverment jurisdiction/control.

These are the following **OPERATIONAL PHASES.**

I.PREPARATION PHASE

A. RESOURCES INVENTORY AND PLANNING

1. **RECONNAISSANCE AND BOUNDARY SURVEY**(RBS)- RBS activities aims to Identify/locate and Delineate total mangrove ares (including closed canopy areas /pristine portions,secondary growth,logged over,sparsely vegetated, fishponds areas(inc. FLA ares and illegaly developed areas)and tidal flats/mudflats.).Greound verification activities shall be done by field offices and preceded by survey of the total areas available for FSP development/Rehabilitation.Map inputs are land classification maps,FLA maps,Aerial photographs (to be provided by the FSP - DA),and Spot Images (from NAMRIA).It aims delineate a total of 30,000 hectares of available areas within the critical bays and support areas. Priority shall be on the critical bays.RBS shall commence on the first month 1992 and finished by February.

2. **MANGROVE RESOURCES INVENTORY** (MRI)-Identified and Surveyed Mangrove ares shall be assessed QUANTITATIVELY and QUALITATIVELY thru MRI activities.A .5% sampling intensity using strip plot method, parameters to be assess are teh following:

1) Species Composition
2) Density
3) Average stand dbh
4) Average stand height
5) No. of seedlings/sampling
6) No. of trees dead/dying

Results shall be reflected on an updated vegetation map. For areas not covered by FSP-DENR. The contracted research institutions shall be responsible for facilitating mangrove resources inventory. For areas covered by FSP-DENR activities shall commence after the survey/reconnaissance phase and period for implementation/duration will be three months.

1) **Reconnaissance and Boundary survey** - this activity shall start the preparatory phase and aims to idnetify and delineate mangrove areas (including closed canopy area, secondary growth, logged over, sparely vegetated, and tidel flats). Delineated areas shall be assessed quantitatively and qualitatively. Fishpond areas shall be delineated (including those illefally developed. Reconnaissance and Boundary survey shall start on the first month of 1992 and last for about a month. It aims to delineate a total of 30,000 has. of mangrove forest areas and mudflats within the critical bays and other support areas. Priority shall be within the critical bays.

2) **Preparation, updating, reproduction and Distribution of base maps and operational maps** - This activity shall commence after the Mangrove Resources Inventory Allied activities will include zoning of areas for development schemes (e.i. reforestation, AMR, FSI or ISI and Aquasilviculture) Technical recommendations and updating of statistical data. This period shall have a duration of a 2 months, starting at fifth month of implementation (May - June 1991).

3) **Survey Mapping and Planning** - For identified reforestation sites. Survey, Mapping and Planning activities shall commence on the first month of 1992 and last th e months. The DENR field offices (DENR-FO's) and FSP-DENR shall be responsible in the contracting of SMP shall commence on the 7th month and last for 3 months, (other areas mean AMR areas, aquasilviculture areas MSA and FLMA areas, research areas, parks and wilderness areas and FSI/FSI areas) Development Plans/Management Plans shall take in considerations are the following:

1) Qualitative and Quantitative state of the area.
2) Potential level use of the area.
3) Environmental need of the critical bay.

The next stage of the preparatory phase is the Human Resources Development and Orientation (HRDO) stage which will be simultaneous to the implementation of resource inventory and development planning.

1) **Preparation/Development and Reproduction of Technical and Information Campaign Materials** - The initial phase of HRDO is the preparation information campaign and technical materials which includes the following:

1) Technical manual for Mangrove Managers and NGO's representative.
2) Rivers for Fishermen Associations
3) Audio-visual materials
4) Radio plug materials
5) Comics
6) Posters

The DENR-FO's - ERDB and other GO's and NGO's shall be tapped for their contribution. The FSP-DENR shall coordinate the all activities and a responsible in contracting the mass production of the materials. This activity shall start on January 1992 and ends of February.

2) **Identification of Alternative livelihood Technologies** - Simultatneous to the implementation of preparation and reproduction o information and technology materials. Identification and documentation of non-invasive alternative livelihood i.e. aquasilviculture and amaton .

2. Contracting of Monitoring and Evaluation Contracts - This activity sgall commenced ager a month. The CSD contracts are awarded. Monitoring shall be facilitated thru ICM. It is also a continuing activity . The prime alienable for the M & E contracts shall be the Bay Management Counci' and the local government units.

3. Regular Monitoring Supervision and Validation (RMSV) of Activity - Monthly RMSV activities shall be conducted by the DENR - FO's assisted by the FSP-DENR, while Quarterly and Annual RMSV acitivites shalll be a concern of the FSP-DENR assisted by the DENR Fo's. This is a continuing activity.

4. Implementation of Alternative/Support Livelihood Packaged Projects (A/SLPP) - This activities shall commence on November of 1992 and continued up to the "Program" duration.

   a) The first phase of A/SLPPs activity is conduct of Environmentel Impact Assessment and Feasibility Studies. This pahse shall be done on November of 1992 up to March 1993. This activity shall be done by the contracted Research Institutions doing the REA and Coordinated by the FSp-DENR.

   b) Funding - Funding is the second part of A/SLPP. Proposal shall be submitted to the Credit Component of FSP for possible funding on January of 1993. The FSP-DENR shall also propose budget for the A/SLPP.

   c) Site Preparation - Activities shall commence on April 1993 for plot areas and December 1992 for other areas.

   d) Implementation/Operation shall commence on the 3rd Quarter of 1993 up to the "program" duration.

   e) Evaluation shall be done on the last Quarter of 1994 as well as recommendations and assessment.

5) **Regular Coordination/Establishment of Institutional Linkages** - This is a continuing activities where results/accomplishment shall be regularly reported to FSP-DENR-OSEC on monthly basis.

Evaluation Phase - Evaluation Phase shall commmence on the 3rd quarter of 1994 except on evaluation phase activities like MSA and FLMA awarding.

1) **Impact Evaluation** - Assessment of impact of the project activities shall be done thru socio-economic survey on the 3rd quarter of 1994. This shall be coordinated by the FSP-DENR-OSEC assisted by DENR-FO's DA-PFMU's, NGO's and BMC's.

2) **Post Project Evaluation** - Post Project Evaluation activities shall be conducted by the BMC's DENR Central Office, DA-PMO and the ADB representatives. This activity shall be done on the last quarter of 1994.

3) Turn - over of Projects to DENR-Fo's and Local Government

3) **Technical Trainings and Information Education and Campaign.** Information campaign materials dissemination and radio - plug in to provide preliminary orientation effort shall be concentrated the critical bays and support areas. Information education seminars shall be conducted in the critical bays coordinated thru the the FSP -DA Module II and III trainings.Technical trainings shall be conducted Bagbilao, Quezon/ Lucena city for Luzon areas(including Mindoro,Palawan,Mariduque,and Masbate) and Talibon,Bohol or Carigara, Leyte for Mindanao and Visayas areas.Technical trainings shall be given to the DENR field Offices representatives, DA - PFMU representatives NGO s community organizers and local goverment units representatives. Tehcnical trainings shall be conducted on March to April of 1992 whilw scgedules for 1993 and 1994 shall be on the months of Jan-Feb. It shall also be emphasized to the DANR-FO's to participate actively on the formation of BMC s and for the Development of CRM plans in each critical bay.

4) **Contracting of Comprehensive Site Development Contracts** - The DA and DA contracted NGO's for community organizing shall endorsed organized FA's and established FA's as the priority alienable for DSP contracted as weel as the the MSA's and FLA's unvardees or stewards within the critical bays. The next priority is the coastal community organization which are registered and accredited by the DENR and Local Goverment Units. The third priority are the NGO's not locally based but accredited with the DENR. Contracting CDC contracts and documentation shall followw one month before the SMP activities is ended.

Implementation Phase - Implementation Phase shall constituted of the following activities:

1. Technical Assistance on Plantation Establishment and Maintenance and Protection activities.

2. Contracting of the Monitoring and Evaluation contracts.

3. Regular monitoring, supervisor and validation of activities.

4. Implementation of Packaged Alternative/Support livelihood.

   a) Feasibility Study/EIA
   b) Site Preparation
   c) Implementation
   d) Evaluation

5. Regular Coordination of FSP-DENR and DENR-FL s.

1. **Technical Assistance on Plantation Development Maintenance and Protection Measures** - This activity shall be acontinuing activity and the prime responsibility of the DENR FO's. New Technologies shall also be reviewed and disseminated thru trainings and Technical Consultantion.

Units and Fishermen Communities. All projects done in areas under protection, research and wilderness shall be turned-over to DENR-Fo's. Projects concerning areas outside protection shall be research and wilderness zone shall be truned-over and managed by the LGU's and BMC's. While areas concerning A/SLPP, MSA and FLMA shall be turned-over to the Coastal Communities. These shall be done on the last quarter of 1994.

4) Awarding of MSA and FLMA - FLMA shall commence after the duration of contracts under CSD. Priority shall be the FA's. MSA areas shall be delineated. These areas includes (nypa stands, and mangrove areas,traditionally depended by Coastal Communities. Provided however that these areas are outside protection, research and wilderness areas. MSA awarding shall stand January 1993 and continued up to the 3rd quarter of 1994.

This Agreement made and entered into this _____ day of _____ 19 ___ between the Republic of the Philippines Department of Environment and Natural Resources (DENR), hereinafter referred to as the Grantor, and _____ _____ of legal age, Filipino, with postal address at _____. hereinafter referred to as Grantee.

W I T N E S S E T H :

WHEREAS, the Grantor has jurisdiction and authority over the demarcation, protection, management, disposition, reforestation, occupancy and/or use of public forest resources including mangrove areas;

WHEREAS, a steward is someone who is entrusted with the resources of another for the purpose of exercising stewardship over those resources by providing care, protection and wise management;

WHEREAS, the Grantor will enter into a Stewardship Agreement with and issue a CErtificate of Stewardship covering mangrove areas to qualified individuals, communities, associations or cooperatives for the purpose of allowing the Grantee to plant and/or manage and protect permanent mangrove forest, to harvest in a sustainable way and enjoy all the produce therefrom, and to benefit others by maintaining that forest for coastline protection and support of coastal fisheries;

WHEREAS, the Grantee is qualified to enter into a Stewardship Agreement under the laws of the Republic of the Philippines and has filed with the _____ _____ of the DENR for permission to plant and/or manage and protect mangroves on a parcel of public intertidal forestland, hereinafter referred to as the Stewardship Area;

WHEREAS, the Grantor, after having evaluated the social and economic condition of the Grantee, hereby recognizes and considers said Grantee as a qualified participant in the management and protection of mangrove areas as part of the national effort to maintain and enhance this essential coastal forest;

WHEREAS, according to official records on file with the Grantor, no adverse claim has been presented nor any objection or opposition has been filed against the application of the Grantee;

NOW, THEREFORE, for and in consideration of the foregoing premises, the Grantor hereby authorizes the Grantee under this Stewardship Agreement to plant and/or manage and protect permanent mangrove forest on the Stewardship Area described in the attached map (Annex 1), in accordance with the Mangrove Stewardship Plan attached hereto (Annex 2), both of which form an integral part of this Agreement, subject to existing forest laws, policies, rules and regulations and to the following terms and conditions:

A. RIGHTS AND RESPONSIBILITIES OF THE GRANTEE

1. The Grantee shall have the sole and exclusive right to peacefully utilize the Stewardship Area and enjoy all the produce therefrom against any and all third parties; PROVIDED, that, the Grantee shall establish and/or manage permanent mangrove forest on the Stewardship Area in accordance with the Mangrove Stewardship Plan attached hereto and employ appropriate mangrove forest management methods and practices; PROVIDED, further, that, the conversion of all or part of the Stewardship Area to a fishpond development, salt works, paddy cultivation or any other activity not authorized in writing by the DENR which results in the destruction of all or a part of the mangrove forest shall not be allowed and shall be cause for immediate cancellation of this Agreement.

2. The Grantee shall successfully implement Phase One of the Mangrove Stewardship Plan attached hereto within three years from the execution of this Agreement.

3. The Grantee may receive technical assistance and extension services in the management of the Stewardship Area, including assistance in the procurement of planting materials, harvesting and marketing from the DENR, the Department of Agrarian Reform, the Department of Agriculture and other government or private entities.

4. The Grantee shall not use tenant labor in the Stewardship Area but must undertake development and management himself PROVIDED, however, that assistance from the family and/or neighbors of the Grantee is allowed; PROVIDED, further, that, cooperatives, associations or community Grantees may use their members as paid labor to develop the area in accordance with the Mangrove Stewardship Plan.

5. The Grantee shall preserve monuments and other landmarks which indicate corners and boundaries of the Stewardship Area.

6. The Grantee shall prevent unauthorized or unregulated cutting, or any other activity destructive to the mangroves on the Stewardship Area or on other areas immediately adjacent thereto, shall immediately report such activities to his Barangay Captain and/or nearest DENR representative, and, when necessary, shall actively assist the local DENR in

protecting mangrove forest.

7. The Grantee shall prevent the introduction of new infrastructure of any kind (land fill, dwellings, walls, wharfs, etc.) unless such infrastructure is specifically authorized in writing by the DENR.

8. In the event of death or incapacity of the Grantee or of any other eventuality which prevents the Grantee from fulfilling his/her obligations under this Agreement, the Grantee or nearest kin shall notify the Grantor within sixty (6) days.

B. RIGHTS AND RESPONSIBILITIES OF THE GRANTOR

9. The Grantor shall monitor and evaluate the progress of the Grantee in the implementation of the Mangrove Stewardship Plan, making such mutually agreed revisions in the Plan as may be required and allowed under the implementing guidelines, as well as the compliance by the Grantee with other terms and conditions of the Stewardship Agreement.

10. The Grantor reserves the right to regulate the cutting or harvesting of the mangrove trees and associated species to insure that adequate forest cover always exists on the Stewardship Area.

11. The Grantor reserves the right to permit the opening, if public interest requires, of such portion of the area as may be required for road or boat right-of-way; PROVIDED, that, the person or entity granted the road or boat right-of-way shall pay the Grantee a reasonable compensation for any damage to improvements.

12. The Grantor reserves the right to remove any existing or future unauthorized infrastructure (land fill, dwellings, walls, wharfs, etc.) from the area.

C. GENERAL PROVISIONS

13. The Grantee must have been living within the project area or adjacent barangay/sitio and must continue to live there to actively perform the activities allowed and indicated in the Mangrove Stewardship Plan.

14. The Grantee shall not be allowed to hold more than one (1) Mangrove Stewardship Agreement at any time.

15. The Grantor and the Grantee shall jointly prepare a Mangrove Stewardship Plan for the Stewardship Area in accordance with the implementing guidelines issued by the Grantor for this purpose.

16. The Grantor and the Grantee shall conform with other related laws, rules and regulations that may be promulgated hereafter.

17. No fees, including forest charges, shall be collected for use of the Stewardship Area by the DENR during the first five (5) years of this Agreement; PROVIDED, that, fees may be collected thereafter as determined by the Secretary of the DENR.

18. This Stewardship Agreement is non-transferable; PROVIDED, that, in the case of death or incapacity of the Grantee before the expiration of this contract, a qualified heir may assume full responsibility over the Stewardship Area, subject to approval of the Grantor; PROVIDED, further, that, in cases where no qualified heir is willing or able to assume responsibility over the Stewardship Area, the Grantor may enter into a Stewardship Agreement over the Stewardship Area with another qualified party.

19. Upon expiration of this Stewardship Agreement, the Grantee shall have the right of preemption to any subsequent stewardship agreement covering the allocated Stewardship Area or, if some reason the government opts not to reallocate the Area for stewardship, the Grantee shall be entitled to just compensation for mangrove forest management related improvements introduced thereon following the procedure provided below.

20. In the event of the cancellation of this Stewardship Agreement for cause, as defined in Section E, the Grantee shall not be entitled to compensation for improvements introduced on the Stewardship Area; PROVIDED, that, if the Grantor terminates this Agreement for other reasons, the Grantee shall be entitled to a fair compensation for all forest management related improvements introduced therein based on their assessed value as determined by a competent third party on the date of termination minus all charges or other monetary obligations accruing to the government; PROVIDED, further, that when compensation is due, the Grantee may harvest such improvements as can reasonably be removed consistent with applicable mangrove management policies, the value of which shall be deducted from the final compensation.

D. EFFECTIVITY OF TENURE

21. This Stewardship Agreement shall become effective upon execution thereof by the parties and shall continue for a period of TWENTY FIVE (5) years expire on _____ renewable for another TWENTY FIVE (25) years.

E. CANCELLATION OF THIS AGREEMENT

22. The following are grounds for the cancellation of this Stewardship Agreement for cause:

a. Failure of the Grantee to comply with the terms and conditions hereof within six (6) months after having been notified in writing of his neglect by the Grantor;

b. Conversion of Stewardship Area to a fishpond development, saltworks, paddy cultivation or any other unauthorized activity which results in the destruction of all or a part of the mangrove forest on the Stewardship Area.

c. Serious and/or continued violation of forestry laws, rules and regulations in the stewardship of the Area.

23. The Grantor reserves the right to cancel this agreement when the public interest, as determined by the secretary of DENR, so demands.

G. RATIFICATION

24. This agreement becomes an integral part of the Certificate of Stewardship.

25. The provisions of this Agreement were fully and clearly explained by the Grantor to the Grantee in a dialect understandable to the Grantee before the Agreement was signed.

26. The Grantor and the Grantee shall sign each page of this Agreement including the Appendices (if the Grantee does not know how to write, he shall affix his right thumbmark in the space provided for his signature).

IN WITNESS WHEREOF, the said parties have hereunto set their hands this ____ day of _____, 199____ in _____

By Authority of the Secretary:

_____ GRANTOR

_____ GRANTEE

WITNESSES:

_____

_____

Republic of the Philippines
OFFICE OF THE PRESIDENT

CSC No. ___

CERTIFICATE OF MANGROVE STEWARDSHIP

To All WhomThese Presents May Come, Greetings:

THAT this CERTIFICATE is hereby awarded to:

_____

of legal age, Filipino, married/single/head of family, with residence/postal address at _____, to reforest and/or rehabilitate, protect and manage a parcel of mangrove forest land found in Sitio _____, Barangay _____, Municipality of _____, Province of _____, containing an area of _____ hectares, more or less, bounded and described as follows:

and registered with THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES in accordance with existing rules and regulations.

As a Mangrove Forest Steward, _____ shall have the right to peacefully occupy this Mangrove Stewardship Area, to manage it in accordance with the attached Mangrove Stewardship Agreement, which becomes an integral part of this Certificate, using appropriate forestry methods and practices, to enjoy all the produce therefrom, and to such other rights as may be granted or provided by laws, decrees, letters of instruction, orders, rules and regulations, PROVIDED, the Steward maintains this Area as permanent mangrove forest.

IN TESTIMONY WHEREOF, and by the authority vested in me by law, I, _____ Secretary of the Department of Environment and Natural Resources, have caused this CERTIFICATE to be issued and the seal of the Republic of the Philippines to be hereunto affixed.

Given under my hand at Quezon City on this ____ day of _____ in the year of Our Lord One Thousand Nine Hundred and _____.

ATTESTED:

_____
Regional Executive Director

By: _____

_____
Secretary

By: _____

Entered in the Registration Book of the Department of Environment and Natural Resources this day of _____, 19__, under Registry Book No. ___, Page No. __.

No._____

Appendix 6 - DENR Memorandum No. 11, Series of 1988. Implementing Guidelines of the National Forestation Program

Pursuant to DENR Administrative Order No. 39, series of 1988 and in order to immediately operationalize and implement the contract forestation/reforestation program of the government, and insure the effective conduct of bidding, award and execution of reforestation contracts, the following guidelines are hereby adopted for the guidance of all concerned:

ARTICLE I

POLICY, OBJECTIVES, AND DEFINITION OF TERMS

SEC. 1. Basic Policy. Consistent with national objectives pertinent to forest development, conservation, and equitable distribution of the benefits derived from forest resources, it is the policy of the government to create incentives that will encourage the participation of non-government organizations, local government units and the private sector, including forest occupants and rural communities, in forest resources development, management and protection, and the enforcement of laws, rules and regulations pertinent to the conservation of forest resources for present and future generations.

SEC. 2. Objectives of the Program. The objectives of this program are:

a) To use reforestation as a tool for addressing rural equity and development issues;

b) To create new jobs and expand the opportunities for profitable self-employment;

c) To foster the growth of a dynamic private sector reforestation industry.

d) To encourage local government units, non-government organizations and to participate in contract reforestation;

e) To attain a condition of ecological stability, and optimum/sustainable productivity of forest resources; and

f) To install an efficient system for broad-based private sector participation in the management of bids, awards, monitoring, evaluation, certification and payment for contract reforestation work.

SEC. 3. Definition of Terms. Amplifying further the provisions of Sec. 4, DENR Administrative Order No. 39, series of 1988, the following words as used in this Order are hereby defined:

a. DEPARTMENT or DENR - refers to the Department of Environment and Natural Resources.

b. SECRETARY - refers to the Secretary of the DENR.

c. UNDERSECRETARY - refers to the Undersecretary for Field Operations of the DENR.

d. DIRECTOR - refers to the Director of the Forest Management Bureau.

e. PROGRAM - refers to the contract reforestation program of the Government.

f. REGIONAL/PROVINCIAL AND WATERSHED MANAGEMENT/REFORESTATION PLAN - refers to the detailed development plan for an area programmed for contract reforestation.

g. DEVELOPMENT PLAN - refers to a plan which describes a site programmed for Contract Reforestation development; such plan to include targets, quantities and quality of work to be performed, schedules and cost estimates.

h. PRE-QUALIFICATION - is the process whereby an individual, entity or organization, after having submitted evidence of adequate capability to implement a reforestation contract, is registered with the DENR as a prospective bidder.

i. CONTRACT - means an Agreement between the Government represented by the DENR, and an entity or individual, whereby the latter agrees to implement an activity or a series of activities required to reforest a denuded portion of the public domain and the former (DENR) agrees to pay for the activity or activities duly-accomplished, pursuant to the terms and conditions of the Agreement.

j. CORPORATE REFORESTATION CONTRACT - refers to a CONTRACT between the government represented by DENR and private corporations, non-government organizations, local government units and other formal/legally-constituted entities for purposes of profit or other legitimate objectives of the entity concerned.

k. FAMILY APPROACH REFORESTATION CONTRACT - refers to a Contract entered into by and between the government represented by the DENR and the head of a family.

l. COMMUNITY REFORESTATION CONTRACT - refers

religious organization acting for and in behalf of residents of a community located in or adjacent to a reforestation site, whereby the residents would implement activities prescribed in the Contract under supervision of the entity, which would in turn be directly responsible to the DENR for performance under the CONTRACT.

m. CASH CROPS - refers to annual or semi-annual plants, usually intercropped with tree species which when harvested can be sold or utilized. Illegal plants such as marijuana and the like are not considered as cash crops.

n. RED - refers to the Regional Executive Director of the DENR Regional Office.

o. PENRO - refers to the Provincial Environment and Natural Resources Officer.

p. CENRO - refers to the Community Environment and Natural Resources Officer.

ARTICLE II

SITE IDENTIFICATION, DELINEATION AND PREPARATION OF REGIONAL/PROVINCIAL REFORESTATION PLAN

SEC. 4. Identification of Project Sites. Consistent with the total framework of the National Reforestation Program, the Secretary or his duly-authorized representative shall identify the specific denuded logged-over areas in regions, provinces and/or watersheds which need reforestation following the criteria for selecting areas for contract reforestation found in Annex A.

SEC. 5. Delineation and Approval of Project Sites Five Hundred Hectares (500) or Less in Size. The Regional Executive Director shall within three (3) months from the promulgation of this Order, identify, delineate and approve for implementation the specific sites for development under this Program: Provided, that priority shall be given to the following locations:

a. Lands that are accessible by motorized transport (e.g. jeep or motorcycle) or not more than two hours hiking distance (est. 8 km) from a road or trail accessible by motorized transport;

b. Lands that are visible from roads traversed by public transport vehicles;

c. Areas with existing tenurial instruments issued by the DENR;

d. At least sixty percent (60%) of the land area identified for the establishment of production forests; or

e. The proposed site is a catchment area providing water for irrigation, household consumption or hydro-power generation.

SEC. 6. Central Office Approval of Sites More Than Five Hundred Hectares (500 ha). For sites exceeding five hundred hectares (500 ha) the RED shall submit all documents describing the proposed sites to the Secretary or his duly authorized representative, for information and approval. These documents shall include the following:

a. Location Map

b. Updated project site map indicating

1. Boundaries and technical descriptions determined by surveying methods which have the precision adequate to protect against boundary conflicts (e.g. compass quality azimuth and distances with stadia or plane-table precision);

2. Existing vegetative cover;

3. Areas already forested, areas for development into production forests, areas for development as protection forests, and areas under permanent occupation or cultivation;

4. Rivers, streams, lakes, existing roads, trails, buildings, settlements and other major physical features;

5. Contour lines at twenty meter (20 m) contour intervals; and

6. Identification of areas with forest occupants indicating their approximate number (i.e. population) and the number of hectares occupied.

Pursuant to DAO-30, the RED shall not be required to secure the Secretary's approval for sites with area of five hundred hectares (500 ha) or less.

SEC. 7. Regional/Provincial and Watershed Management/Reforestation Plan. Upon approval of the project sites, the RED, in consultation with concerned local officials and/or instrumentalities shall prepare Regional/Provincial and Watershed Management/Reforestation Plans, which shall contain among others, the following:

a. Proposed alignments or locations of roads, trails, bridges, buildings and structures to be constructed;

b. Location of proposed right-of-way that would link the project sites with the nearest municipal, provincial or national all-weather roads;

c. Location of areas proposed for development as production forests and as protection forests;

d. Locations of settlements or upland communities;

e. Proposed locations of water impounding dams or reservoirs;

f. Watershed boundaries of major rivers as defined by the National Irrigation Administration (NIA);

g. Suitable species based on soil analysis, indicator plants other reliable parameters and the need to optimize species diversification in reforestation projects and avoid extensive monocultures.

h. Strategic locations of firelines, and other fire control structures, and

i. Locations of forest nurseries.

SEC. 8. Adherence to Regional/Provincial and Watershed Management/Reforestation Plan. All development activities to be undertaken in the project sites shall as much as practicable conform with the Regional/Provincial and Watershed Management/Reforestation Plans: Provided, that deviations thereof, shall be allowed subject to approval by the Secretary or his duly authorized representative upon recommendation of the RED.

ARTICLE III

TYPE OF REFORESTATION CONTRACTS, PROCEDURES AND MODE OF IMPLEMENTATION

SEC. 9. Types of Contract Reforestation. Pursuant to Sec. 3 hereof, there are three (3) distinct types of contract reforestation under this program, namely:

a. Family Approach Contract Reforestation

b. Community Contract Reforestation

c. Corporate Contract Reforestation

SEC. 9-A. Contract Award Procedures. Family Approach and Community Contracts may be awarded through negotiated bidding procedures, subject however to the rules, regulations and financial ceilings pertinent to corporate [illegible] government offices/agencies. However, Family Approach and Community Contracts involving an expenditure that exceeds the authorized financial ceiling for negotiated contracts shall be awarded through competitive bidding procedures pursuant to Section 54 to 74 of this Order. All Corporate Contracts shall be awarded through competitive bidding procedures described in Chapter III of this Order. Unless exempted by duly-authorized offices of Governments pursuant to existing rules and regulations.

SEC. 9-B. Activity Specific Contracts/Sub-Contracts. To enhance participation by all sectors of the population and enlist their specific areas of expertise, any of these three types of contracts may, at the discretion of the approving authority or official concerned, be broken down into activity specific contracts or sub-contracts including but not limited to (i) seedling production, (ii) site delineation and preceding surveys, (iii) site preparation, (iv) enhancement of natural regeneration, (v) covercrop establishment, (vii) construction of roads, trails and other infrastructure, (vii) implementation of soil and water conservations measures, (viii) agroforestry, (ix) preparation of site-specific development plans including design and financial feasibility studies and (x) monitoring and evaluation of performance preferably by non-government organizations.

SEC. 9-C. Determination of Costs. In arriving at the costs for inclusion in contract documents, whether implemented by the Family Approach, Community or Corporate mode, or by activity specific or sub-contracting arrangements within these modes, costs shall be determined in accordance with the Guide for Cost Estimates in Annex E of this Order except as allowed by the Secretary or his duly authorized representative, or as adjusted from time-to-time reflecting changes brought about by inflation and other price escalation/de-escalation factors.

CHAPTER I

FAMILY APPROACH CONTRACT REFORESTATION

SEC. 10. Areas for Family Approach Reforestation Projects (FAR). Family Approach Reforestation may be implemented in public forest lands identified and/or delineated pursuant to Sec. 4 and Sec. 5 of this Order: Provided, that areas near rural communities and population centers shall be preferred.

SEC. 11. Size of Contract Area. For an individual family head, size of the area to be developed

shall not be less than one (1) hectare nor more than five (5) hectares; Provided, however, that the foregoing limitations shall not preclude the awarding of subsequent contracts for the reforestation of additional lands after the initial areas shall have been fully and properly reforested.

SEC. 12. Prospective Contractors. Any head of family described hereunder may be selected to implement a Family Approach Reforestation Contract:

a. Married/Widow/Widower with dependent children

b. Unmarried man or woman who is head of the family

SEC. 13. Project Organizational Group. Personnel administering FAR projects on behalf of the DENR shall come from the PENRO or CENRO where the project site is located. Project Leaders and Special Disbursing Officers (SDO's) may be designated by the RED or his duly authorized representative, either or both of whom may serve on a part-time or full-time basis and be responsible for one or more contracts. SDOs should be the holders of a regular appointment under the PENRO or CENRO. Additional personnel may be assigned depending on the size and the other requirements of the projects.

SEC. 14. Recruitment and Selection of Participants. Participants in family approach reforestation shall be recruited and selected by the recognized natural leaders of each area targeted for development. To bring this about, the RED, shall instruct the PENRO and CENRO, to follow the process set forth hereunder:

a. In consultation with reliable local informants (e.g. local government officials local school principal/head teacher; parish priest or minister, tribal chief or datu) and knowledgeable DENR personnel (e.g. social forestry officer assigned to the area), identify the recognized natural leaders in each area and submit a report to the RED listing the individuals so identified;

b. Through background information investigations or other feasible methods appraise the credibility, character and other personal attributes of the leaders listed per "a" (above) and submit this information in a report for review and concurrence by the RED;

c. Secure the RED's concurrence with the list of identified leaders and, having done so, reforestation;

d. Based on the amount of funds available for the purpose, inform the leaders how many hectares are targeted for family approach reforestation in their area,

e. Organize the leaders to screen and select participants to implement family approach reforestation in their respective areas; and inform the leaders that DENR will entrust them with this responsibility;

f. Inform the leaders that participants must be selected with due consideration of the following minimum criteria: (i) a Filipino citizen, (ii) of legal age or head of a family; (iii) physically fit to do reforestation work; (iv) of good moral character; (v) resident of the area;

g. Advise the leaders that future expansion of family approach reforestation in their areas, and the additional job opportunities implicit therein, will be contingent on satisfactory performance of the participants they select; provided however that in cases of unsatisfactory performance identified by duly-authorized DENR personnel, DENR shall entrust the leaders with responsibility for implementing appropriate remedial measures including the selection of a suitable replacement to take over development of the area previously allocated to a participant whose performance was unsatisfactory; and

h. Assist the leaders formalize participation of the families/individuals the select pursuant to the process described above, by accomplishing the various official forms required by existing rules and regulations.

i. In situations where the RED, PENRO and CENRO unanimously agree that it is impossible to identify natural leaders who are competent to conduct an objective, fair and reliable selection of family approach participants, the activities described in paragraphs "a" to "h" above may be implemented by the PENRO or CENRO; provided however, that the concerned Assistant Secretary for Field Operations is duly informed of the situation and authorizes the PENRO or CENRO, through the RED, to conduct the selection process.

SEC. 15. Preparation of Development Plans. After completing the activities described in Sec. 14 (above) the PENRO, drawing on the services of the CENRO and the Project Leader, shall prepare and submit to the RED appropriate

plans and recommendations to implement a FAR project (or projects) in the target areas concerned. It shall not be necessary to complete coverage of all the targeted areas within a PENRO's jurisdiction before recommending the launching of a FAR project. Each project shall be recommended for launching as soon as the activities described above have been completed. Among others, the plan shall include the items enumerated hereafter in Sec. 19 to Sec. 27 of this Order.

SEC. 16. Preparation and Processing of FAR Contracts. The RED or his duly-authorized representative shall, within fifteen (15) working days after receipt of the PENRO's recommendation, approve, modify or disapprove the same and send a written advice accordingly to the PENRO and the applicants. For each approved project, the RED shall order the preparation of a CONTRACT based on the PENRO's recommendation and furnish one (1) copy each of the approved contract to the RED, PENRO, participant, Undersecretary and the Director. Among others, contracts shall include provisions for transfer of responsibility for implementation in the event of death or disability. Where appropriate, contracts may also provide for combination of DENR-implemented activities and contractor-implemented activities in a project (e.g. DENR provides seedlings, Contractors plant, maintain and protect).

In case of disapproval, the RED or his authorized representative shall inform the PENRO and the applicants of the reasons thereof.

SEC. 17. Duration of Family Approach Contracts. FAR Contracts shall have a duration of three (3) years subject to extension when warranted because of climatic conditions (like drought, typhoons), security problems or similar unforeseen circumstances which interrupt the anticipated schedule of activities. Thereafter, any and all rights to improvements made by the contractor shall automatically belong to the government except as provided in Sec. 27 hereof ("Incentives, Benefits, and Privileges"). However, in situations where Family Approach Reforestation is included as a component of the Integrated Social Forestry Program (ISFP) or the Comprehensive Agrarian Reform Program (CARP), the duration, tenure security provisions and privileges thereof shall prevail.

SEC. 18. Organization of Participants. To facilitate management, coordination and control, FAR participants implementing reforestation adjacent or near one another shall be encouraged to group themselves into formal or

the project; or appoint one or more authorized persons to represent their group in dealing(s) with the DENR Office concerned.

SEC. 19. Seminars and Trainings. Prior to the implementation of a FAR project, the PENRO or CENRO concerned shall conduct a seminar for the participants, explaining all aspects of the project and the procedures to be applied. All participating families shall be required to attend the seminar and subsequent trainings conducted on-site by the PENRO or CENRO, in order to equip them with the necessary technical know-how on raising seedlings, site preparation, planting techniques, maintenance, protection of plantations and related activities.

SEC. 20. Nursery Establishment. With the assistance of DENR field technical personnel, the participating families shall choose a common nursery site which shall be centrally located in the project site, and having all the required elements such as water supply, accessibility, gentle slope, exposure to sunlight, etc.

SEC. 21. Choice of Species and Sources of Seeds. The species to be planted shall depend on the site conditions and the purposes of the plantation, (i.e. whether for production forest, protection forest or agro-forestry).

The Project Leader (Sec. 13) shall request the FAR participants and local leaders concerned (Sec. 14) to recommend the species they believe are suitable and desirable to plant and to suggest sources of seeds and other planting materials. After due consideration of these recommendations, the Project Leader in consultation with reforestation and social forestry specialists in the CENRO shall have the final responsibility for choice of species and sources taking into account site suitability, and related technical criteria, optimal species diversification and avoidance of extensive monocultures, financial viability criteria and marketing potentials e.g. accessibility to processing centers/prospects for added-value via processing). However, in the process of finalizing species/seed choices, the Project Leader shall at all times strive for consensus with the local leaders and participants to help ensure that species planted are perceived by the residents of the area to be useful and desirable with marketing and processing potentials.

SEC. 22. Plantation Operations.

a. Assignment of Parcels/Lots. The CENRO shall predetermine the area of the project site (i.e. no. of hectares) by referring

checking this data through actual survey and delineation of the boundaries of each participant. The area shall be subdivided into parcels, each parcel containing an approximate area of not more than five (5) hectares per participant depending on the condition and area of the site. The distribution of parcels shall be done by drawing lots or any other feasible arrangement installed by the local leaders referred to in Sec. 14. The CENRO shall mark project and parcel boundaries by installing monuments, placement of durable hardwood posts or planting tree, palm or other species which clearly demarcate the boundaries.

b. Site Preparation. The participating families shall construct trails leading to and traversing the project site, for proper supervision and management. Trail construction costs may be included as an allowable expense under the contract. Various site preparation treatments may be applied, depending on site characteristics, technical feasibility and preferences of the participants such as: (i) complete brushing; (ii) complete brushing followed by plowing; (iii) strip brushing; (iv) strip plowing; (v) assisted natural regeneration; and (vi) combinations of the foregoing. At a minimum, however, strip brushing of at least one (1) meter width following the orientation of the contour shall be prescribed depending on the recommended spacing for the particular tree species. Planting holes shall be prepared before the start of the rainy season and shall be fifty percent (50%) larger in size than the planting pots to be used.

c. Assisted Natural Regeneration. Wherever feasible, FAR contracts may incorporate appropriate methods, techniques and procedures to enhance/assist natural regeneration of existing pioneer species.

SEC. 23. Planting Activities. Planting of seedlings shall begin after the start of the rainy season. The procedures to be followed shall be in accordance with standards prescribed by the DENR.

SEC. 24. Plantation Maintenance.

a. Application of Fertilizer(s) - To enhance the growth of seedlings, fertilizer(s) shall be applied once during planting and at least once thereafter, preferably during the first rainy season of plantation establishment. Whenever feasible, organic fertilizers shall be used instead of inorganic (i.e. chemical fertilizers).

b. Weeding - Weeding (ring or strip) shall be conducted at least once during the first year and three (3) times during the first year and two (2) times a year during the second and third years of plantation establishment. More frequent weeding shall be prescribed if necessary;

c. Cultivation - This shall be done by breaking the soil in a radius of approximately thirty (30) centimeters around the planted seedlings, coinciding with the ring weeding cycles cited above;

d. Replanting - Dead or substandard seedlings shall be replaced within two (2) months after initial planting or at the start of rainy season in the succeeding year.

SEC. 25. Protection.

a. Greenbreaks - Greenbreaks measuring ten to fifteen meters (10-15 m) wide shall be established using fire resistant species with economic value such as bananas or tree species with good coppicing ability;

b. Patrol and Fire Prevention - Participants shall patrol the area to prevent the occurrence of fire;

c. Protection Against Pests and Disease - Participants shall from time to time conduct ocular survey of their plantation and report immediately to the DENR any symptom or occurrence of pests or diseases, or if necessary request technical assistance;

d. Protection from illegal occupants - The participants shall protect the project area from illegal occupation.

e. Negligence and/or unsatisfactory implementation of protection measures shall be grounds for the imposition of sanctions and penalties as provided in Article III of this Order.

SEC. 26. Funding Requirements.

a. Sources of Funds - In general, funds for FAR Projects shall come from DENR appropriations. However, other sources may also be used (e.g. Grants). Allotments from DENR appropriations shall be based on the actual needs of the project. Funds management systems shall be consistent with duly-prescribed procedures.

b. Disbursement of Funds - To ensure prompt payment for labor and other services provided by the participants, Special

Disbursing Officers (SDOs) may be appointed and made responsible for the financial aspects of implementation pursuant to existing rules and procedures. SDOs shall be bonded in amounts adequate to allow withdrawal of cash advances sufficient to make timely payments to FAR participants. In carrying with these functions, SDOs shall also be responsible for timely submission of liquidation reports and requests for cash advance reimbursements with sufficient lead time for processing the same to ensure DENR compliance with the payment targets and schedules prescribed in contracts.

e. Schedule of Payment - The project leader, in consultation with the CENRO and PENRO, shall prepare the schedule of payment for each project, and submit the same to the RED for approval and for inclusion in the contract. It shall be the objective to make payments at least once each month during the first year of contract implementation since most family approach contractors will be poor families who cannot afford long delays between payments. From the second year onward, payments may be made at longer intervals since it is assumed that contractors will already be deriving some income from intercrops.

SEC. 27. Incentives, Benefits and Privileges. Family Participants shall be entitled to the following:

a. Families may avail of free technical assistance, educational materials and training in reforestation, agroforestry and related farming technologies, all of which shall be provided by the DENR through the PENRO/CENRO;

b. Throughout the duration of the contract, participants shall be allowed to raise cash crops in between rows of planted trees and maintain other livelihood projects not detrimental to the established plantation;

c. The CENRO may allow participants to cut, collect and utilize thinnings and/or pruned branches provided these treatments are limited to situations where the canopies of adjacent trees are crowded and inhibiting development of the faster growing trees (in the case of thinning) or when there is a need to improve form (in the case of pruning). In no case however shall thinning or pruning unduly reduce the canopy to such an extent that grass or other non-woody species would become the dominant vegetative cover. The CENRO concerned shall provide advice and

sound silvicultural practices. The CENR shall further be responsible fo monitoring thinning/pruning activities t prevent abuse of this privilege and fo enforcing rules/regulations prescribed by the RED for the purpose.

d. Each FAR contract and budget shall include provisions for paying a bonus to participants who successfully prevent fire or other serious destruction to their assigned areas and who attain a survival rate of not less than eighty percent (80%) of the number of trees prescribed in their contracts. The total amounts paid as bonus shall not exceed twenty percent (20%) of the total value of the contract. Bonuses for preventing fire or other serious destruction shall be paid annually one month after the end of the dry season. Bonuses for attaining a survival rate of not less than eighty percent (80%) shall be paid upon conclusion of the contract.

e. Participants who successfully comply with the terms and conditions of their contracts, may, at the conclusion thereof, be granted Woodlot Lease Agreements provided the operations under such grants would conform with the principles of sustained-yield management, provided further that areas of land developed as production forests are available and, provided finally, that such grants are consistent with the existing rules and regulations governing such agreements as currently being tested and developed in DENR Region III, and amendments and modifications thereto which the DENR may promulgate from time to time.

SEC. 28. Monitoring and Evaluation. Monthly monitoring and evaluation shall be conducted by the Project Leader, CENRO, duly-authorized representative or an independent entity contracted for the purpose, to ascertain that the desired targets are accomplished on time without undue waste of effort and resources. In all cases, the Monitoring and Evaluation System (MES) prepared by the National Forestation Program Working Group shall be applied. However, the RED may, at his discretion, prescribe additional criteria over and above those included in the MES.

SEC. 29. Turn-over of the Contract Reforestation Areas to the DENR. Upon conclusion of the duration of a contract, the RED shall cause an inspection of the project concerned and assess the contractor's performance. Provided performance is consistent with the terms and conditions of the contract, the RED shall certify accordingly and shall formally accept the project for and in behalf

activities (i.e. protection, maintenance, etc.)

CHAPTER II

COMMUNITY CONTRACT REFORESTATION

SEC. 30 Areas for Community Contract Reforestation Projects (CCR). Community Reforestation may be implemented on areas identified under Section 10 of this Order.

SEC. 31 Size of Contract Area. The size of the area to be developed under community reforestation shall be more than five (5) hectares but not more than one hundred (100) hectares; Provided, however, that the foregoing limitations shall not preclude the awarding of subsequent contracts for the reforestation of additional lands after the initial areas shall have been fully and properly reforested or developed.

SEC. 32. Prospective Contractors. Any of the following may apply for a Community Reforestation Contract:

a. Duly recognized association or cooperative of project participants, preferably composed of families and individuals residing in the project area;

b. Other civic or religious organization, preferably one which is already well-established, locally managed and actively operating within the project area;

c. The appropriate local government unit having jurisdiction in the project area which has, preferably, demonstrated substantial appreciation for environmental concerns, curbing illegal logging, reforestation and other related activities.

d. Tribal communities that are indigenous to and reside within the project area

e. A non-government organization (NGO) preferably a non-profit group duly registered with the Securities and Exchange Commission that has secured written authorization from all the proposed participants to represent them as their linkage with the DENR.

SEC. 33. Project Organizational Group. Personnel administering CCR contracts on behalf of the DENR shall come from the PENRO or CENRO where the project site is located. At a minimum, each project shall have a Project Leader and a Special Disbursing Officer (SDO) may be designated by the RED or his duly authorized representative, either or both of whom may serve on a part-time or full-time basis to

regular appointments. Additional personnel may be assigned depending on the size and other requirements of the project.

SEC. 34. Preparation and Processing of Community Reforestation Contracts. Any of the prospective contractors identified in Sec. 32 may propose a CCR project to the PENRO through the CENRO. Furthermore, the PENRO or CENRO may initiate a CCR project and enlist any of the parties listed in Sec. 32 as implementors. In either case, the PENRO concerned shall submit an appropriate development plan and recommendation to the RED. The RED or his representative shall, within fifteen (15) working days after the PENRO's recommendation, approve, modify or disapprove the same and send a written advice accordingly to the PENRO and the applicants. For each approved community reforestation project, the RED shall order the preparation of a contract based on the PENRO's recommendation and furnish one (1) copy each of the approved contract to the RED, PENRO, community/organization representative, Undersecretary and Director.

In case of disapproval, the RED or his duly-authorized representative shall inform the PENRO and the prospective contractor of the reasons thereof.

SEC. 35 Community Assessment. Prior to execution of the project, the concerned PENRO or CENRO shall undertake community assessment (social, economic, political and biophysical characteristics) in the project site to gather baseline information as basis for the preparation of a detailed design.

SEC. 36. Duration of Community Reforestation Contracts. Community Contracts shall have a duration of three (3) years subject to extension when warranted because of climatic conditions (like drought, typhoons), security problems or similar unforseen circumstances which interrupt the anticipated schedule of activities. Thereafter, any and all rights to improvements made by the contractor shall automatically belong to the government except as provided in Sec. 27 hereof ("Incentives, Benifits, and Privileges").

SEC. 37. Organization of Participants. For better management, coordination and control, participants (except those who are already organized) shall be encouraged to group themselves into a formal or informal organization and to elect a set of officers who shall oversee the operation of the project or appoint one or more representative to represent their group in dealing with DENR office concerned; Provided, that in case of tribal communities (ethnolinguistic groups)

existing local leadership will be further enhanced/recognized based on existing local customs, traditions and beliefs.

SEC. 38. Seminars and Trainings. Prior to the implementation of the project, the PENRO or CENRO shall conduct a seminar for the community participants, explaining all aspects of the project and the procedures to be applied. All participants shall be required to attend the seminar, and subsequent training conducted on-site by the PENRO or CENRO, in order to equip them with the necessary technical know-how in raising seedlings, site preparation, planting techniques, maintenance, protection of plantations and related activities.

SEC. 39. Preparation of Development Plan. The prospective participants shall be encouraged to participate actively in the preparation of the development plan. Technical personnel from the PENRO and CENRO concerned shall be made available to assist specifically on the technical aspects of the detailed design. It should be indicated in the plan that the project shall be developed through cooperative efforts of all the participants or by any arrangement cognizant of the existing customs and traditions of the communities, groups or associations. Among others, the development plan shall include those items enumerated under Section 40 up to Section 46 of this Order.

SEC. 40. Nursery Establishment. With the assistance of PENRO and CENRO technical personnel, the community participants shall choose a common nursery site which shall be centrally located in the project site, and having all the required elements such as water supply, accessibility, gentle slope, exposure to sunlight, etc.

SEC. 41. Choice of Species and Source of Seeds. The species to be planted shall depend on the site conditions and the purpose of the plantation, (i.e., whether for production or protection). Procedures applied and responsibility for chosing species/sources of seeds shall be consistent with the provisions of Sec. 21 herein, but replacing the words "FAR participant" and "local leaders" in Sec. 21 with "community-based contract reforestation awardee" for purposes of this Section (Sec. 41).

SEC. 42. Plantation Operations, Planting, Maintenance and Protection. The CENRO shall predetermine the area of the project site (i.e. area in hectares) by referring to available maps and cross-checking the data through actual survey and delineation of boundaries on the ground using methods consistent with the provisions of Section 3, paragraph "b", sub-paragraph 1 on page 4 of this Order. As much as practicable, natural features should be used to mark boundaries. All other activities shall be conducted pursuant to the provisions of Sec. 22, 23, 24 and 25 herein.

SEC. 43. Funding Requirements

a. Sources of Funds - In general, funds for Community Contract Reforestation shall come from DENR appropriations. However, other sources may also be used (e.g. Grants). Allotment from DENR appropriations shall be based on the actual needs of the project. Funds management systems shall be consistent with duly prescribed procedures;

b. Disbursement of Funds - To ensure prompt payment for labor and other services, SDOs shall be bonded in amounts adequate to allow withdrawal of cash advances sufficient to make timely payments to community participants.

SEC. 44. Mode of Payment. The community contract participants shall be paid in accordance with their accomplishments after each major activity has been completed or as stipulated in the contract of works. As a general practice, the participants shall be paid at least ten installments based on the schedule of activities as dictated by the prevailing site and climatic conditions. In general, payments would be consistent with the pattern, schedule and approximate percentage ranges of total costs of the contract as indicated hereunder:

a. First Payment - (10-15%) This shall be made after acquisition of planting materials, preparation of potbeds, potting soil and sowing beds, successful germination and potting/planting of seedlings, and construction of trails.

b. Second Payment - (3-5%) This covers the care and maintenance of seedlings in the nursery and would normally be paid before the start of planting season.

c. Third Payment - (20-30%) This covers the activities for plantation establishment including trail construction, strip brushing, hole digging, plowing, planting and application of fertilizer.

d. Fourth Payment - (5-10%) This covers ring weeding and cultivation. This payment shall be based on the inventory of surviving seedlings two (2) months after planting and the amount of trail maintenance that was implemented.

e. Fifth Payment - (3-5%) This covers the second ring weeding cycle, replanting and protection of the plantation during the first rainy season.

f. Sixth Payment - (3-5%) This covers the third ring weeding cycle, cultivation, cost of fertilizer and labor for application, and protection of the plantation up to the start of the first dry season and trail maintenance.

g. Seventh Payment - (3-5%) This is given after further maintenance and protection of the plantation and after inventory of surviving seedlings.

h. Eighth Payment - (2-3%) This is given after the fourth ring weeding cycle, cultivation and application of fertilizer and maintenance and protection of the plantation (2 months after the start of the rainy season of the second year).

i. Ninth Payment - (1-2%) This is given after the fifth ring weeding cycle and if plantation is properly maintained and protected.

j. Tenth Payment - (10-20%) This is the last payment given to the community contract participants and shall be governed by the provisions for bonuses described in Sec. 27-d, herein.

SEC. 45. Incentive, Benefits and Privilege. All of the incentives, benefits and privileges provided in Sec. 27 for Family Approach Reforestation shall also apply to CCR.

SEC. 46. Monitoring and Evaluation. Monitoring and evaluation shall be conducted pursuant to the provisions of Sec. 28.

SEC. 47. Turn-over of Community Contract Reforestation Areas to the DENR. Upon conclusion of the duration of a contract, the RED shall cause an inspection of the project concerned and assess the contractor's performance. Provided, performance is consistent with the terms and conditions of the contract, the RED shall certify accordingly and shall formally accept the project for and in behalf of the DENR, free the contractor from further responsibility for all subsequent plantation activities (i.e. protection, maintenance, etc.).

CHAPTER III

CORPORATE CONTRACT REFORESTATION

SEC. 48. Land Available for Corporate Contract Reforestation. Corporate Contract Reforestation shall be implemented in areas identified and/or delineated for development under the National Forestation Program in accordance with Sec. 4 and Sec. 5 of this Order:

SEC. 49. Development Project Plan. The RED shall cause the preparation of a development project plan for each of the areas approved for development under this Program. Plan work may be carried out by DENR personnel or as an activity specific contract pursuant to Sec. 9 of this Order, at the discretion of the RED.

The development project plan shall conform with the Regional/Provincial Watershed Management/Reforestation Plan, and shall include the following:

a. Proposed road and trail indication;

b. Proposed culvert and bridge designs;

c. Right-of-way documents/agreements for construction and/or upgrading of an access road linking the project site with the nearest municipal, provincial or national all-weather road;

d. Proposed location of access road not to exceed two (2) meters travelled way (i.e. single lane) with provision for turnouts to allow passage by one vehicle at a time;

e. Soil analysis of areas targeted for reforestation, (if available);

f. Plan of nursery, related structure and water system;

g. Program of work and cost estimates for construction of roads, trails, bridges, culverts, diversion ditches and/or canals, buildings and structures;

h. Computation of construction quantities to a plus or minus fifteen (15%) percent degree of accuracy;

i. List of unit costs based on current prices verified by proforma quotations from at least three (3) probable suppliers;

j. Materials and supplies should be in accordance with standards and specifications set by the DENR Secretary;

k. Construction plans at appropriate scales and in sufficient detail to guide project implementors and performance evaluators;

l. Preliminary Approved Agency Estimates

m. Planting and maintenance schedules that are consistent with location-specific climatic variables;

n. Comprehensive list of species suitable for the site, recommended quantities to plant for each species and proposed planting density per hectare;

o. A plantation/forest protection plan;

p. Recommended measures to generate community support and participation in the project;

q. Policies for recruitment of laborers, giving priority to local residents;

r. An incentive plan designed to enhance performance of laborers and supervisors;

s. A description of problems or constraints that could affect implementation (e.g. peace and order situation); and

t. Draft of a Contract Reforestation Package.

EC. 50. Central Office Reforestation Bids and Awards Committee (CO/RBAC). Pursuant to Article III, Sec. 8 of DENR Administrative Order No. 39, the Central Office RBAC shall be responsible for the pre-qualification of applicants and awarding of contracts for areas more than five hundred (500) hectares. The Committee is composed of the following:

a. Chairman - FMB Director

b. Vice Chairman - Chief, Planning Service, DENR

c. Member - (1) Legal Officer

(2) Technical Personnel designated by the Undersecretary for Field Operations

(1) Chief, Reforestation Division, FMB

(1) Chief, Social Forestry Division, FMB

(1) Chief, Finance Service, DENR

(1) COA Representative (Witness)

(1) FASPO Representative

(1) Society of Filipino Foresters Inc. as NGO Representative

... 37, Series of 1988, the Regional Reforestation Bids and Awards Committee shall be responsible for the pre-qualification of applicants and awarding of contracts for areas with five hundred (500) hectares or less. The Committee is composed of the following:

a. Chairman - Regional Executive Director

b. Vice Chairman - Regional Technical Director for Forestry

c. Member - (1) Chief, Legal Officer

(1) Chief, Forest Resources Dev. Div. (FMS)

(1) Chief, Planning and Management Division

(1) COA Representative (Witness)

(1) Representative, Environment & Protected Areas Sector

(1) Representative, Ecosystem Research Sector

The foregoing paragraph notwithstanding, the Chairman may call upon any member of the regional staff to assist the committee.

SEC. 52. Reporting and Documents Safekeeping. The Central and Regional RBAC Chairmen shall create Secretariats from their respective staff to handle and/or prepare all necessary documentation relating to the contracting process. Likewise, it shall be the responsibility of the RBAC Chairmen to take appropriate measures to safeguard all said documents for referral purposes.

SEC. 53. Selection of Contractors. Except as otherwise allowed, corporate reforestation contracts shall be awarded through competitive bidding. Before the bidding stage, all applicants should undergo pre-qualification. The major criteria shall be the technical, financial and administrative capabilities of the prospective bidders.

SEC. 54. Invitation to Pre-Qualifyers. The RBAC's shall give ample publicity and advertisement to a scheduled bidding for corporate contract reforestation, and invite prospective bidders to submit pre-qualification documents, to enable them to qualify as bidders.

For this purpose, the Invitation to Pre-

qualify to Bid shall be advertised once in two (2) newspapers of national circulation and one (1) local newspaper to pre-qualify contractors for contracts above five hundred (500) hectares.

Provided, however, that to pre-qualify contractors for areas five hundred (500) hectares and below the Regional RBAC Chairman may forego advertising in a newspaper of national circulation and in lieu thereof advertise in two (2) consecutive issues of a local newspaper in general circulation in the Region concerned, furnishing a copy thereof to the Central Office RBAC; Provided, finally: that the last date of publication should be not more than fifteen (15) days before the scheduled date of submission of the pre-qualification requirements.

All applicants for Pre-qualification shall submit the following documents:

a. Articles of Incorporation, Constitution and By-Laws;

b. Certification of Registration with the Securities and Exchange Commission (SEC), the Bureau of Cooperative Development (BOCD), the Department of Science and Technology (DOST), the Department of Education, Culture and Sports (DECS), the Department of Social Welfare and Development (DSWD) or other agencies of government authorized to register or accredit non-government organizations/entities, as the case may be;

c. Financial Statement(s) audited by an independent CPA which compare the last three (3) years. In the case of organizations which have been in existence for less than three (3) years, the applicant shall submit an audited financial statement covering the entire period of operation;

d. Certification of the Company's paid-up capitalization;

e. Certification from banks or other financial institutions regarding guarantees, credit lines, loans and other financial accommodations which may be available for the proposed reforestation contract;

f. Corporate profile statement indicating experience in reforestation and related projects or, in the case of newly-organized entities, a description of the experience and qualification of key personnel, who will be responsible for project implementation;

g. Proposed employment contract to employ a duly qualified Operations Manager who has previously managed or supervised reforestation/plantation development projects;

h. Technical and Management proposals to insure the effective implementation of proposed reforestation projects;

i. List of tools and equipment owned or leased by the applicant, and available for use in contract reforestation;

j. Presentation of Authorization for a Department Representative to verify the submitted information.

SEC. 55. Appreciation of Pre-Qualification Documents. The RBAC shall study and review the pre-qualification documents, and determine the degree of compliance by the applicant with all legal, technical, financial and other requirements. The RBAC shall complete this work not later than fifteen (15) calendar days after submission of an application for pre-qualification has been duly-received.

SEC. 56. Marking of Pre-Qualification Documents. After completing study and reviews as provided in Sec. 55 (above), the RBAC shall, within not more than five (5) additional calendar days, mark all pre-qualification documents either as "Pre-Qualified" or "Pre-Disqualified" and countersign the same. Duly processed applications to implement contracts over 500 hectares shall be forwarded to the Secretary for review and approval.

SEC. 57. Notice to Pre-Qualifiers. Within five (5) days from the approval of Pre-Qualification documents, the RBAC Chairman shall inform all Pre-Qualifiers accordingly. They shall then be registered by the RBAC in the roll of pre-qualified bidders.

SEC. 58. Notice to Pre-Disqualifiers. Pre-disqualified applicants shall likewise be informed by the RBAC stating therein the grounds for their disqualification. Those pre-disqualified are given five (5) days upon receipt of notice of disqualification within which to appeal for reconsideration.

SEC. 59. Invitation to Submit Bids. Notice shall be given to prequalified contractors that the DENR is accepting bids to undertake contract reforestation on a specified project site. Such notice shall explain the terms and conditions for bidding, targets, area, essential features of a bid and other pertinent information based on the items prescribed for development project plan in Sec. 49 of this Order. Such notice further explain that assessment of financial

capability of contractors shall be conducted pursuant to the provisions of PD 1594 (Rules and Regulations Governing Government Infrastructure Projects).

Such notice shall be advertised by publication in two (2) newspapers of general circulation not less than two (2) times over a period of not less than two (2) weeks; in newspapers of national circulation for projects over 500 hectares and in regional newspapers for areas 500 hectares and below in which case a copy of the regional advertisement shall be furnished to the Central Office RBAC.

Bid notices shall likewise be posted in a prominent place in the national, regional, provincial and community offices, of the DENR.

Similarly, the notice shall be sent by mail to all pre-qualified bidders. Upon written request, all of the information indicated in Sec. 49, paragraphs a, b, c, d, e, f, g, j, and k shall be furnished to a prospective, pre-qualified bidder.

SEC. 61. Grounds for Disqualification. The following situations shall be grounds for disqualification of prospective bidders:

a. Failure to meet the required legal, technical and financial requirements as borne out by the documents submitted;

b. The prospective bidder is under suspension, or blacklisted due to violations of the terms and conditions of a previous reforestation contract;

c. In the case of joint ventures, where any of the members is presently suspended or blacklisted for violation as herein above provided; and

d. In case of corporations, suspension or blacklisting of its stockholder(s), director(s), or officer(s).

SEC. 62. Responsibility of the Bidders. The following are the responsibilities of the bidders:

a. Accomplish the necessary forms and all other requirements specified under this Order;

b. Carefully examine all pertinent documents received from the DENR;

c. Determine, verify and satisfy themselves by whatever means they consider necessary or desirable, in regard to all matters pertaining to an invitation to submit a bid, including the location and nature of the work, climatic conditions, terrain,

by the DENR to the Regional/Provincial and Watershed Management/Forestation Plan or the Development Project Plan, peace and order conditions and all other factors which may affect project implementation. Submission of a bid shall be interpreted by the DENR to mean that the bidder/submitter fully understands all the pertinent documents and data furnished by the Department, and further, that the bidder/submitter has inspected, verified or used other means to satisfy his information requirements prior to submission of the bids;

d. Assume responsibility for interpretations of all data, specifications, awards and information provided by the DENR and assume full responsibility for any erroneous interpretation thereof;

e. By virtue of submitting a bid proposal, certify to familiarity with and understanding of all laws, ordinances, decrees, rules and regulations of the Philippines which may apply or affect dealings, agreements, contracts or transactions with the DENR.

SEC. 63. Contents of a Bid. All bids shall be responsive to the scope of work described in a Bid Notice and shall include the following:

a. Development work plan and schedule for implementation of the activities defined in the invitation for bids;

b. Identification of the key personnel responsible for managing project implementation;

c. Description of previous experience by the bidder and bidders key personnel in reforestation work and related tasks defined in the invitation to bid;

d. An estimated budget and cash flow broken down into monthly requirements. For this purpose, bidders shall use the DENR publication entitled "Project Budget Preparation Manual", until such time that it is reviewed or revised by the Bids and Awards Committee;

e. Bid bond equivalent to two-and-one half percent (2 1/2%) of the bid price, from a reputable bonding company;

f. Proposed site development map indicating the proposed planting arrangements, species and number of trees to be planted in each compartment, seedling production and planting schedules, schedule for road/trail

schedules for plantation and infrastructure maintenance;

g. Proposed responses to the issues/problems/ concerns listed in Sec. 49, paragraphs "o" to "s" herein.

SEC. 64. Form of Bidding. All bids shall be submitted to the CO/RBAC (R/RBAC) in sealed envelope with the name of the bidder and the project site typed or printed in capital letters and signed by the bidder.

SEC. 65. Period for Submission of Bids. All bids shall be submitted at the time, date and place specified in the Invitation for Bidders which shall be not more than fourty-five (45) calendar days after final publication as provided in Sec. 59 of this Order. Bids submitted after the scheduled time for submission shall not be accepted.

SEC. 66. Receiving of Bids. The following shall be observed in the reception of bids:

a. All bids which are consistent with the requirements set forth in this Order, and received by the CO/RBAC (or R/RBAC) Chairman on the designated time, date and place shall be eligible for consideration.

b. Bids shall be properly identified, initialed by the RBAC and recorded in the appropriate record book by the Secretariat of the Committee.

c. A bid which is not accompanied by the required bid bond shall be rejected outright;

d. Prior to opening of bids, the AAE shall be announced.

e. Bids shall be opened at the place, date and time specified in the advertisement (Sec. 59) by the RBAC. The bidder or their duly authorized representatives shall have the option to attend the opening of bids. All bids received and read must be initialed by all members of the RBAC and the Auditor's representative;

f. After all bids have been received and opened, the corresponding abstract of bids shall be prepared by the RBAC secretariat and completed within not more than one (1) working day after bids are opened per paragraph "d" above. The abstract of bids shall be signed by all members of the RBAC, attaching thereto all the bids with their corresponding Bid Bond and the minutes or proceedings of the bidding. The abstract of bids shall contain the following:

1. Name and location of the Contract Reforestation project;

2. Time, date and place of bidding;

3. Name of bidders and their corresponding bids arranged from the lowest to highest in terms of cost, and the amount of bid guaranty, and the name of the issuing banks.

g. On the time and date for opening of bids there shall be at least two (2) competing bidders. In case there is only one bidder, the bid shall be returned unopened and the project shall be advertised anew for bidding. Should after rebidding, there would still be only one bidder, the project may be undertaken by administration or through negotiated contract giving preference to the lone bidder.

SEC. 67. Evaluation of Bids. The RBAC shall complete its appreciation and evaluation of bids not later than ten (10) working days after the bids are opened per Sec. 66 paragraph "d" hereof, determine the ranking of each bidder and inform all the bidders accordingly. Appreciation and evaluation shall be conducted in accordance with the following:

a. Bids shall be evaluated on the basis of both cost criteria and technical criteria;

b. The evaluation will compare costs for each major activity. In general, the bid having the lowest aggregate cost will be ranked highest in preference. However, if estimated costs for one or more major activities are unreasonably low, such that quality of the eventual output may be doubtful, ranking may be adjusted accordingly. The evaluation will likewise examine the technical merits of a bid including:

1. qualifications of the proposed management teams;

2. previous experience of the contractor and key staff in reforestation work;

3. feasibility, appropriateness and innovativeness of the proposed development plan;

4. financial capability;

5. experience in related forestry operations; and

6. Responsiveness to the terms, conditions and other features of the

unique/site-specific features, the importance of each separate activity will vary in relation to overall impact on performance. Therefore, the weights or scores allotted to each activity within the scope of work for each project shall be determined in advance on a site-to-site basis by the CO/RBAC or R/RBAC concerned and shall be specified in the Invitation to Bidders;

d. During the course of evaluation, any discovery of misrepresentation in prequalification statements or proposals, or any significant change in the situation of a contractor may be cause for downgrading of ranking or outright disqualification; and

e. The Bid Bond of all losing bidders shall be returned within five (5) working days after completion of evaluation; however, the Performance Bond of the winning bidder shall remain in the possession of the DENR.

SEC. 68 Negotiation of Terms and Conditions. The top ranked bidder, as determined pursuant to Sec. 67 of this Order, shall be invited to meet with the RBAC within not more than five (5) calendar days after appreciation and evaluation has been completed, in order to negotiate and finalize terms and conditions for a contract. Negotiation shall deal with issues in the invitation to bid that (in the opinion of the RBAC) have not been adequately addressed or whose proposed plans can be improved. In no case however, shall negotiation materially revise the original provisions of the invitation to bid, or reduce or increase costs by more than three percent (3%) of the bid price previously submitted and considered during appreciation/evaluation of bids. The primary objective of negotiation will be to ensure concensus between DENR (as represented by the RBAC) and the top-ranked bidder, on overall terms and conditions for implementation of the contract. Negotiation shall be conducted and completed within five (5) working days after it is initiated.

SEC. 69. Notice of Award. For purposes of this Order, notice of award shall mean formal notification to the winning bidder that its proposal has been determined to be the most meritorious and that the DENR is prepared to enter into a contract for project implementation.

Such Notice of Award shall be issued within five (5) calendar days after negotiation (Sec. 68) has been completed and shall be deemed to be complete upon signature by the duly authorized DENR representative and the duly authorized representative of the bidder, indicating the latter's conformity with the terms and conditions of the notice.

SEC. 70. Preparation of Contract. Upon completion of the issuance of Notice of Award, the RBAC shall, within five (5) working days thereafter, prepare a contract for signature by the DENR Secretary, or his authorized representative as the case may be, and the winning bidder.

SEC. 71. Contents of a Contract. Reforestation contracts shall contain the terms and conditions for implementation, and payments, plus the following annexes:

a. Copy of pre-qualification notice of approval;

b. Copy of the Invitation to Bidders;

c. Copy of the awardee's bid prepared pursuant to Sec. 63 of this Order;

d. Letter, board resolution or other appropriate document granting authority to the bidder's representative to sign the contract;

e. Copy of the Notice of Award signed by the duly authorized representative of the DENR and the bidder, the latter indicating conformity thereto;

f. Performance Bond; and

g. Other applicable supporting documents.

SEC. 72. Contracting Procedures. The prepared contract shall be processed as follows:

a. The contract shall be submitted by the RBAC concerned for review, approval or modification by the Secretary, or the Secretary's duly-authorized representatives; provided however that the RED shall exercise these functions up to the financial ceiling of authority granted to RED's by existing rules and regulations; provided further that the RED shall advise the Secretary in writing as to the action/decisions the RED has taken, with copies furnished to the Undersecretary, the FMB Director and the appropriate Assistant Secretary for Field Operations;

b. After review, approval or modification by the DENR officials identified above, the contract shall be presented to the winning bidder who shall be given five (5) days within which to either indicate conformity by signing the contract or to request, modification thereto, in which case the

contract shall be returned for further review per Paragraph (a) above;

c. After final completion of the review/approval/modification process described above, and signature by the winning bidder, the contract shall be returned to the Secretary, RED or their duly authorized representatives for signature.

SEC. 73. Provision for Contingency. In the event of refusal or failure of the winning bidder to either sign the contract or request modification thereto within the stipulated time (i.e. 10 working days) the bidder shall be deemed to have defaulted on its agreement to the terms of the notice of Award.

In case of default for the reasons stated above, the bidder's Bid Bond shall be forfeited in favor of the Government. The DENR shall collect the forfeited amount on behalf of the Government.

In such case, the DENR shall apply Sec. 68 to 71 in favor of the second-ranked bidder. If the second-ranked bidder chooses not to accept the Notice of Award or defaults, Sec. 68 to 71 shall then apply to the third-ranked bidder.

However, if both the second or third ranking bidders refuse or fail to exercise their option to be awarded and to sign a contract, the project shall be advertised anew for bidding; Provided, however, that should either the second or third ranking bidder choose to exercise their options, the procedures set forth in Sec. 68 to 71 of this Order shall apply.

SEC. 74. Notice to Proceed. The Secretary, RED or their duly-authorized representatives shall issue a Notice to Proceed in favor of the contractor within five (5) working days after signing formalities have been completed, the contract has been notarized, approved by the Commission on Audit (COA) and availability of funds certified by the appropriate DENR Officer.

75. Monitoring and Evaluation of Performance. Contractor performance shall be inspected and verified by the Regional Office concerned and a representative of a Non-Government Organization, based on the targets, terms and conditions of the contract. The non-government organization may be contracted for this purpose and paid for its services pursuant to Sec. 9 of this Order. The Central Office shall, at its discretion, conduct periodic spot checking of monitoring work. Monitoring shall be conducted in

System formulated by the National Forestation Program Working Group.

SEC. 76. Submission of Inspection Reports. The monitors referred to above (Sec. 75) shall submit their reports in the form of Sworn Statements, to the PENRO within ten (10) calendar days after the inspection has been completed.

SEC. 77. Endorsement of Inspection Report. Within five (5) working days from receipt of the report, the PENRO shall endorse the same to the Regional Executive Director, recommending either payment, in full or in part or non-payment, based on the data provided in the report. The PENRO shall furnish a copy of the endorsement/recommendation to the contractor.

SEC. 78. Evaluation of the Inspection Report. The RED shall complete evaluation of the inspection report as well as the endorsement/recommendations of the PENRO within seven (7) days from receipt thereof.

SEC. 79. Processing for Payment. Within fifteen (15) days from receipt of the inspection report and endorsement/recommendation of the PENRO, the Regional Executive Director shall process for payment the amounts due to a contractor, and inform the contractor accordingly.

In cases where payments are to be approved in the DENR Central Office, the Regional Executive Director shall forward the documents described in Secs. 75 to 78 above to the Central Office within five (5) days after completion of evaluation and appraisal, including in such submission a recommendation for either payment (in full or in part) or non-payment.

SEC. 80. Central Office Effects Payment. Within fifteen (15) working days after receipt of communication from the RED per Sections 78 and 79 hereof, the CO/RBAC shall process for payment and release the amounts due to a contractor and inform the contractor accordingly.

SEC. 81. Right to Appeal by Contractor. In the event of an adverse or negative determination and/or recommendation of the PENRO, the Regional Executive Director, or the CO/RBAC for either partial or non-payment, the Contractor may appeal such determination within ten (10) working days after receipt thereof. Such appeal shall be in writing and duly sworn to by the Contractor. Appeals filed after the stipulated ten (10) working days shall no longer be given due course.

PENALTIES, GROUNDS FOR CANCELLATION, AND ADMINISTRATIVE SANCTIONS

SEC. 82. Grounds for Cancellation. The Undersecretary, upon the recommendation of the RED after proper investigation may cancel/rescind Corporate Reforestation Contracts, and the RED, upon recommendation of the PENR) or CENRO may cancel/rescind Family Approach and Community Reforestation Contracts, for any of the following reasons:

a. If the contract was obtained through fraud, misrepresentation or omission of material facts at the time of application;

b. Abandonment of the area, or failure to start operational activities within one (1) month from the award/issuance of the contract;

c. Voluntary surrender of contract by contractor for cause; and

d. Violation of any of the terms and conditions of the contract.

SEC. 83. Penalties - In the case of Corporate Contract Reforestation, evidence of misrepresentation of facts by the Contractor during the prequalification or bidding, and violation of contract terms and conditions shall be sufficient grounds for the following sanctions:

a. Cancellation of Pre-qualification;

b. Suspension of the privilege to pre-qualify and/or bid for Contract Reforestation projects for one (1) year for the first offense, disqualification for two (2) years for the second offense, and perpetual disqualification for the third offense;

c. Forfeiture of 100% of Performance Bond;

d. Prosecution in court for civil or criminal offenses where conditions or circumstances warrant.

In the case of Family Approach and Community Contract Reforestation, evidence of misrepresentation of facts during recruitment/selection/processing per Sections 14, 32 and 34 of this Order, and/or violation of contract terms and conditions, shall be sufficient grounds for the following sanctions:

a. Suspension or cancellation of contract;

b. Replacement of a family approach selected by the committee of local leaders identified in Section 14 of this Order.

c. Suspension of the privilege to implement new Family Approach or Community Contract Reforestation projects for a period of not less than two (2) years; and

d. Prosecution in court for civil or criminal offenses where conditions or circumstances warrant.

SEC. 84. Administrative Sanctions for DENR Employees. DENR employees may be subject to administrative sanction, including reprimand, demotion, suspension or termination from the service, and to civil and criminal prosecution, subject to the Civil Service Law and other applicable laws, rules and regulations, for any of the following acts:

a. Solicitation of money, gifts or favors from applicants for pre-qualification, bidders, contractors or co-employees responsible for any phase of Contract Reforestation implementation;

b. Falsification of inspection reports, evaluation, appraisals and other data relevant to monitoring, evaluation, certification of performance and recommendations for payment or non-payment;

c. Obstruction or failure to carry out the provisions of this Order, leading to undue delay in pre-qualification, bidding, award, finalization of contracts, monitoring, evaluation, appraisal, certification of performance, submission of recommendations for payment or non-payment, or implementation of the contract.

SEC. 85. Supplemental Rules and Regulations.

a. The Undersecretary upon recommendation of the RED shall formulate such supplemental rules and regulations as may be necessary to effectively carry out the objectives of this Order. Additionally, the RED, may promulgate supplemental rules, procedures and regulations which apply to his/her Region. However, such rules and regulations shall be in accordance with this Order, and duly approved by the DENR Secretary.

b. In carrying out the provisions of this Order, the DENR officers and personnel concerned shall use the standard forms attached hereto as annexes; provided however, that the RED may design and use alternative forms subject to approval of the same by the Undersecretary.

SEC. 86. Repealing Clause. The provisions of any Administrative Orders, memoranda, circulars and related DENR documents which are inconsistent with this Order are hereby repealed or amended accordingly.

SEC. 87. Effectivity. This Order shall take effect immediately.

FULGENCIO S. FACTORAN, JR.
Secretary

RECOMMENDING APPROVAL:

CIRILO B. SERNA
Director
Forest Management Bureau

Appendix 7 - Department Administrative Order No. 70, Series of 1990. The Forest Land Management Agreement.

WHAT is DAO 71?

DAO-71 was approved on August 9, 1990. It offers reforestation contractors an opportunity to apply for and receive a Forest Land Management Agreement (FLMA). The FLMA will give the contractor the privilege to harvest fruits, wood and other products from the trees and other plants grown and maintained through the contract.

This privilege may be granted for 25 years, and is renewable for another 25 years. In other words, the area presently covered by a reforestation contract can be converted into a commercial tree farm. This tree farm can be a source of income for you, for the next 50 years.

The Forestland Manager's Responsibilities

However, whoever is granted this privilege must accept certain responsibilities. The major responsibilities are (a) to protect and maintain the tree farm; (b) to implement harvesting in a manner that will ensure sustainability and avoid erosion; (c) to reforest areas that are harvested; (d) to reforest additional areas outside of the area covered by the FLMA and (e) to give DENR a share of the income earned from the FLMA.

Requirements for Application

You may apply for an FLMA at the DENR Community Environment and Natural Resources Office (CENRO) having jurisdiction over your contract reforestation site. Before you apply, however, make sure that at least eighty percent (80%) of the trees you planted (or replanted) have survived. FLMA's will only be issued to contractors who have demonstrated their capability to manage a tree farm by achieving an 80% survival rate.

Incidentally, when we refer to "trees," we also mean all other permanent crops covered by your contracts. This includes bamboo, pandan, rattan and other permanent plants) It also includes wild trees and bushes you have maintained and protected through Assisted Natural Regeneration (ANR), if this was part of your contract. But for simplicity in this document, we will just use the word "trees" to include all permanent crops.

When you submit your application you will need to state the kinds and number of trees that are surviving on your site. For example, if you have planted and successfully grown 5,000 kakawate, 4,000 narra and 100 bamboo this should be indicated on your application. You should also prepare an estimated schedule of harvests. For instance, the kakawate might be harvested for firewood in two years, the bamboo in five years and the narra in twenty years. Don't worry about preparing an exact schedule. We realize this cannot be done with absolute accuracy because no one can predict the rainfall and all the other conditions that will affect future growth. However, try your best to be as accurate as possible in your estimates.

Preparation of a harvest schedule will be good planning exercise. It will also be important in working out the production sharing arrangements which are explained later in this document.

When filing your application, you should also submit a sketch map that shows the location, boundaries and the number of hectares. This is for your own protection. Maps help prevent land disputes. Remember that you will be entering into a 25 year agreement that can be extended up to 50 years. The FLMA not only grants harvesting privileges. It also gives you sure tenure over the land.

Implementing Rules and Guidelines

An FLMA will be subject to certain rules that will be mutually beneficial to you and to your community. The rules are summarized as follows:

a) Every tree that you cut down at harvest time will be replaced by replanting new trees. This will ensure that the area remains forested. It will also give you sustained production.

b) While the trees are still small, land between the trees should be used to grow temporary crops such as kadyos, gabi, bananas and other plants that are compatible with the trees. Interplanting will encourage better protection and maintenance. It will also supply income while waiting for the trees to mature.

c) Each FLMA holder is required to reforest additional areas outside of the site covered by the FLMA. The boundaries of your FLMA will be expanded to include these additional areas once they have been successfully reforested.

d) If you are a corporate or community contractor, and you are issued an FLMA, you must guarantee priority in employment to the local residents in operating the FLMA. Moreover, a majority share in ownership of the FLMA must be transferred to the local residents within ten (10) years from the original date of the FLMA.

If local residents own a share of the FLMA, the community will have strong incentives to prevent burning, poaching and other forms of destruction. Furthermore, this rule fulfills the constitutional mandate for equity in the access to natural resources. In this case, the resources are man-made forests.

e) If you are a family contractor you should form a cooperative or other type of association with neighboring contractors so that your combined areas are approximately 100 hectares. Collectively, you should file only one application. One FLMA will be issued to your cooperative or association, covering the entire area of all its members. This will improve your chance to get better prices for your products.

Remember that one of your major products will be wood. It is very difficult to earn a good price from small volume sales of wood. Each sale should be large enough to fill at least one jeepney load. Several families must cooperate in order to fill up a jeepney. Cooperation is also necessary to protect the area against fire, poaching and similar problems.

We realize that in some cases, it may be difficult to form a cooperative or association immediately. If this is a problem in your area, you may be given an FLMA as an individual. But you must promise to join with your neighbors and form a cooperative association within not less than five (5) years from the date your individual FLMA is issued.

Production-Sharing

Government funds and loans are used to finance reforestation contracts. This investment provides three (3) years of temporary employment and income. By the end of a three (3) year contract, a considerable amount of money will have been spent to convert a denuded land into a partially-developed tree farm. But, several more years of care and protection will be needed before the trees mature.

Under the FLMA, a reforestation contractor may be given the 25 to 30 year harvesting privileges explained earlier if the contractor accepts the responsibility to continue protecting and caring for the trees planted under the contract.

Taxpayers provide the seed money to develop tree farms through contract reforestation. When this investment begins to pay off, profits from the investment can supply additional seed money to help develop more tree farms and help other upland residents who need employment. Therefore, to be fair to all concerned, whoever receives an FLMA should agree to help the government finance additional reforestation contracts. In this way, each FLMA holder will help others share the same privilege in the future.

A simple system will be used to help others, while also earning income. The FLMA holder will turn over a share of the proceeds from sales to the DENR. The DENR will use this share to finance additional reforestation contracts. The people who implement these new contracts will also be eligible for an FLMA in the future.

You will naturally ask "how much will I pay DENR as a production share?". Again the answer is simple. The production share is a one-to-one exchange. For each hectare covered by your FLMA, the production share will be the amount needed to pay someone else to plant another hectare. This amount must be turned over to DENR in yearly installments beginning in Year 7 of the FLMA. A portion of the production share will be collected each year. By the 25th year of the FLMA, the total amount of all yearly installments should be equal to the amount needed to reforest an area with the same number of hectares that are covered by your FLMA.

The amount needed to reforest an equivalent area will be computed in man days of labor. For example, suppose you were a reforestation contractor who was paid P18,000 per hectare. If the minimum wage is P75.00, you were paid the equivalent of 240 man days of labor per hectare (P18,000 divided by P75/day = 240 man days). During the next 25 years you must turn over to DENR the amount needed to pay 240 man days of labor for each hectare covered by your FLMA. If you received less than P18,000 per hectare under the contract, the amount you pay as production share will also be less than 240 man days.

The exact amount of the total production share is based on (a) the amount you received as a contractor and (b) the legal minimum wage for non-plantation agricultural labor in the year you make payment. For instance, suppose that eight years from now you harvest 20 trees and sell them for P500 each. Your total income will be P10,000 (20 x P500 = P10,000). If it cost you P50 to harvest each tree your total expense will be P1,000 (20 x P50 = P1,000). Your net income will be P9,000. Suppose you decide that you want to keep P5,000 for your living expenses and pay P4,000 as production share. If the minimum wage at that time is P80, the value of your payment is equal to 50 man days of labor (P4,000 divided by P80/day = 50). Since the total production share is equal to 240 man days, your remaining balance will be 190 man days to be paid up to the 25th year of the FLMA (240 days -50 days = 190 days).

During the first 25 years, the amount paid each year will not always be the same. On years when there is a major harvest, larger amounts should be paid. For example, during years when you cut and sell several big trees, your income will be substantial and large payments are possible. However, during years when you only have small harvests of firewood or intercrops, the payments can be lower.

No payments of production share will be required during the first six years. Payments will begin in Year 7 of the FLMA. By the seventh year, trees that were only three (3) years old when the FLMA is issued will be approximately then (10) years old. If the tree farm is well-maintained, harvests from the 10-year old trees will be adequate to pay the production share and still earn a good profit.

We want you to earn a profit from FLMA operations. This will provide an incentive to take good care of your tree farm. And more trees means a better environment for everyone.

If you wish, you can begin paying the production share earlier than the 7th year. For example, suppose you planted bamboo in 1988, it is 3 years old when an FLMA is issued in 1991. If it grew well, some harvests can begin in 1993 because by that time the bamboo will be 5 years old. Early payment of production share will be advantageous to you. Annual payments over the 25 years will be lower. Also, the production share you will pay is based on a certain number of man days of labor, multiplied by a minimum wage. The minimum wage keeps increasing. For example, the cost of 240 man days of labor in 1993 will be lower than it will be in 1988 (i.e. 7 years after the FLMA is issued).

Money that will will be used to pay the production share should be deposited in the bank each time a sale is made. The bank account will be in the name of the FLMA. Yearly withdrawals will be made to pay the production share.

In addition to payment of the production share, you are also required to reforest all areas that you harvest within the boundaries of your FLMA. Furthermore, you are required to reforest additional lands outside of your FLMA at your own expense. DENR will assign these additional lands for you to reforest. Once these additional lands have been fully reforested, they will also be included in your FLMA.

Other Requirements

Planting additional lands outside the FLMA can begin immediately or it can be postponed until such time that you have available funds from your harvests. The date to begin additional planting is adjustable, based on your harvest schedule. Naturally however, it will be advantageous to plant as early as possible, because this will increase the number of hectares covered by your FLMA.

We mentioned earlier that your application should include a harvest schedule. This schedule will be a guide for determining the yearly production share and the date when you will begin to plant additional lands. From time-to-time, the schedule can be revised to correspond with the growth rates that are achieved.

The FLMA will be a joint-venture enterprises between you and the government. Through contract reforestation, government supplies the initial capital. You will furnish the maintenance needed to complete the development of a tree farm. Both parties will share in the benefits.

The FLMA is a new program. Experience will show us how it can be improved over the years. Rest assured that changes can always be amended and improved to make the program work better for you, for your community and for your fellow citizens. The DENR will always welcome your suggestions.

With mutual trust, hard work and cooperation much can be achieved. One major objective of the FLMA system is to see millions of upland residents become our country's major suppliers of forest products. Another major objective is to create a self-financing system for continued development and maintenance of tree farms, without always depending on overseas loans. With cooperation between FLMA holders and the government, we can surely attain these two objectives. ●

Appendix 8 - Department Administrative Order No. 123, Series of 1989. The Community Forestry Program.

SECTION 1 OBJECTIVES

The Constitution mandates (i) equitable access to natural resources and (ii) conservation of natural resources for the benefit of present and future generations. Pursuant to these mandates, the Department of Environment and Natural Resources (DENR) hereby launches the COMMUNITY FORESTRY PROGRAM. In collaboration with rural communities and non-government organizations (NGO's), this PROGRAM shall test, refine and develop solutions to the following problems:

1.1. The conventional practice of awarding forest products utilization permits/licenses to timber companies has denied legal access to these resources by rural communities. This is not consistent with the principles of social equity mandated by the Constitution.

1.2 Despite many decades of forest products extraction, poverty is still widespread in the uplands. This demonstrates that financial benefits from the forests have not been shared by the rural poor.

1.3 Forest conservation is an imperative pre-condition to sustainable development and it requires the active participation of rural communities. But denial of access has cancelled out a major incentive to practice forest conservation. For rural communities destructive slash-and-burn farming (kaingin) provides more attractive financial benefits than conservation. This is an irrational situation that must be corrected.

1.4 Forest products utilization privileges can be granted to rural communities, thus creating strong incentives to practice forest conservation. However, rural communities need training to manage this new opportunity and to cope with its varied responsibilities. Furthermore, government must install the appropriate procedures for community management of forest resources. These issues shall be addressed in the COMMUNITY FORESTRY PROGRAM as provided herein.

DEFINITIONS

The words, phrases and acronyms listed hereunder, are defined as follows:

PROGRAM OR CFP	-	the Community Forestry Program
COMMUNITY FORESTRY MANAGEMENT AGREEMENTS or CFMA's	-	Agreements which grant forest products utilization privileges to rural communities
DENR	-	the Department of Environment and Natural Resources
SECRETARY or O/SEC	-	the Secretary of the DENR
UNDERSECRETARY or U/SEC	-	the DENR Undersecretary for Field Operations
REGIONAL EXECUTIVE DIRECTOR or RED	-	a DENR Regional Executive Director
RTD	-	a DENR Regional Technical Director for Forestry of the DENR
PENRO	-	a Provincial Environment and Natural Resources Office/Officer of the DENR
CENRO	-	a Community Environment and Natural Resources Office/Officer of the DENR
ISF	-	the Integrated Social Forestry Program
CREF	-	Contract Reforestation
TSI	-	Timber Stand Improvement
FORESTED AREAS	-	lands which are wholly or partially covered by natural forests (e.g., dipterocarp, pine, mangrove)
COMMUNITY FORESTRY PROJECTS or PROJECTS	-	Projects launched by the DENR pursuant to his Order

PRINCIPAL FEATURES OF THE PROGRAM

3.1 Community residents shall be awarded twenty-five (25) year COMMUNITY FORESTRY MANAGEMENT AGREEMENTS (CFMA's) renewable for another twenty-five (25) years. CFMA's shall grant forest products utilization privileges to the communities subject to (i) submission and approval of a management/ development plan, (ii) compliance with DENR rules and regulations and (iii) adherence to the principles of sustained yield management.

3.2 To help CFMA awardees cope with their forest management responsibilities, the DENR will provide assistance to the awardees in the following areas: (i) establishing community organizations, (ii) on-the-job training in forest management planning and conservation, (iii) livelihood opportunities in forest resource rehabilitation, and (iv) developing other livelihood opportunities that do not necessarily depend on extraction and utilization of forest products.

3.3 The PROGRAM shall begin with the launching of twelve (12) PROJECTS in Calendar Year 1989 and shall be expanded on the basis of lessons learned in these projects.

3.4 Non-government organizations (NGO's) and the DENR shall assist rural communities in the various phases of training, organization and operations. These phases are described schematically in Figure 1 and further explained in the Manual of Operations (annex A).

SEC. 4 MANUAL OF OPERATIONS

4.1 The Manual of Operations attached hereto (Annex A) shall be the official guideline for implementation of COMMUNITY FORESTRY PROJECTS.

4.2 The UNDERSECRETARY FOR FIELD OPERATIONS shall from time to time, propose revisions to Annex A based on lessons learned during implementation. Proposed revisions shall be submitted to the Secretary and approval thereof, said revisions shall be applied in PROGRAM implementation.

COVERAGE AND SITE SELECTION

5.1 Criteria: COMMUNITY FORESTRY PROJECTS may be implemented on all lands in the public domain including upland. Lowland and mangrove areas, except the following:

a. established critical watersheds covered by proclamations, legislation and specific administrative issuances;

b. protected and wilderness areas;

c. civil, military and other government reservations where forest products utilization is forbidden by law, decree, proclamation or administrative issuance; and

d. areas covered by existing permits, leases and/or contracts except in cases where the permittee/lessee/contractee shall execute an appropriate waiver.

5.1.1 Sites selected for COMMUNITY FORESTRY PROJECTS shall have the following mandatory criteria:

a. not within a prohibited area per paragraph 5.1 (above);

b. participants must live within the site and shall agree to protect the forest;

c. there is a potential to develop of livelihood that are not necessarily dependent on forest products extraction (e.g. contract reforestation, food processing);

d. if located within or including part of a dipterocarp forest, the PROJECT area has not been logged for at least 5 years prior to the PROJECT implementation.

5.1.2 In addition to mandatory criteria set forth in paragraph 5.1.1, priority shall be given to sites with the following features (i.e.preferable/ optional criteria):

a. at least one of the boundary lines of the site is located no further than five kilometers (5 kms) from

an existing road that provides market access;

b. there is an ISF project within or adjacent to the forest;

c. the site is part of an expired, abandoned or cancelled timber license agreement (TLA);

d. approximately fifty percent (50%) of the site is forested;

e. community organization work has previously been carried by government or an NGO;

f. there is an NGO already operating within or nearby the site; and

g. the local government is perceived to be receptive to the PROJECT and no serious problems of negative political intervention are anticipated.

6.2 Area: The initial area covered by a PROJECT shall not exceed one thousand hectares (1,000 ha). However, this area may be increased in the future if the community demonstrates adequate managerial capability.

SEC. 6 MANAGEMENT/DEVELOPMENT PLANS

6.1 Each PROJECT shall have a comprehensive management and development plan prepared jointly by the Community and an NGO with DENR assistance. This plan shall provide the following:

6.1.1 Virgin Forest Areas

a. an operationally-feasible protection plan consistent with the principle that all logging in virgin forests should be banned.

6.1.2 Residual Forest Areas:

a. complete stand and stock tables;

b. an operations map dividing the area into working units;

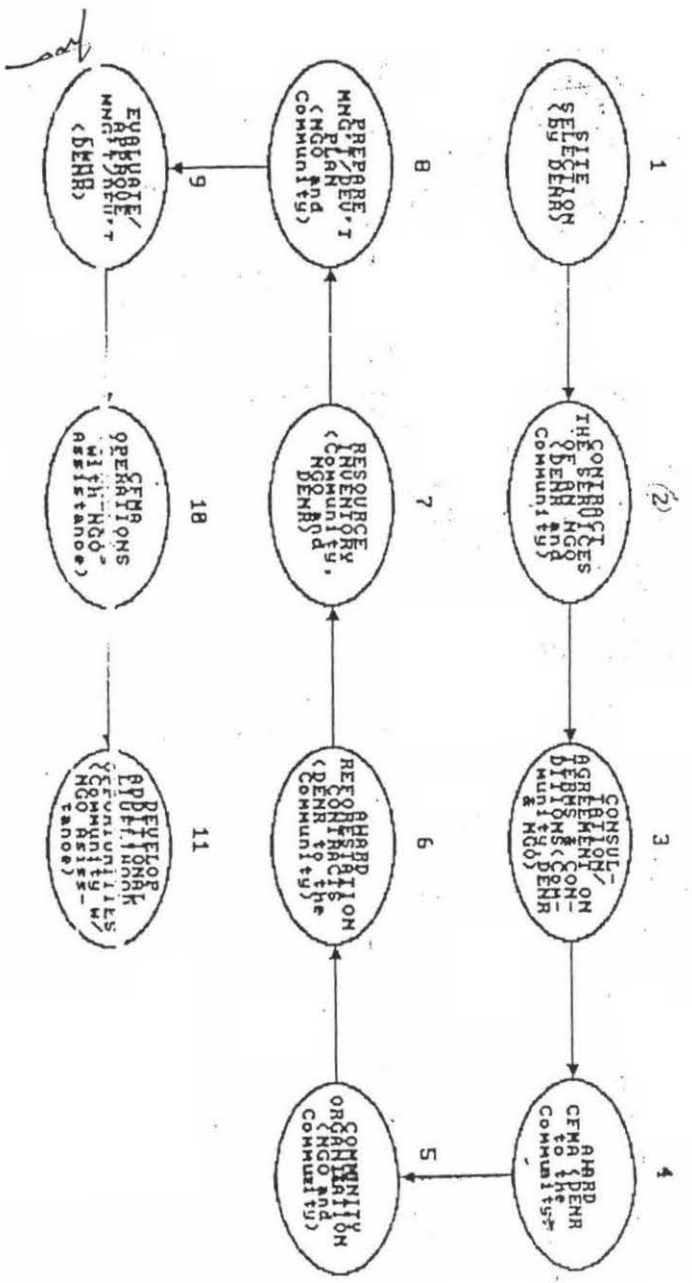


Figure No. 1
COMMUNITY FORESTRY PROGRAM
Operational Sequence

c. schedule and details of TSI, forest products extraction and enrichment planting that will be carried out (e.g., no. of hectares TSI per year; amount of timber and minor forest products to be extracted by working unit per year; tree species for enrichment planting);

d. nursery locations and development/ operations plans;

e. road and trail alignments; and

f. forest products collection stations.

6.1.3 Mangrove Areas

a. schedule and details of sustained-yield selective cutting operations for fuelwood gathering or other forms of extraction allowed under DENR rules and regulations;

b. revegetation, enrichment planting and other development activities allowed under DENR rules and regulations (e.g., nipa and bakawan establishment);

c. other livelihood activity that will be implemented consistent with DENR policy, rules and regulations such as aqua-silviculture.

6.1.4 Non-forested areas

a. a map indicating number, location and areas of lands claimed, occupied and vacant;

b. names of occupants/claimants and their status (e.g., CSC holder, tax declaration);

c. areas identified for reforestation to be implemented and financed by the CFMA awardee;

d. areas identified for reforestation to repay start-up expenses advanced by DENR;

e. areas identified for contract reforestation to provide immediate employment (i.e., livelihood opportunities);

(Note: c, d and e should be broken down into areas to be developed as protection forests and production forests)

f. agroforestry development areas;

g. nursery locations and development/ operations plans;

h. road and trail alignments;

i. existing structures (e.g., houses, bridges); and

j. structures to be installed (e.g., water impoundment dams).

6.1.5 General Information

a. who will manage the various activities included in the plan and how these will be carried out;

b. comprehensive vegetative cover map;

c. census of occupants;

d. marketing plan;

e. financial management (i.e., how income will be administered and shared);

f. processing plan;

g. other relevant information.

6.2. The Management/Development Plan shall be prepared collaboratively with the community and shall be carried out as an "on-the-job" training exercise for the residents. In addition to operating details for each forested block, all occupied lands should be covered by simple (but clear) sketch maps indicating the types of activities the occupant intends to implement (i.e., a farm development plan).

6.3 Management/Development plans shall provide detailed information for the first three (3) years

of the PROJECT and indicative plans for the succeeding years.

6.4 Management/Development plans shall be updated at the end of the third year and every five (5) years thereafter. However, the DENR may require more frequent updating if schedules are upset by circumstances beyond control (e.g., typhoons) or if the CFMA grantee is unable to keep up with the original schedule provided in the plan.

SEC. 7 PROJECT OPERATIONS

CFMA operations shall be implemented pursuant to provisions of the Manual of Operations attached hereto as Annex "A", and any subsequent revisions thereof.

SEC. 8 PHASING

For 1989, twelve (12) projects shall be programmed and implemented to constitute the first phase of the COMMUNITY FORESTRY PROGRAM The PROGRAM may be expanded thereafter, consistent with the development of Community, NGO and DENR capability to administer additional PROJECTS.

SEC. 9 REPEALING CLAUSE

All DENR administrative orders, guidelines, memoranda and official issuances not consistent with the provisions of this Order are hereby repealed, amended or revised accordingly.

SEC. 10 EFFECTIVITY

This Order takes effect immediately.

FULGENCIO S. FACTORAN, JR.
Secretary

APPENDIX 9 - Growth/Yield Parameters for Mangrove Forests (Source: Crown Agents 1990 & PCARRD 1991)

1. Mangrove Plantation

wood products average harvest	- 13 cu.m./ha/yr
value (at PHP 300/cu.m)	- PHP 3,900/ha/yr
fish products average harvest	- 667 kg/ha/yr
value (at PHP 20.16/kg)	- PHP 13,450/ha/yr
total value	- PHP 17,350/ha/yr

2. Managed Naturally Regenerated Mangrove Stands

wood products average harvest	- 7.5 cu.m./ha/yr
value (at PHP 300/cu.m)	- PHP 2,250/ha/yr
fish products average harvest	- 667 kg/ha/yr
value (at PHP 20.16/kg)	- PHP 13,450/ha/yr
total value	- PHP 15,700/ha/yr

3. Unmanaged Understock Mangrove Stands

wood products average harvest	- 3.5 cu.m./ha/yr
value (at PHP 300/cu.m)	- PHP 1,050/ha/yr
fish products average harvest	- 667 kg/ha/yr
value (at PHP 20.16/kg)	- PHP 13,450/ha/yr
total value	- PHP 14,500/ha/yr

Table 6.9 SENSITIVITY ANALYSIS OF INTEGRATED SOCIAL FORESTRY PROGRAM (ISFP) BY CONSIDERING HIGHER WEIGHTS ON SOCIO-ECONOMIC CRITERIA

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		2	2	2	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	6	6	6	3	3	3	3	3	3	3	3	3
Fish Pond Operators	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Timber Licensees	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Indirect Users													
Municipal Community	1	6	*	6	3	3	3	3	3	3	3	3	3
Regional/National Community	1	6	*	6	3	3	3	3	3	3	3	3	3
Future Generations	1	*	*	*	3	3	3	3	3	3	3	3	3
GOAL ACHIEVEMENT SCORE		18.0	6.0	18.0	12.0	12.0	12.0	12.0	12.0	18.0	10.0	10.0	18.0
PERFECT GOAL SCORE		18.0	6.0	18.0	12.0	12.0	12.0	12.0	12.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	55.6	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		200.0	200.0	200.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	55.6	100.0
PROGRAM SUSTAINABLITY SCORE	1411.1	PERFECT GOAL SCORE BASED ON WEIGHT						1500.0					
% SUSTAINABILITY	94.1												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.10 SENSITIVITY ANALYSIS OF FORESTRY SECTOR PROGRAM (FSP) BY CONSIDERING HIGHER WEIGHTS ON SOSIO-ECONOMIC CRITERIA

MANGROVE SUSTAINABLE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
GOALS/CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS --->		2	2	2	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	6	6	6	3	3	3	3	3	3	3	3	3
Fish Pond Operators	1	6	6	6	3	3	3	3	3	3	3	3	3
Timber Licensees	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Indirect Users													
Municipal Community	1	6	6	6	3	3	3	3	3	3	3	3	3
Regional/National Community	1	6	*	6	3	3	3	3	3	3	3	3	3
Future Generations	1	*	*	*	3	3	3	3	3	3	3	3	3
GOAL ACHIEVEMENT SCORE		24.0	18.0	24.0	15.0	15.0	15.0	15.0	15.0	18.0	14.0	14.0	18.0
PERFECT GOAL SCORE		24.0	18.0	24.0	15.0	15.0	15.0	15.0	15.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8	77.8	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		200.0	200.0	200.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8	77.8	100.0
PROGRAM SUSTAINABILITY SCORE	1455.6				PERFECT GOAL SCORE BASED ON WEIGTH			1500.0					
% SUSTAINABILITY	97.0												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.11 SENSITIVITY ANALYSIS OF NATIONAL FORESTRY PROGRAM AND FOREST LEASE MANAGEMENT AGREEMENT (NFP/FLMA) BY CONSIDERING HIGHER WEIGHTS ON SOCIO-ECONOMIC CRITERIA

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		2	2	2	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	2	4	4	1	1	1	1	-1	-1	-1	1	1
Fish Pond Operators	1	4	6	6	1	1	1	1	-1	-1	-1	2	2
Timber Licensees	1	4	6	6	1	1	1	1	-1	-1	-1	2	2
Indirect Users													
Municipal Community	1	4	4	4	1	1	1	1	-1	-1	-1	1	1
Regional/National Community	1	2	*	*	1	1	1	1	-1	-1	-1	1	1
Future Generations	1	*	*	*	-1	-1	-1	-1	-1	-1	-1	1	1
GOAL ACHIEVEMENT SCORE		16.0	20.0	20.0	4.0	4.0	4.0	4.0	-6.0	-6.0	-6.0	8.0	8.0
PERFECT GOAL SCORE		30.0	24.0	24.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		53.3	83.3	83.3	22.2	22.2	22.2	22.2	-33.3	-33.3	-33.3	44.4	44.4
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		106.7	166.7	166.7	22.2	22.2	22.2	22.2	-33.3	-33.3	-33.3	44.4	44.4
PROGRAM SUSTAINABILITY SCORE	517.8	PERFECT GOAL SCORE BASED ON WEIGHT						1500.0					
% SUSTAINABILITY	34.5												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.12 SENSITIVITY ANALYSIS OF COMMUNITY FORESTRY PROGRAM (CFP) BY CONSIDERING HIGHER WEIGHTS ON SOCIO-ECONOMIC CRITERIA

MANGROVE SUSTAINABLE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
GOALS/CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		2	2	2	1	1	1	1	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	2	6	6	1	1	1	1	1	3	1	3	2
Fish Pond Operators	1	*	*	*	*	*	*	*	-1	3	-1	-1	2
Timber Licensees	1	*	*	*	*	*	*	*	-1	3	-1	-1	2
Indirect Users													
Municipal Community	1	2	6	6	1	1	1	1	1	3	1	3	2
Regional/National Community	1	2	*	*	1	1	1	1	1	3	1	3	2
Future Generations	1	*	*	*	1	1	1	1	1	3	1	3	2
GOAL ACIEVEMENT SCORE		6.0	12.0	12.0	4.0	4.0	4.0	4.0	2.0	18.0	2.0	10.0	12.0
PERFECT GOAL SCORE		12.0	12.0	12.0	12.0	12.0	12.0	12.0	18.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		50.0	100.0	100.0	33.3	33.3	33.3	33.3	11.1	100.0	11.1	55.6	66.7
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	200.0	200.0	33.3	33.3	33.3	33.3	11.1	100.0	11.1	55.6	66.7
PROGRAM SUSTAINABILITY SCORE	877.8				PERFECT GOAL SCORE BASED ON WIEGHT			1500.0					
% SUSTAINABILITY	58.5												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.13 SENSITIVITY ANALYSIS OF INTEGRATED SOCIAL FORESTRY PROGRAM (ISFP) BY CONSIDERING HIGHER WEIGHTS ON ECOLOGICAL CRITERIA

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	2	2	2	2	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	3	3	3	6	6	6	6	3	3	3	3	3
Fish Pond Operators	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Timber Licensees	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Indirect Users													
Municipal Community	1	3	*	3	6	6	6	6	3	3	3	3	3
Regional/National Community	1	3	*	3	6	6	6	6	3	3	3	3	3
Future Generations	1	*	*	*	6	6	6	6	3	3	3	3	3
GOAL ACHIEVEMENT SCORE		9.0	3.0	9.0	24.0	24.0	24.0	24.0	12.0	18.0	10.0	10.0	18.0
PERFECT GOAL SCORE		9.0	3.0	9.0	24.0	24.0	24.0	24.0	12.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	55.6	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	100.0	100.0	200.0	200.0	200.0	200.0	100.0	100.0	55.6	55.6	100.0
PROGRAM SUSTAINABLITY SCORE	1511.1	PERFECT GOAL SCORE BASED ON WEIGHT						1600.0					
% SUSTAINABILITY	94.4												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.14 SENSITIVITY ANALYSIS OF FORESTRY SECTOR PROGRAM (FSP) BY CONSIDERING HIGHER WEIGHTS ON ECOLOGICAL CRITERIA

MANGROVE SUSTAINABLE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
GOALS/CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS --->		1	1	1	2	2	2	2	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	3	3	3	6	6	6	6	3	3	3	3	3
Fish Pond Operators	1	3	3	3	6	6	6	6	3	3	3	3	3
Timber Licensees	1	*	*	*	*	*	*	*	*	3	-1	-1	3
Indirect Users													
Municipal Community	1	3	3	3	6	6	6	6	3	3	3	3	3
Regional/National Community	1	3	*	3	6	6	6	6	3	3	3	3	3
Future Generations	1	*	*	*	6	6	6	6	3	3	3	3	3
GOAL ACHIEVEMENT SCORE		12.0	9.0	12.0	30.0	30.0	30.0	30.0	15.0	18.0	14.0	14.0	18.0
PERFECT GOAL SCORE		12.0	9.0	12.0	30.0	30.0	30.0	30.0	15.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8	77.8	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	100.0	100.0	200.0	200.0	200.0	200.0	100.0	100.0	77.8	77.8	100.0
PROGRAM SUSTAINABILITY SCORE	1555.6	PERFECT GOAL SCORE BASED ON WEIGTH						1600.0					
% SUSTAINABILITY	97.2												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.15 SENSITIVITY ANALYSIS OF NATIONAL FORESTRY PROGRAM AND FOREST LEASE MANAGEMENT AGREEMENT (NFP/FLMA) BY CONSIDERING HIGHER WEIGHTS ON ECOLOGICAL CRITERIA

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	2	2	2	2	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	1	2	2	2	2	2	2	-1	-1	-1	1	1
Fish Pond Operators	1	2	3	3	2	2	2	2	-1	-1	-1	2	2
Timber Licensees	1	2	3	3	2	2	2	2	-1	-1	-1	2	2
Indirect Users													
Municipal Community	1	2	2	2	2	2	2	2	-1	-1	-1	1	1
Regional/National Community	1	1	*	*	2	2	2	2	-1	-1	-1	1	1
Future Generations	1	*	*	*	-2	-2	-2	-2	-1	-1	-1	1	1
GOAL ACHIEVEMENT SCORE		8.0	10.0	10.0	8.0	8.0	8.0	8.0	-6.0	-6.0	-6.0	8.0	8.0
PERFECT GOAL SCORE		15.0	12.0	12.0	36.0	36.0	36.0	36.0	18.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		53.3	83.3	83.3	22.2	22.2	22.2	22.2	-33.3	-33.3	-33.3	44.4	44.4
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		53.3	83.3	83.3	44.4	44.4	44.4	44.4	-33.3	-33.3	-33.3	44.4	44.4
PROGRAM SUSTAINABILITY SCORE	386.7	PERFECT GOAL SCORE BASED ON WEIGHT			1600.0								
% SUSTAINABILITY	24.2												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.16 SENSITIVITY ANALYSIS OF COMMUNITY FORESTRY PROGRAM (CFP) BY CONSIDERING HIGHER WEIGHTS ON ECOLOGICAL CRITERIA

MANGROVE SUSTAINABLE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
GOALS/CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	2	2	2	2	1	1	1	1	1
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	1	3	3	2	2	2	2	1	3	1	3	2
Fish Pond Operators	1	*	*	*	*	*	*	*	-1	3	-1	-1	2
Timber Licensees	1	*	*	*	*	*	*	*	-1	3	-1	-1	2
Indirect Users													
Municipal Community	1	1	3	3	2	2	2	2	1	3	1	3	2
Regional/National Community	1	2	*	*	2	2	2	2	1	3	1	3	2
Future Generations	1	*	*	*	2	2	2	2	1	3	1	3	2
GOAL ACIEVEMENT SCORE		4.0	6.0	6.0	8.0	8.0	8.0	8.0	2.0	18.0	2.0	10.0	12.0
PERFECT GOAL SCORE		9.0	6.0	6.0	24.0	24.0	24.0	24.0	18.0	18.0	18.0	18.0	18.0
% GOAL ACHIEVEMENT		44.4	100.0	100.0	33.3	33.3	33.3	33.3	11.1	100.0	11.1	55.6	66.7
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		44.4	100.0	100.0	66.7	66.7	66.7	66.7	11.1	100.0	11.1	55.6	66.7
PROGRAM SUSTAINABILITY SCORE	755.6	PERFECT GOAL SCORE BASED ON WIEGHT						1600.0					
% SUSTAINABILITY	47.2												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.17 SENSITIVITY ANALYSIS OF INTEGRATED SOCIAL FORESTRY PROGRAM (ISFP) BY CONSIDERING HIGHER WEIGHTS ON INSTITUTIONAL CRITERIA

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	1	1	1	1	2	2	2	2	2
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	3	3	3	3	3	3	3	6	6	6	6	6
Fish Pond Operators	1	*	*	*	*	*	*	*	*	6	-2	-2	6
Timber Licensees	1	*	*	*	*	*	*	*	*	6	-2	-2	6
Indirect Users													
Municipal Community	1	3	*	3	3	3	3	3	6	6	6	6	6
Regional/National Community	1	3	*	3	3	3	3	3	6	6	6	6	6
Future Generations	1	*	*	*	3	3	3	3	6	6	6	6	6
GOAL ACHIEVEMENT SCORE		9.0	3.0	9.0	12.0	12.0	12.0	12.0	24.0	36.0	20.0	20.0	36.0
PERFECT GOAL SCORE		9.0	3.0	9.0	12.0	12.0	12.0	12.0	24.0	36.0	36.0	36.0	36.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	55.6	100.0
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	100.0	100.0	100.0	100.0	100.0	100.0	200.0	200.0	111.1	111.1	200.0
PROGRAM SUSTAINABLITY SCORE	1522.2	PERFECT GOAL SCORE BASED ON WEIGHT						1700.0					
% SUSTAINABILITY	89.5												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.18 SENSITIVITY ANALYSIS OF FORESTRY SECTOR PROGRAM (FSP) BY CONSIDERING HIGHER WEIGHTS ON INSTITUTIONAL CRITERIA

MANGROVE SUSTAINABLE DEVELOPMENT GOALS/CRITERIA ----->		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS --->		1	1	1	1	1	1	1	2	2	2	2	2
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	3	3	3	3	3	3	3	6	6	6	6	6
Fish Pond Operators	1	3	3	3	3	3	3	3	6	6	6	6	6
Timber Licensees	1	*	*	*	*	*	*	*	*	6	-2	-2	6
Indirect Users													
Municipal Community	1	3	3	3	3	3	3	3	6	6	6	6	6
Regional/National Community	1	3	*	3	3	3	3	3	6	6	6	6	6
Future Generations	1	*	*	*	3	3	3	3	6	6	6	6	6
GOAL ACHIEVEMENT SCORE		12.0	9.0	12.0	15.0	15.0	15.0	15.0	30.0	36.0	28.0	28.0	36.0
PERFECT GOAL SCORE		12.0	9.0	12.0	15.0	15.0	15.0	15.0	30.0	36.0	36.0	38.0	38.0
% GOAL ACHIEVEMENT		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8	73.7	94.7
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		100.0	100.0	100.0	100.0	100.0	100.0	100.0	200.0	200.0	155.6	147.4	189.5
PROGRAM SUSTAINABILITY SCORE	1592.4	PERFECT GOAL SCORE BASED ON WEIGTH 1700.0											
% SUSTAINABILITY	93.7												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.19 SENSITIVITY ANALYSIS OF NATIONAL FORESTRY PROGRAM AND FOREST LEASE MANAGEMENT AGREEMENT (NFP/FLMA) BY CONSIDERING HIGHER WEIGHTS ON INSTITUTIONAL CRITERIA

SUSTAINABLE MANGROVE DEVELOPMENT		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
CRITERIA ----->		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	1	1	1	1	2	2	2	2	2
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	1	2	2	1	1	1	1	-2	-2	-2	2	2
Fish Pond Operators	1	2	3	3	1	1	1	1	-2	-2	-2	4	4
Timber Licensees	1	2	3	3	1	1	1	1	-2	-2	-2	4	4
Indirect Users													
Municipal Community	1	2	2	2	1	1	1	1	-2	-2	-2	2	2
Regional/National Community	1	1	*	*	1	1	1	1	-2	-2	-2	2	2
Future Generations	1	*	*	*	-1	-1	-1	-1	-2	-2	-2	2	2
GOAL ACHIEVEMENT SCORE		8.0	10.0	10.0	4.0	4.0	4.0	4.0	-12.0	-12.0	-12.0	16.0	16.0
PERFECT GOAL SCORE		15.0	12.0	12.0	18.0	18.0	18.0	18.0	36.0	36.0	36.0	36.0	36.0
% GOAL ACHIEVEMENT		53.3	83.3	83.3	22.2	22.2	22.2	22.2	-33.3	-33.3	-33.3	44.4	44.4
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		53.3	83.3	83.3	22.2	22.2	22.2	22.2	-66.7	-66.7	-66.7	88.9	88.9
PROGRAM SUSTAINABILITY SCORE	286.7	PERFECT GOAL SCORE BASED ON WEIGHT						1700.0					
% SUSTAINABILITY	16.9												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development

Table 6.20 SENSITIVITY ANALYSIS OF COMMUNITY FORESTRY PROGRAM (CFP) BY CONSIDERING HIGHER WEIGHTS ON INSTITUTIONAL CRITERIA

MANGROVE SUSTAINABLE DEVELOPMENT GOALS/CRITERIA ----->		SOCIO-ECONOMIC			ECOLOGICAL				INSTITUTIONAL				
		1	2	3	4	5	6	7	8	9	10	11	12
WEIGHTS ----->		1	1	1	1	1	1	1	2	2	2	2	2
RESOURCE USERS	WEIGHTS												
Direct Users													
Coastal Communities	1	1	3	3	1	1	1	1	2	6	2	6	4
Fish Pond Operators	1	*	*	*	*	*	*	*	-2	6	-2	-2	4
Timber Licensees	1	*	*	*	*	*	*	*	-2	6	-2	-2	4
Indirect Users													
Municipal Community	1	1	3	3	1	1	1	1	2	6	2	6	4
Regional/National Community	1	2	*	*	1	1	1	1	2	6	2	6	4
Future Generations	1	*	*	*	1	1	1	1	2	6	2	6	4
GOAL ACIEVEMENT SCORE		4.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	36.0	4.0	20.0	24.0
PERFECT GOAL SCORE		9.0	6.0	6.0	12.0	12.0	12.0	12.0	36.0	36.0	36.0	36.0	36.0
% GOAL ACHIEVEMENT		44.4	100.0	100.0	33.3	33.3	33.3	33.3	11.1	100.0	11.1	55.6	66.7
GOAL ACHIEVEMENT SCORE BASED ON WEIGHTS		44.4	100.0	100.0	33.3	33.3	33.3	33.3	22.2	200.0	22.2	111.1	133.3
PROGRAM SUSTAINABILITY SCORE	866.7	PERFECT GOAL SCORE BASED ON WIEGHT 1700.0											
% SUSTAINABILITY	51.0												

Legend:

IMPACT SCALES

3 - highly satisfied
2 - moderately satisfied
1 - fairly satisfied
* - not applicable
-1 - dissatisfied

SUSTAINABLE MANGROVE DEVELOPMENT CRITERIA

1 - increased income earning opportunity and basic social services
2 - reformed resource access rights
3 - increased people's involvement in planning and decision-making
4 - maintenance of extensive mangrove area and structural pattern
5 - maintenance of diversity and species composition
6 - maintenance of organic matter and sediment accretion
7 - maintenance of community organization and species composition
8 - increased individuals' inclination in protecting human and the mangroves
9 - increased individuals' perception on the importance of mangroves
10 - confronting both human needs and ecological needs in planning and decision making
11 - devolution of mangrove management responsibilities to local communities
12 - increased commitment and coordination of concerned individuals and agencies in mangrove sustainable development