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Socio-ecological Case Studies on Forest Lands Cultivation in Leyte, Philippines

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IN DEN TROPEN UND SUBTROPEN
UNIVERSITÄT HOHENHEIM
Fachgebiet Agrarökologie der Tropen und Subtropen
Prof. Dr. Werner Koch

und dem

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DES AGRARBEREICHS
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Socio-ecological case studies on forest lands cultivation in Leyte, Philippines

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TABLE OF CONTENTS

	Contents	Page

Contents		Page

LIST OF TABLES

Number	Title	Page

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

A&D	Alienable or Disposable Lands
BFD	Bureau of Forest Development (currently the FMS)
BIS	Barangay Information Sheet
BL	Bureau of Lands (currently the LMS);
BSWM	Bureau of Soils and Water Management of DA
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
EDPC	Electronic Data Processing Center of ViSCA;
ERD-MO	Environmental Research Division of the Manila Observatory
FAO	Food and Agriculture Organization
FFCIS	Forest Farm Characteristics Information Sheet
FIS	Farmer Information Sheet
FLC	Forest land cultivator
FOSAM	Forest Stewards Association of Mahaplag
GIS	Geographic Information System of the Tropical Ecology Program, Department of Agronomy and Soil Science, ViSCA,
HH	Household
HIS	Household Information Sheet
ISFP	(Philippine) Integrated Social Forestry Project
ISFPAL	Information Sheet on Farm Production in A&D Lands
KACSP	Kauswagan Agricultural Cooperative Settlement Project
KKK	*Kilusang Kabuhayan at Kaunlaran*

KKK-NLSF	*Kilusang Kabuhayan at Kaunlaran* - National Livelihood Support Fund
LMS	Lands Management Service of DENR
LOI	Letter of Instructions (from the Philippine President)
LSBDA	Leyte Sab-a Basin Development Authority
LSP	Leyte Settlement Project
MA	Municipal Assessor
MAO	Municipal Agriculture Office
MARO	Municipal Agrarian Reform Officer
MPDC	Municipal Planning and Development Coordinator
NCSO	National Census and Statistics Office
NEDA	National Economic Development Authority
NLSF	National Livelihood Support Fund
NRDC	Natural Resources Development Corporation
NSCB	National Statistical Coordination Board
PAG-ASA	Philippine Atmospherical, Geo-physical and Astronomical Services Administration
PRCRTC	Philippine Root Crops Research and Training Center
SLSP	Southern Leyte Settlement Project
Str. 1	Vegetational Stratum 1 (0-1 m. above ground level)
Str. 2	Vegetational Stratum 2 (1-2 m. above ground level)
Str. 3	Vegetational Stratum 3 (2-6 m. above ground level)
Str. 4	Vegetational Stratum 4 (more than 6 m. above ground level)
TLA	Timber License Agreement
TPMC	Timber Producers and Marketing Corporation
ViSCA	Visayas State College of Agriculture

1 INTRODUCTION

1.1 Statement of the Problem

> Rain forests have crossed a threshhold of perception. No week passes without a new report on television, radio or in the press of another piece of destruction, or a new message of gloom for the planet. The public is left in no doubt that something nasty is happening down on the Equator. Man's present-day impact on tropical rain forests is, however, just the last stanza of a saga stretching back into the past beyond the beginning of written history.

Thus characterized WHITMORE (1990) the growing human concern for a stable and sustainable environment. Forests, particularly tropical rain forests, have been recognized as a major component for the maintenance of climatic conditions, for the preservation of plant and animal species, and for the prevention of the impoverishment of human societies (WHITMORE 1990). And, the reported rates of removal of forest products and of forest land conversion make such concerns genuinely well-founded.

For example, the Food and Agriculture Organization (FAO) reported that in 1980 the world's remaining tropical forests covered an estimated 1,935 mi. ha., and predicted that for the period 1981 to 1985 this would be reduced by 11.3 mi. ha. per year (LANLY 1982). In the 1990 assessment (FAO 1993), the forest cover estimate for 1980 was further adjusted to 1,910 mi. ha. while reporting that the world's tropical forest cover had been reduced to 1,756 mi. ha., reflecting an even higher rate of forest loss--15.4 mi. ha. per year from 1981 to 1990 (Table 1).

For its part, the Philippines was reported by LANLY (1982) as having 9.32 mi. ha. of forest cover in 1980. The national rate of forest destruction was projected to be 1.1% per year for the period 1981-1985. By 1990, Philippine forest cover was down to 7.83 mi. ha. (FAO 1993), representing an actually higher forest destruction rate of 3.3% per year (Table 1).

The situation in the Leyte island group, composed of the Biliran islands, the Leyte mainland and the Pana-on islands (Figure 1), would present an even grimmer scenario. Based on data obtained during the 1987 inventory of Philippine forest resources, the Leyte island group had a forest cover of 93,000 ha., representing 12%

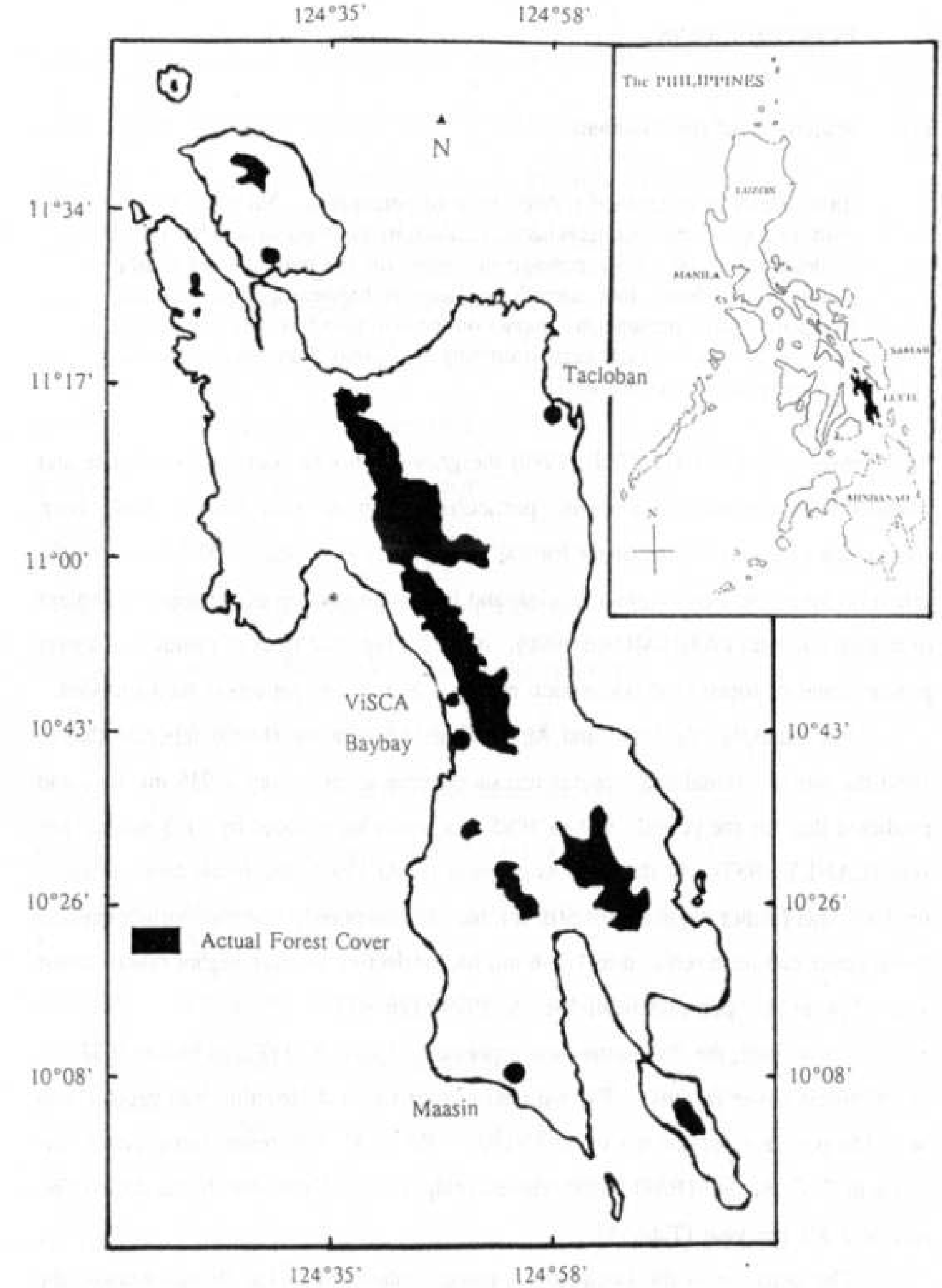

Figure 1. Map of the Leyte island group showing remaining forest cover (Adapted from maps generated by the Geographic Information System of the Tropical Ecology Program, DASS, ViSCA)

of the total land area or 35% of the forest land area (ACOSTA 1991; Table 1; Appendix Tables 1.1 & 1.2). Comparing these inventory results to similar data gathered in 1969, ACOSTA (1991) reported higher than the pantropical and the national rates of forest conversion--3.7% annually for the northern part of Leyte mainland and the Biliran islands, and 4.3% for the southern part and the Pana-on islands. And in relation to the 1939 inventory, the Leyte island group lost 242,000 ha. or 72% of its forest cover.

Table 1. Status of the forest cover in the tropics, the Philippines and the Leyte island group

Location	Total area ('000 ha.)	Actual forest cover in 1980 ('000 ha.)	Actual forest cover in 1990 ('000 ha.)	Rate of forest loss for 1981-90 (in %)
Tropics	4,778,347	1,935,000	1,756,299	0.8
Philippines	29,817	9,320	7,831	3.3
Leyte island group	800	n.d.	93	n.d.

n.d. - no data available

Sources: LANLY 1982
ACOSTA 1991
FAO 1993

As of 1985, the Bureau of Forest Development (BFD 1986) designated 217,500 ha. of Leyte mainland as Timberlands, Forest and Watershed Reserves, and National Parks, Game Refuge and Wilderness Areas (Table 2; Appendix Table 2.1). Data collated by the Environmental Research Division of the Manila Observatory (ERD-MO 1991), on the other hand, revealed that in 1990 only 39.9% of the mainland's forest lands actually had forest cover; the rest were already cultivated or under other forms of land use. Islândwide, this represented a forest cover of only 12.1% (Figure 2). This would stand in strong contrast to the 1972 estimated forest cover of 87% of forest lands based on an inventory of 104,187 ha. (YAMBOT 1975; Appendix Table 1.3).

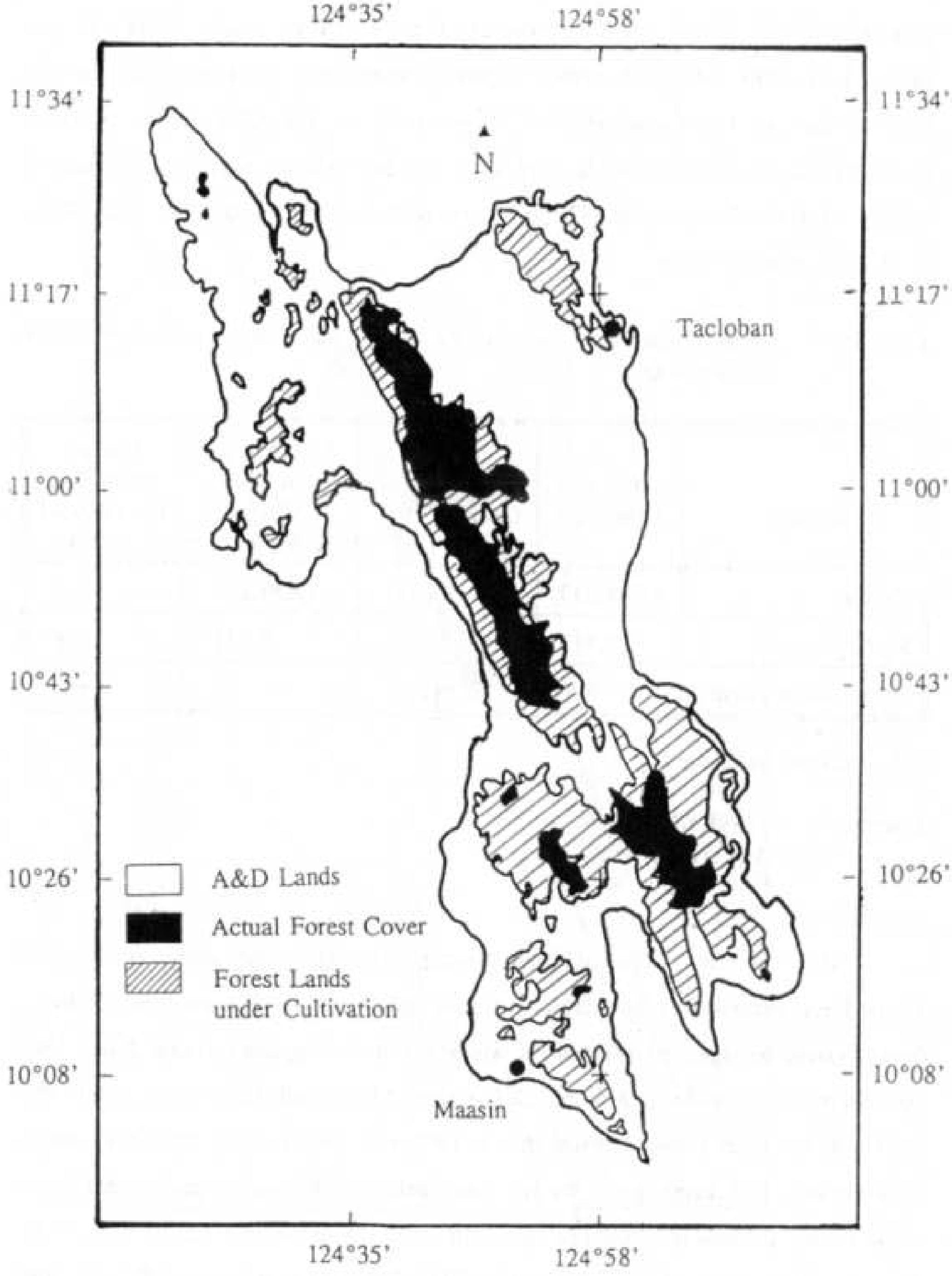

Figure 2. Map of Leyte mainland showing forest lands and actual forest cover (Adapted from maps generated by GIS)

Table 2. Information about the forests of Leyte mainland

Characteristic	Area (ha.)	% of total land area	% of forest land area
Total land area	719,800	100.0	
Area of forest lands (as of 1985-92)	217,500	30.2	100.0
Area of actual forest cover (as of 1990)	86,800	12.1	39.9
Area of cultivated forest lands (as of 1990)	130,700	18.2	60.1

Sources: BFD 1986
ERD-MO 1991

ACOSTA (1991) attributed the loss of the islands' forests to the conversion of timberlands into *kaingin* (see section 1.4 Definition of Terms), into commercial agricultural use (e.g. grazing) and into non-forest plantations (e.g. coconut [***Cocos nucifera* L.**] and abaca [***Musa textilis* Née**]), and to the destructive practices of both legal and illegal loggers. Blaming the *kaingineros* (see section 1.4 Definition of Terms) for Leyte's deforestation is, however, "onerous because it picks on the last segment of a chain of events that cause the destruction of the forest and in effect puts the blame on the victims of resource-deprivation caused by bad social policies" (Kalaw as quoted by VITUG 1993). The major identifiable factor which led to the loss of Leyte's forests remains to be the logging operations from the 1960s to the early 1970s, and which resumed in 1986-89. Undoubtedly, however, the production activities of the people who came after these operations have contributed to the conversion of forests to agricultural uses. And as farmers' actions would, to a great extent, determine the pattern of land use which would be manifested within forest lands, the search for solutions to the problem of forest destruction would definitely involve a better understanding of their relevant forms of interference on the forest ecosystem.

1.2 Conceptual Framework

1.2.1 Shifting Cultivation as a Form of Agroecosystem Establishment

Rain forests represent the most persistent form of natural vegetation in the humid tropics. They are complex and intricately designed ecosystems which "persist despite periodic environmental disturbances or perturbations ... by means of ... an orderly progression in the species composition and structure of the ecosystem known as *succession*" (MARTEN 1984). Pertaining to the disturbances or modifications introduced by humans, MARTEN (1984) characterized the transformations to wit: A mature tropical rain forest when cleared and cultivated becomes an agricultural field (an agroecosystem). When the field is abandoned, it reverts to a secondary growth forest which later develops into a mature forest. But when subjected to further cultivation (especially with the use of fire), the field goes through the grassland stage before reverting to the secondary and finally the mature forest stages.

The establishment of an agroecosystem, as exemplified by clearing and cultivation, is primarily intended to serve human needs for agricultural products (KOCH et al. 1990). Once established, the agroecosystem is then geared towards the attainment of high crop yields. Stability, which may only be maintained in special and exceptional cases and only within short periods, usually assumes a subordinate role to the objective of producing outputs with immediate economic value. As RUTHENBERG (1980) pointed out:

> "Outputs [of most ecological systems untouched by humans] are to a minor degree economic (e.g. game) but mostly non-economic (e.g. water joining groundwater). Natural systems, however, are unproductive in terms of human objectives. The basic principle of farming is to change the natural system into one which produces more of the goods desired by [humans]. The man-made system is an artificial construction which requires economic inputs obtained from the environment to maintain its output level. Farming thus implies the abolition of an unproductive 'steady state' in favor of a man-created, more productive but unstable 'state'..."

Conceptually, therefore, the natural ecosystem and the socio-economic system could be seen to comprise two poles of a charged environment wherein the manifested utilization pattern represents the resultant influence of one pole over the other (KOCH et al. 1990; Figure 3). In this model, clearing and cultivation represent greater influence of the socio-economic system and pull the agricultural production system into a highly disturbed or even into an open, high input state. Succession, on the other hand, represents stronger ecosystem influence, and returns the environment into a less disturbed or a closed, low input state. In between this range are arrayed various patterns of land uses reflecting varying levels of ecosystem disturbance.

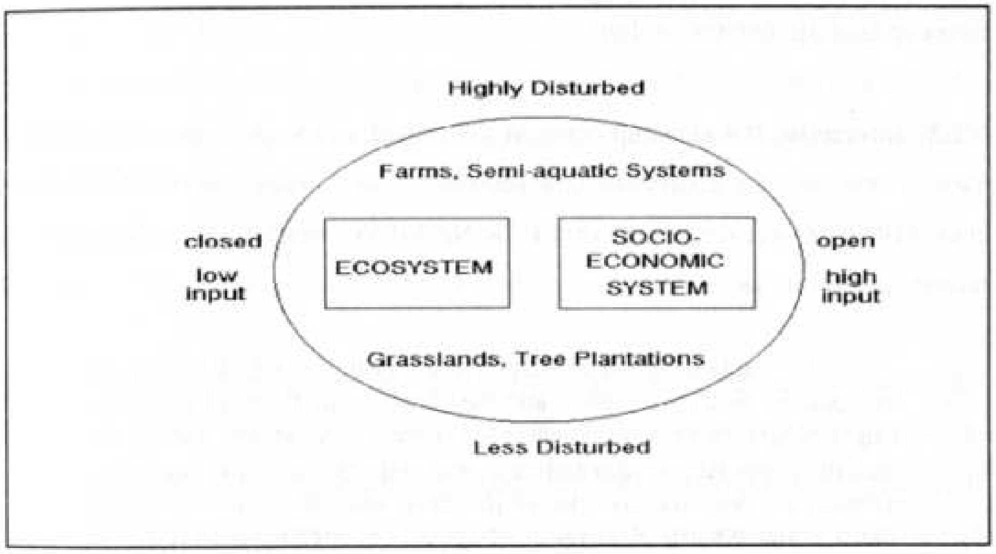

Figure 3. Schematic representation of the interactive relationship between the ecosystem and the socio-economic system whose outcome is manifested as the observable agricultural production system (Translated from KOCH et al. 1990)

Traditional shifting cultivation, with all its variations in form and name, is recognized as a sustainable low-input production system. As WHITMORE (1990) surmised, it "can continue indefinitely on the infertile soils underlying most tropical rain forests ..., provided the carrying capacity of the land is not exceeded." For it to be sustainable, cultivation should not be too long, the bush fallow not too short, and the extraction of bio-mass not too depleting of ecosystem nutrients. It is characterized as a low-input system because most of its inputs come in the form of energy, with very little coming into the system in the form of materials. Except for solar radiation, the application of such production inputs as labor, machines and fertilizers and herbicides remains at a low level mainly due to the beneficial effects of burning which is a characteristic of traditional shifting cultivation.

Under these conditions, the interactive influences of the ecosystem and the socio-economic system remain in cyclical equilibrium. Unsustainability sets in when the socio-economic system exerts undue influence over the ecosystem and subdues the elements and processes which maintain this equilibrium. And in Leyte, this is manifested by the loss of 163,000 ha. of the islands' forest lands to cultivation or other forms of land use (ACOSTA 1991).

1.2.2 Interactive Relationship between Ecosystem and Socio-economic System

Viewed over time, the ecosystem-socio-economic system interaction model of KOCH et al. (1990) fits the description of GUTKIND (1956) regarding the relationship of humans and nature as:

> "... the twin agents of the perennial revolution which shapes and reshapes the face of the earth and the character of [human] activities. This struggle, at times violent and sporadic, at others gentle and consistent, but forever demanding a new response to a new challenge, activates the potential energies of [humans] and nature, molding them into a grand pattern of advance or retreat, of creative interaction or disastrous antagonism, and of promise or failure."

GUTKIND (1956) further posited that the synoptic view to such revolutionary relationship "demands the appreciation of the whole nexus of relations in every detail and of the creative potentiality of every detail within the whole." He called this field of study "social ecology" to "include those branches of the social and natural sciences which have more or less direct bearing upon the role of man in reforming his habitat."

Social ecology, probably a direct translation of the German word *Sozialökologie*, is more commonly refered to as human ecology (e.g. FRIEDRICHS 1978; HAMM 1986). Initially applied by PARK, BURGESS & MACKENZIE (1925) to the study of cities (see also BHARADWAJ 1992), the human ecology perspective has been applied to "the study of human interactions with tropical agroecosystems in Southeast Asia"

(RAMBO & SAJISE 1984).

Proponents of the application of the human ecology analytical framework, nonetheless, recognize that the specialized study of the different ecosystem components has led physical, biological and social scientists into the narrow foci of their respective subject matters and to the compartmentalization of information when looking at situations experienced by farmers. In effect, human ecology, aside from being a conceptual perspective for "the study of relations between people and the natural world" has become a framework to help scientists see how their specialized fields are interrelated (RAMBO & SAJISE 1984). Its major features are that "(1) it employs a systems viewpoint on both human society and nature, and (2) it describes both the internal behaviour of ecosystems and social systems and their interactions with each other in terms of flows or transfers of energy, materials and information. It is, moreover, concerned with understanding (3) the organization of systems into networks and hierarchies, and (4) the dynamics of systems change."

The systems model being adopted for the human ecology perspective makes the framework compatible with the specialist orientation of scientists (RAMBO 1984). It does not preclude, however, the deconstruction of the socio-economic system-ecosystem dichotomy so that components and interactions of both systems could be examined within the context of the situation at hand and not within the framework of defined paradigms. As BOUDON & BORRICAND (1989) propounded, "[n]otions of systems and environment correspond to distinctions of conventions, rather than substantive difference. . . [T]he line between system and environment is decided for each particular case in view of the problem faced and begins accordingly to the level of analysis required."

By doing away with the socio-economic system-ecosystem dichotomy, the agroecological world view expounded by NORGAARD (1987) and the socio-ecosystems view described by DARGANTES (1993), two views which reflect disciplinary biases of the same reality, could be combined to focus on what GUTKIND (1956) described as the "systematic selection of the really instrumental forces which shape [human] social aspirations and transform [their] environment accordingly."

Under this unified socio-ecological perspective, the relevant components and interactions of a given problem occuring within a specified ecological space and time could hopefully be identified and defined at the required level of analysis without the distortion that may be occassioned by specialization. And the application of the model of KOCH et al. (1990) to the phenomenon of forest land cultivation not only points out the important elements and relevant interactions but also shows the resultant indicators of such interactions, namely: the various patterns of manifested land uses.

1.3 Objectives of the Study

The primary interest of this study is to understand the processes involved in the conversion of forest lands into agricultural uses, in order to identify ways to minimize their impact while pursuing the goal of forest restoration and preservation. More specifically, this study intends:

1. to identify the factors contributing or leading to the cultivation of forest lands and the processes involved in the initial stages of forest land cultivation; and
2. to identify the factors associated with the land use practices being implemented in forest lands and the changes that have occured in these cultivation practices.

1.4 Definition of terms

In the Philippines, some terms related to the environment are defined by law. The following definitions have been adapted from the Philippine Forestry Statistics released by BFD (1985).

Alienable or Disposable (A&D) Lands - public lands which have been classified and declared as not needed for forest purposes.

Forest - land of one hectare or more which is at least ten percent stocked with forest trees including seedlings and saplings, wild palm, bamboo or brush; provided that narrow strips having such vegetation are at least 60 m. wide and one hectare in size.

Forest Lands - public lands which have not been declared as A&D and which include the public forest, the permanent forest or forest reserves, forest reservations, timberlands, grazing lands, game refuge and bird sanctuaries.

Forest Reservations - forest lands which have been reserved by the Philippine President for specific purposes.

Kaingin - a portion of the forest land which is subjected to shifting and/or permanent slash-and-burn cultivation having little or no provision to prevent soil erosion.

Kainginero - a person who practices ***kaingin*** as a method of land cultivation.

Permanent Forest or Forest Reserve - public lands which have been classified and declared as needed for forest purposes.

Public forest - public lands which have not been classified to determine which lands are needed for forest purposes and which are not.

Timberland - public land which has been classified and determined to be needed for forest purposes, and which eventually will be proclaimed as forest reserves by the President.

2 MATERIALS AND METHODS

2.1 Selection of Study Sites

2.1.1 Identification of Municipalities with Jurisdiction over Forest Lands

This study covered the mainland of Leyte. The initial tasks involved determining the location of the forest lands and the remaining forest cover, and identifying the towns and cities with territorial jurisdiction over forest lands. The sources of information for this activity included:

1) land classification and forest cover maps of the Leyte island group from the Geographic Information System (GIS) of the Tropical Ecology Program of the Department of Agronomy and Soil Science of ViSCA,
2) a land classification map from the Lands Management Service (LMS) of the Department of Environment and Natural Resources (DENR) in Region 8,
3) the 1990 Leyte Island Drainage Pattern and Forest Cover Map prepared by the ERD-MO,
4) base maps of Leyte showing the boundaries between municipalities (one from the GIS and another from the LMS), and
5) documents from the DENR Region 8, particularly the 1986 Annual Report of the BFD, which provided data on the different land classification inventories for each municipality.

Based on this activity, 48 cities/municipalities were identified as having jurisdiction over forest lands. Figure 4 shows the location of the identified cities and municipalities (Appendix Table 2.1).

2.1.2 Selection of Study Villages

Each of the 48 cities/municipalities were visited to obtain the names of the villages having territorial jurisdiction over forest lands. Assistance in accessing these data were requested from the municipal mayors. In many cases, the data were available from the municipal development plans prepared by the office of the Municipal Planning and Development Coordinator (MPDC). For other towns, the needed information was

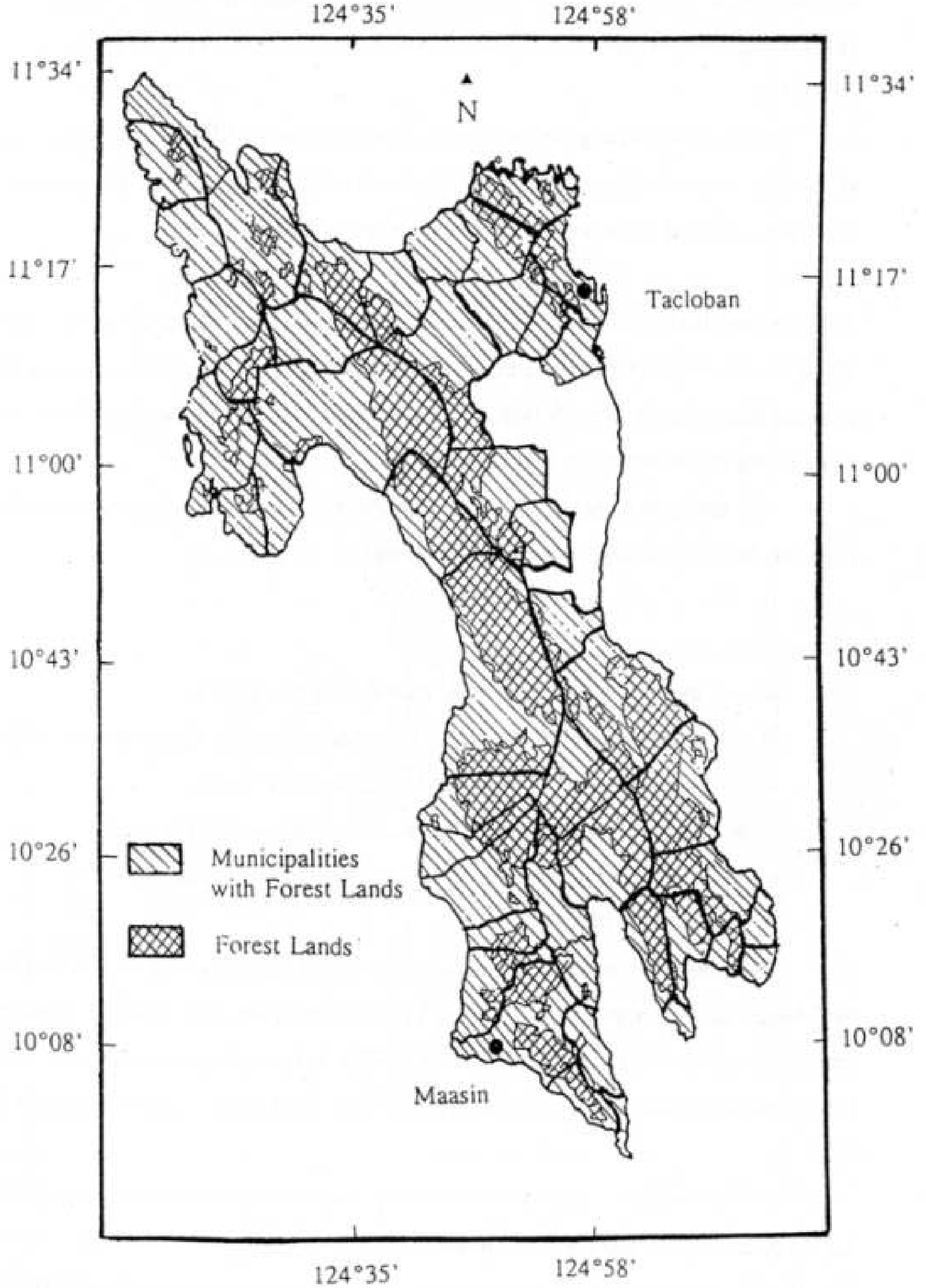

Figure 4. Map of Leyte mainland showing forest lands and the boundaries of the cities and municipalities with jurisdiction over forest lands (Adapted from maps generated by GIS)

extracted from index maps available at the office of the Municipal Assessor (MA) for the taxation of landholdings. In municipalities with agrarian reform projects in forest lands, supplementary data were obtained from the Municipal Agrarian Reform Officers (MAROs).

After consolidating the data from all these sources, 529 villages were identified as having territorial jurisdiction over forest lands. Some municipal governments, however, retained jurisdiction over portions of forest lands.

The 529 identified villages with territorial jurisdiction over forest lands were listed in alphabetical order and numbered consecutively. From these, 16 were randomly selected from the list using a table of random numbers. The locations of the selected study villages are shown in Figure 5.

The decision to select 16 study villages was based on computations using the equation for sample size determination, namely:

$$n = Nz^2s^2/Nd^2+z^2s^2$$

where:

- n = number of villages to be included in the survey,
- N = total number of villages with jurisdiction over forest lands (=529),
- z = coefficient at 95% level of reliability (= 1.96),
- s^2 = sample variance of the normal variable (=432.27), and
- d = error level expressed in units of the normal variable (=10).

The sample variance was computed using the number of forest land cultivators per village as the normal variable. Data for this variable were collated from studies conducted by TABADA & ESCASINAS (1993) in four villages of Bontoc, Southern Leyte, and by DAGOY et al. (1994) in four villages of Baybay, Leyte (Appendix Table 2.2).

2.1.3 Selection of Survey Respondents

The 16 villages were visited and the forest claimants and/or cultivators in each were identified with the help of village officials and other residents. Where a piece of forest

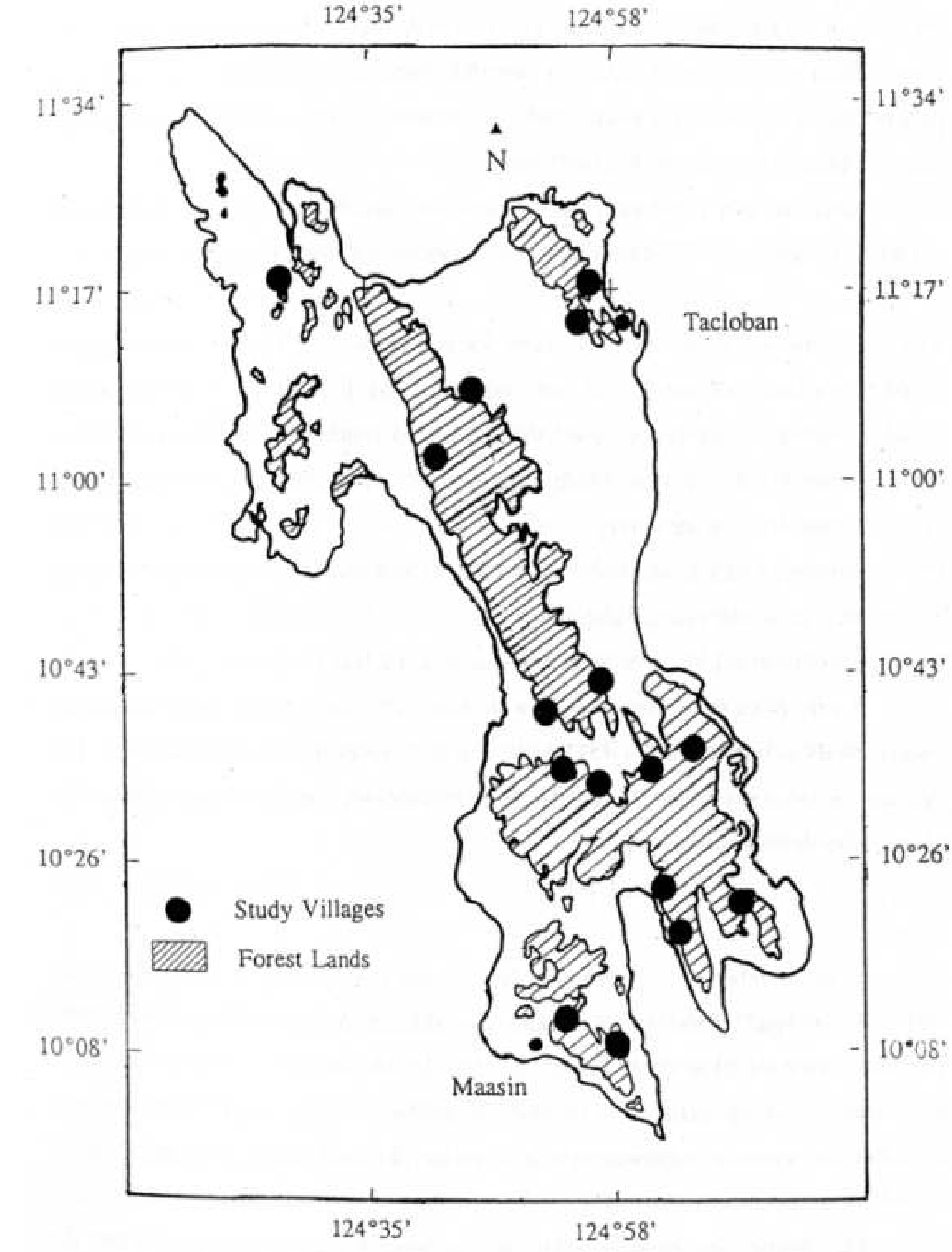

Figure 5. Map of Leyte mainland showing forest lands and the location of the study villages (Adapted from maps generated by GIS)

land was cultivated by somebody but claimed by another (e.g. an absentee claimant), the name of the cultivator was the one included in the list. When the prevailing tenure system for a piece of forest land was complex, inclusion in the list was based on a person's actual involvement in current farm operations. Thus, more than one person could be listed for a parcel of forest land.

Based on this procedure, 14 villages were identified as having forest land cultivators. All in all, 751 forest land cultivators were listed (Appendix Table 2.3).

There were two sets of survey respondents for this study. The first set was composed of 69 forest land cultivators who were present at the time of the first visit to the village. They were interviewed using the Farmer Information Sheet (FIS) in order to:

1. come up with a data set which could be used as inputs for the compution of the sample size for the survey;
2. come up with a general idea of forest land cultivation practices which may be peculiar to the village; and,
3. to establish initial contacts with forest land cultivators.

For the other set, 44 respondents were randomly selected from the consolidated, consecutively-numbered list of 751 forest land cultivators from the 14 villages. The decision to randomly select 44 forest land cultivators was based on the equation for sample size determination:

$$n = Nz^2s^2/Nd^2+z^2s^2$$

where:

n = number of respondents to be included in the survey,

N = total number of forest land cultivators in the list (=751),

z = coefficient at 95% level of reliability (= 1.96),

s^2 = sample variance of the normal variable (=12.25), and

d = error level expressed in units of the normal variable (=1 ha.).

The sample variance used in this equation was obtained using aggregate size (in ha.) of forest farms per cultivator as the normal variable. The data set came from the results of the interviews of the 69 non-randomly selected forest land cultivators

(Appendix Table 2.4).

Of the 44 randomly-selected respondents, only 31 were actually interviewed because six had migrated outside of Leyte, two had temporarily left the village to participate in lowland rice harvests, and five declined the interview or refused to be interviewed. No substitutes were identified to replace these respondents. Instead, inquiries into the aforementioned phenomena were undertaken and the results are discussed in section 2.2.1 Protocol of Appendix 2.

2.1.4 Selection of Case Study Households and Forest Farms

Of the 31 survey respondents, 12 were requested to allow the researcher to make more detailed observations of their farms and to conduct in-depth interviews with other household members, or if applicable, with other persons engaged in the cultivation of their forest farm parcels. Their selection was based on the following characteristics:

1. the implementation of such stages in the shifting cultivation cycle as land clearing, cropping and fallowing within at least one of the respondent's forest farms; and,
2. the type of land tenure system or relations being observed by the case study household in the management of any of their forest farms.

2.2 Data Collection

2.2.1 Protocol

Realizing that some of the data pertaining to the cultivation of forest lands could have sensitive legal (e.g. legality of the cultivation of lands within forest reservations and national parks), political (e.g. implementation of land distribution programs), and administrative (e.g. taxation of forest land claims) implications, officials of concerned local governments--municipal mayors and village chairpersons--and representatives of the various agencies involved as data sources were visited and appraised of the:

1) general concept of the study,
2) objectives of the study, and

3) data collection methods.

2.2.2 Collection of Secondary Data pertaining to Leyte Mainland

A preliminary aspect of this study involved the collection of the following data pertaining to Leyte mainland:

1. physical characteristics;
2. social, political and demographic characteristics;
3. economic conditions; and,
4. projects and activities involving forest lands.

The sources of data included:

1. for land area, terrain and elevation - the Philippine Almanac & Handbook of Facts (YAMBOT 1975), the report of BARRERA et al. (1954), and reports and data compiled by the erstwhile BFD (now known as the Forest Management Service or FMS) and Bureau of Lands (BL now known as LMS);
2. for climatic phenomena - the data bases of the Philippine Atmospherical, Geo-physical and Astronomical Services Administration (PAG-ASA) which were available from the Electronic Data Processing Center (EDPC) of ViSCA;
3. for soil characteristics, typology and classification - soil maps from the Bureau of Soils and Water Management (BSWM) of the Department of Agriculture (DA) and the GIS, and the report of BARRERA et al. (1954);
4. for land classification and land use - land classification maps from the LMS and the GIS, the Philippine Almanac & Handbook of Facts (YAMBOT 1975), the report of BARRERA et al. (1954), the Leyte Island Drainage Pattern and Forest Cover Map from the ERD-MO (1990), and the data compiled by the National Statistical Coordination Board (NSCB 1992);
5. for population distribution - reports from the National Census and Statistics Office (NCSO) and the data compiled by the NSCB and the National Economic Development Authority (NEDA); and,
6. for major sources of income and income levels - data compiled by the NEDA and the NSCB.

2.2.3 Collection of Data pertaining to the Study Villages

An instrument, named Barangay Information Sheet, was formulated to obtain the following information from each village:

- population for the years 1975, 1980 and 1990;
- land area of the various land classes and land uses;
- accessibility in relation to the town center and to the market center;
- number of forest land claimants or cultivators.

These information were obtained through:

- review of existing village records;
- review of existing municipal records and interviews with the personnel of the MPDC, the MA, the MARO and the municipal agriculture office (MAO);
- panel and individual interviews of key informants composed of the village chairperson and members of the village council, pioneer settlers and old residents, and other community leaders; and,
- personal observations.

2.2.4 Development of Survey Instruments

Four survey instruments were formulated for use in interviewing the forest land cultivators. These were named the Farmer Information Sheet (FIS), the Household Information Sheet (HIS), the Forest Farm Characteristics Information Sheet (FFCIS) and the Information Sheet on Farm Production in A&D Lands (ISFPAL). The FIS, HIS and ISFPAL were formulated in Cebuano because this was the language used in northwestern and southern Leyte, and this was found to be spoken even by the *Waray* farmers in northeastern Leyte when talking to Cebuano speakers. Meanwhile, the FFCIS was in English because most of the data were obtained through direct observation or through in-depth unstructured interviews. The survey instruments were field tested among forest land cultivators living near ViSCA for: a) appropriateness of terms used; b) respondents' sensitivity to specific questions; c) appropriateness of the sequence of questions; and d) comprehensiveness of the instruments.

The FIS obtained data on the:

- location of each forest farm parcel;
- area of each forest farm parcel;
- reasons for selecting the forest farm parcel;
- activities undertaken to acquire rights to cultivate the forest farm parcel;
- year of initial cultivation of the forest farm parcel;
- crops planted during the year of initial cultivation;
- crops planted during the succeeding years of cultivation;
- location of farms within A&D lands;
- crops growing or being cultivated in the farms within A&D lands;
- area of the farms within A&D lands;
- tenure status of the respondent on the farm within A&D lands; and,
- sharing arrangements for non-owned farms within A&D lands.

The HIS gathered data on the:

- socio-demographic characteristics of the respondents' household;
- educational status of the household members;
- respondents' perceptions and opinions regarding their forest land use methods, and the various forms of forest land vegetation; and,
- income profile of the household.

The ISFAL collected the following data:

- physical characteristics of the farm;
- crop production and utilization of farm produce;
- tenurial arrangements; and,
- income derived from crop production.

The FFCIS was used to record data on:

- physical characteristics of the forest farm parcel;
- existing crops at time of observation;
- area planted to each type of crop;

- cropping history;
- quantity and value of products derived from forest farm parcel; and,
- tenurial arrangements for the products derived from the parcel.

2.2.5 Conducting the Survey Interviews

The 31 survey respondents were interviewed using all four instruments. In most cases, the first interview session involved the use of the FIS and the HIS. Interviews using the FFCIS and the ISFAL were done at later dates in order that:

1) the respondent could allocate enough time for the interview session;
2) the responses to the FIS questions could be used as inputs into either the FFCIS or the ISFAL;
3) the follow-up questions could delve into a more detailed discussion of the aspect being covered; and,
4) verification of responses could be done at another time.

Most interviews were conducted at the respondents' homes although some were held at public places (e.g. office of the village council or village chapel), or at the respondents' places of work. Each identified respondent was visited, and informed about the concept, the objectives and the data collection methods including his/her being selected as survey respondent. The non-deterministic nature of the respondent selection procedure and the confidentiality of information obtained from individual respondents were given emphasis.

2.2.6 Conducting the Case Studies

In addition to the interviews, the case study households were requested to bring the researcher to their forest farms. Based on the observations of the forest farm parcels, follow-up questions especially with respect to farming practices and to agrarian relations were posed to the case study respondents or to other household members. If applicable, other informants were interviewed to verify the responses of the case study household. (Please refer to section 2.2.6 Conducting the Case Studies of Appendix 2 for more information about this phase of the study.)

From among the forest farm parcels of a case study household, one was selected wherein data on existing vegetation were obtained using the line intercept method. All transect lines were laid out in an east-west orientation. Sketches of the spatial arrangement of existing crops were made using the rope-and-lensatic-compass method. Identification of cultivates was based on the descriptions of REHM & ESPIG (1992). Specimens of non-cultivates were mostly identified by QUIMIO based on comparisons with his herbarium collection. Ornamental plants were identified by BRIONES of the Department of Horticulture of ViSCA.

Three soil samples were also collected from each of these parcels. Sampling sites were fixed at 20%, 50% and 80% of the length of the transect line used in the determination of existing vegetation. All samples were obtained from the top 20 cm. of the soil. These were then air-dried, pulverized and passed through a standard textural 2 mm. sieve. From each of the three samples per parcel, 50 cc. of sieved soil were mixed to come up with a composite sample. Each was then further passed through standard textural 2 mm. and 0.5 mm. sieves. The samples were submitted to the Soil Analysis Section of the Philippine Root Crops Research and Training Center for physical and chemical analyses.

2.3 Data Processing and Analyses

2.3.1 Processing of Data pertaining to Leyte Mainland

Numerical data pertaining to Leyte island obtained from secondary sources were entered into a spreadsheet program to facilitate aggregation. Base and index maps of the island were digitized using the program utilized by the GIS of ViSCA.

2.3.2 Processing and Analyses of Data pertaining to the Study Villages

The data recorded in the Barangay Information Sheet were entered into a spreadsheet program. Descriptive statistics were generated to portray the characteristics of the study villages and to provide an overview of existing conditions therein. Correlation and regression analysis were done for some of the applicable data and derived indices.

2.3.3 Processing and Analyses of the Survey Data

The data obtained by the FIS, HIS, FFCIS and ISFPAL were encoded and entered into a spreadsheet program. To facilitate encoding, a code book was prepared. Imputed values for variables whose measures could not be directly obtained from the interview responses and aggregate scores were derived by processing the data set using facilities within the spreadsheet program. Descriptive statistics as well as tests of relationships (e.g. correlations and associations) were generated using MICROSTAT.

In the analysis of forest land cultivation practices, data on land use transformations from the 31 randomly-selected respondents and the 69 non-randomly selected respondents were put together and treated as one set. Tests of differences performed between the two groups yielded no significant differences thus the aggregation.

2.3.3 Processing and Analyses of Data from the Case Studies

In-depth interview field notes as well as records of field observations were used to augment the data obtained through the interview instruments. Verification was mostly undertaken through cross-referencing from various informants.

3 BACKGROUND INFORMATION ON LEYTE

3.1 Physical Characteristics

3.1.1 Geographic Location and Characteristics

Leyte mainland, the eighth largest island in the Philippine archipelago, lies between 124°17' and 125°18'E longitude and between 9°55' and 11°48'N latitude. It has a high rugged backbone of mountain, known as the central cordillera, traversing its axis. Further to the north, the central cordillera is joined by another mountain range which dominates the peninsula of the towns of Leyte and Capoocan. The section of the cordillera extending from Capoocan to Baybay is roughly broken by steep slopes whose peaks attain heights of 700 to 1,100 m. Southward from Baybay, the central cordillera becomes less steep with lower elevations, and later divides into each of the peninsula of Macrohon and of Cabalian at the southern tips of the island. On the northeastern edge of the island, a range of hills extends from the town of Palo northward to Babatngon. At the northwestern side, another range of hills extends from Merida to San Isidro (BARRERA et al. 1954; YAMBOT 1975).

The Philippine Fault, extending from northwestern Luzon down to eastern Mindanao, passes through the central cordillera of Leyte in a northwest-southeast trend. And lying on the Fault's eastern block are eight quaternary volcanic centers (GD-DENR 1992; Figure 6). As described by the ORMOC TASK FORCE STUDY GROUP (1991):

> ... Leyte is made up of a basement of pre-Tertiary (>135 million years) basic igneous and metamorphic rocks concentrated along the mountain range ... These are overlain by marine and terrace gravel deposits (limestones, conglomerates, etc.) of Early Neogene-Late Paleogene Age. The youngest of the units exposed in the area is the Plio-Pleistocene volcanic formation which has an andesitic composition. Blanketing the slopes of these volcanic centers are pyroclastic materials, chiefly made up of lahar deposits.
>
> ... All the rocks in the general area are highly sheared and intensely fractured because of the ... [Philippine Fault].

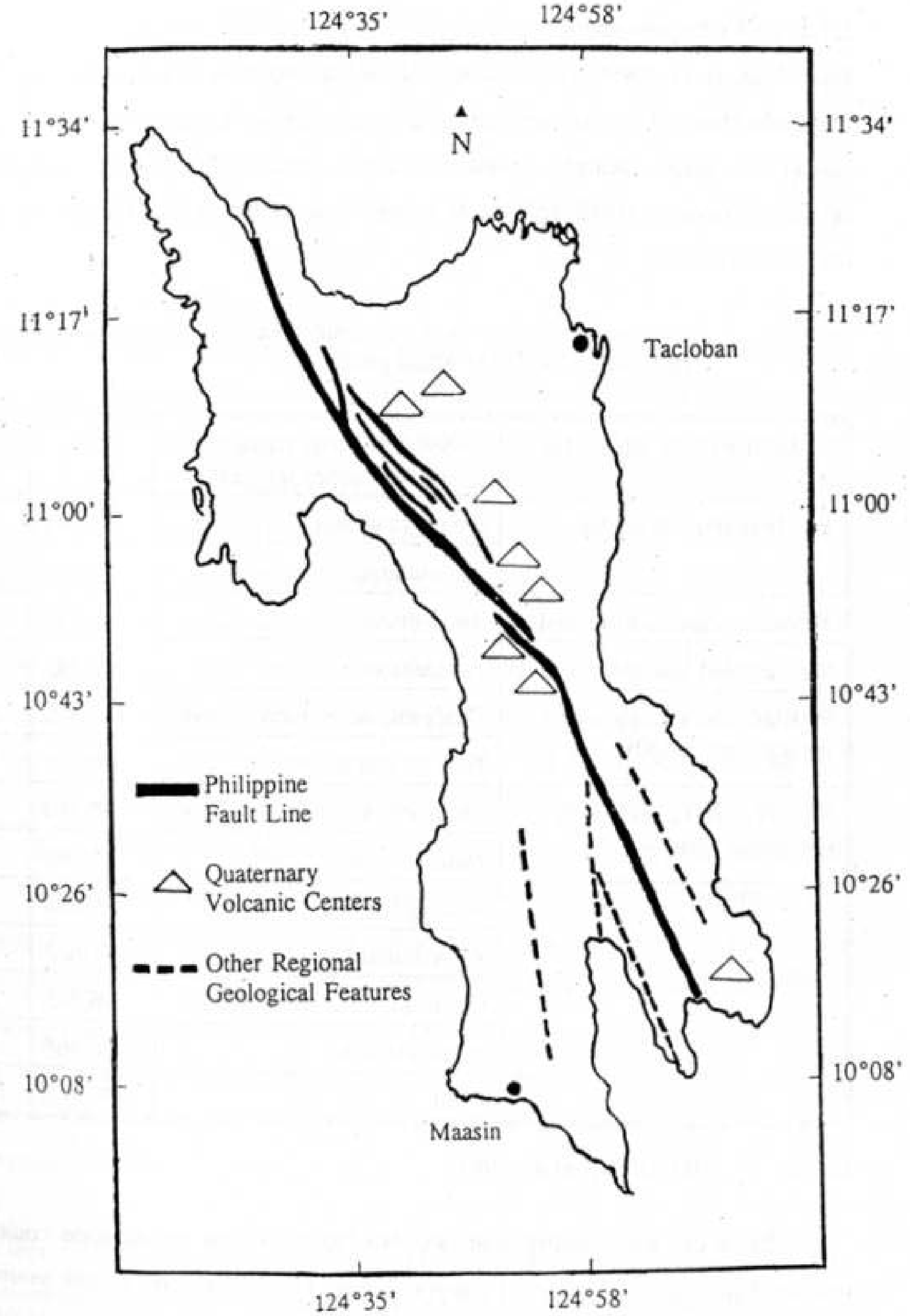

Figure 6. Map of Leyte mainland showing location of quaternary volcanic centers and the trend of the Philippine Fault Line (Adapted from maps generated by the GIS and the Geology Division of DENR)

3.1.2 Soil Characteristics

BARRERA et al. (1954) classified the soil of the Leyte island group into 30 types (Appendix Table 3.1). In terms of relief, some 9,584 ha. were classified as non-agricultural lands (located in swampy coastal areas), 181,622 ha. as lowland agricultural soils, and 607,553 ha. as upland areas of which 522,653 ha. are non-calcareous (Table 3).

Table 3. Soil categories based on the recommended land use of the various soil types within the Leyte island group

Relief and drainage class	Soil categories based on recommended land use	Area (ha.)	%
Poorly-drained lowlands	Non-agricultural	9,584	1.2
	Agricultural	77,314	9.7
Moderately-drained lowlands	Agricultural	87,776	11.0
Well-drained lowlands	Agricultural	16,533	2.1
Well-drained uplands with non-calcareous soils	Cultivable w/ erosion control	204,375	25.6
	Non-cultivable	318,278	39.8
Well-drained uplands with calcareous soils	Cultivable w/ erosion control	42,410	5.3
	Non-cultivable	42,490	5.3
Total	Non-agricultural	9,584	1.2
	Agricultural	181,622	22.7
	Cultivable w/ erosion control	246,785	30.9
	Non-cultivable	360,768	45.2
	Total	798,760	100.0

Source: BARRERA et al. 1954

Based on recommended land use, 246,785 ha. of the upland areas could be cultivated under certain systems of erosion control. For the 360,768 ha. with mountain soils, BARRERA et al. (1954) recommended that "under no condition should [these areas] be cultivated but be kept under permanent vegetative cover." They, however, acceded that this block of rough mountainous land includes small areas suitable for cropping and considerable lands suitable for grazing and that the extreme ends of the mountain range are not as rugged as the central part. In their 1947 survey, they noted that some areas designated as rough mountain lands were already subjected to *kaingin* and planted to upland rice and root crops, while those with Faraon clay, steep phase soils had *kaingin* and were planted to coconut, corn, banana and cassava.

3.1.3 Climatic Conditions

The climate of Leyte is characterized by the absence of distinct dry and wet seasons with rainfall somewhat evenly distributed throughout the year. But because of the central cordillera, the climate in the northeastern part differs slightly from that in the northwest, and that in the southeast from the southwest. Rainfall on the eastern side is influenced by exposure to the trade winds. In the northeast, known as Type G in the Koppen system of agro-climatic classification, it is characterized by an even distribution of rainfall with no marked seasonality; although precipitation during the months of October to January usually reaches 300 mm. per month (Figure 7). The southeast portion of Leyte mainland, classified under agro-climatic Type D, is characterized by low sun rainfall caused by the outblowing moonsoon and the northeast trade winds.

The western side of Leyte mainland generally receives less rainfall primarily due to the deflection of the trade winds. The northwestern portion, classified as agro-climatic Type C, has a short dry season during the low sun period. The Type D agro-climate in the southwestern portion is characterized by a short dry season during the high sun period. In both locations, monthly precipitation of around 200 mm. is normally experienced during the months of October to January. Interestingly, the area between Baybay and Ormoc has been reported to receive more rainfall during the months of July and August than the rest of the island (BARRERA et al. 1954; Figure 7; Appendix Tables 3.2 & 3.3).

The high precipitation during the months of October and November could be traced to the occurence of typhoons especially that Leyte lies along their path (BARRERA et al. 1954). Data collated by the Tacloban Station of PAG-ASA (EDPC 1994) revealed that for the period 1971 to 1994 the island was hit by an average of three typhoons per

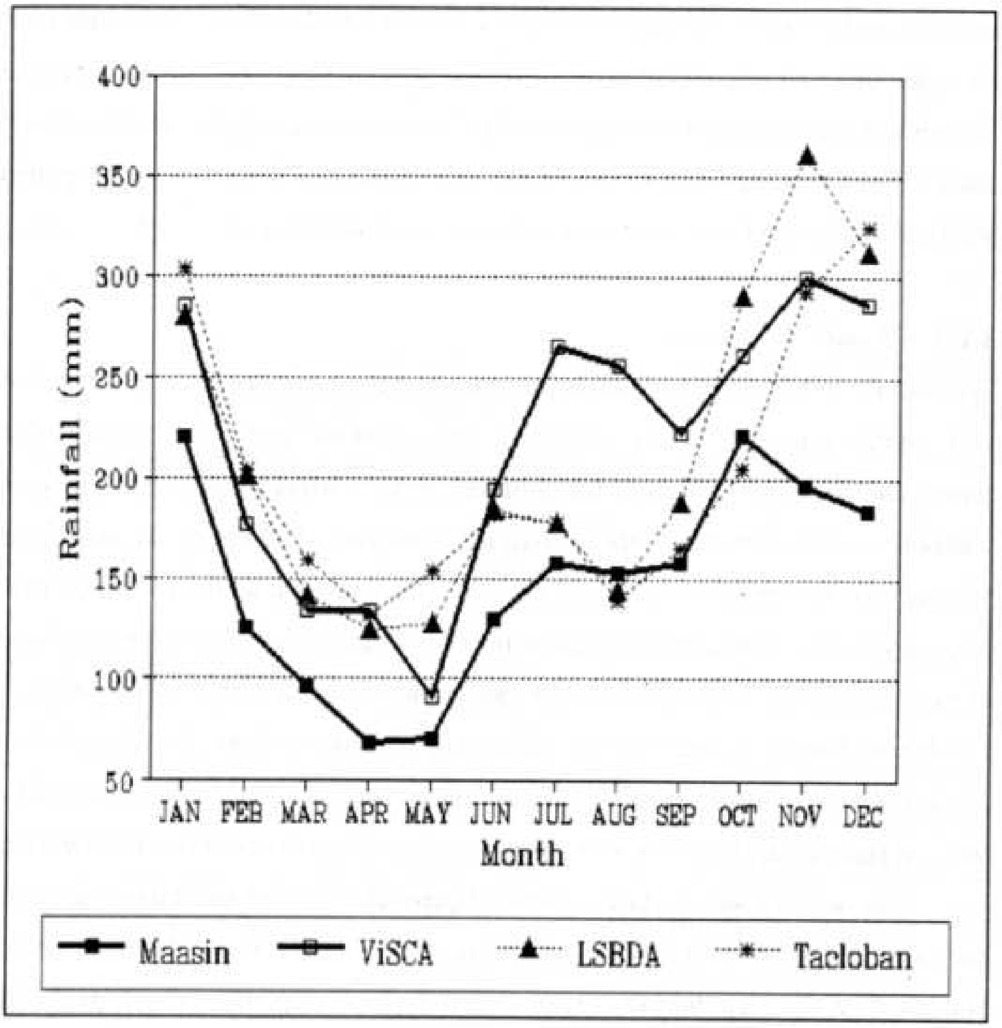

Figure 7. Monthly average rainfall (in mm) measured at four stations in Leyte mainland (EDPC 1994)

year, with an average typhoon packing winds of some 69 km. per hour (Table 4). Almost half (43.5%) of all the typhoons recorded during this 24-year period occured within the months of October and November.

Table 4. Occurence of typhoons for the period 1971 to 1994

Month	Typhoon occurence from 1971-94		Average speed (in km/h)
	Number	% of total	
January	3	4.8	50.5
February	0	-	-
March	2	3.2	76.0
April	4	6.4	134.0
May	3	4.8	37.9
June	8	12.9	61.0
July	5	8.1	67.1
August	4	6.4	47.3
September	2	3.2	83.2
October	10	16.1	52.2
November	17	27.4	78.0
December	4	6.4	67.7
Annual Ave.	2.8		68.8

Source: EDPC 1994

3.2 Social, Political and Demographic Charateristics

3.2.1 Political Subdivision

At the time of declaration of Philippine independence in 1946, the Leyte island group was collectively known as the Province of Leyte. In 1960, 17 municipalities in the southern tip of Leyte mainland and in the island of Panaon were organized into the Province of Southern Leyte pursuant to Republic Act 2227. The Province of Leyte retained jurisdiction over the northern part of the mainland and the Biliran island group. In 1993, the Province of Leyte was further subdivided with the creation of the Province of Biliran composed of the Biliran, Maripipi and Gigatangan islands.

3.2.2 Languages

The people of Leyte speak two main languages, namely *Cebuano* and *Waray*. The former, a language based mainly in the central Visayan islands, is spoken in Southern Leyte and northwestern Leyte. The latter is spoken in the northeasten part of Leyte which faces Samar, the main *Waray*-speaking island. As mentioned earlier, many of the forest land cultivators working at the vicinity of the central cordillera could speak both languages.

3.2.3 Population

As of 1990, Leyte mainland had 1.64 million residents. Of these, 83% lived in the part belonging to the Province of Leyte, and the rest to Southern Leyte. For the period 1980 to 1990, the population of the mainland grew by an average of 1.2% annually. The rate of population increase in the two parts, however, had not been even: an average of 1.4% annually in the northern part, and only 0.4% per annum in the southern part (Figure 8; Appendix Table 3.4). This would depict a markedly slow increase in population considering that the southern part of the mainland had, in the past, posted growth rates of 0.9% to 3.2% per annum.

Increase in the man-to-land ratio, an offshoot of population growth, is regarded as a major factor in the loss of forest cover (ACOSTA 1991; DAGOY & ABENOJA 1985; DARGANTES & KOCH 1995a; PONCE et al. 1990). In the Leyte island group, the 97% increase in population between the period 1939 and 1990 coincided with a 72% decrease in forest cover and a 55% increase in cultivated and open lands. The decrease in the per capita forest cover (86%) was more drastic, however, than that in cultivated and open land (21%). Expressed differently, in 1939 there was 0.4 ha. of forest cover per person, but in 1990, there was only 0.1 ha. per person. Even if computed to include only the residents in villages with jurisdiction over forest lands, per capita forest cover would only amount to 0.2 ha. (Appendix Table 3.5). Reduction in the per capita area of cultivated and open lands, on the other hand, was less drastic: from 0.5 ha. per person in 1939 to 0.4 ha. in 1990 (Figure 9).

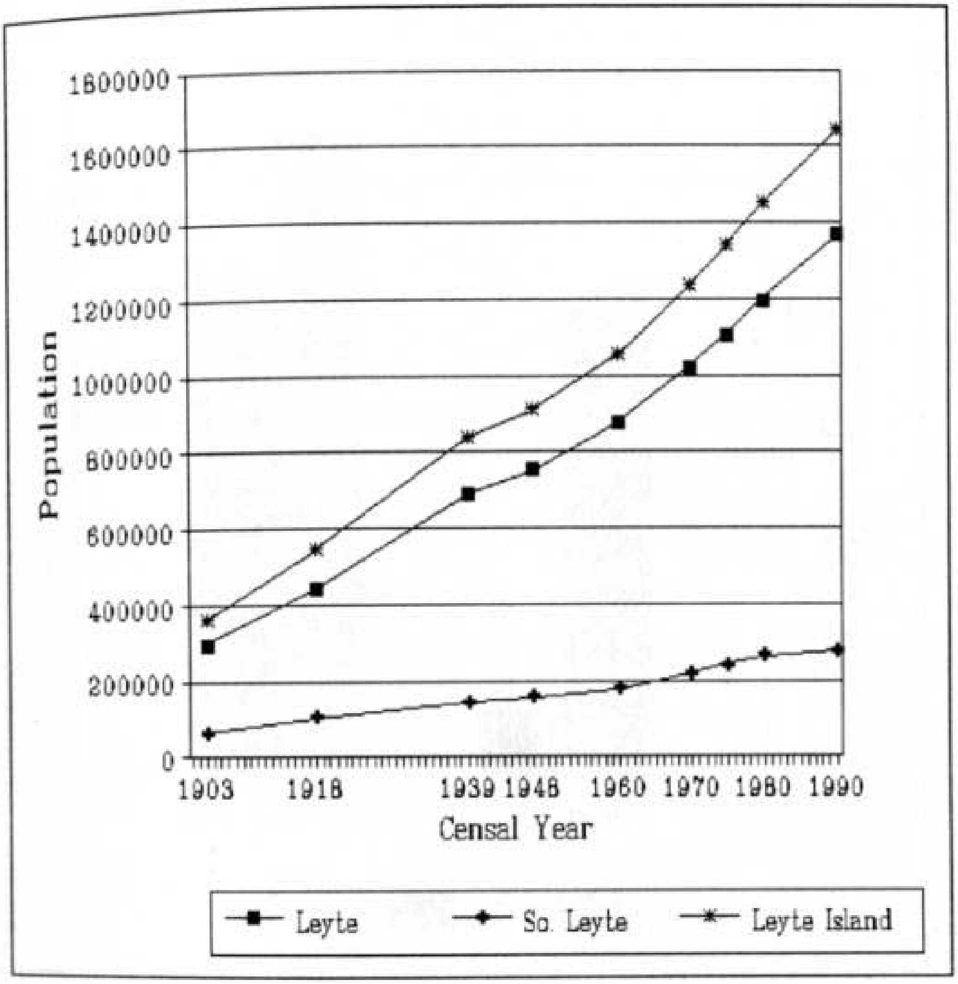

Figure 8. Total population of Leyte mainland during various census years

3.3 Economic Conditions

3.3.1 Domestic Production

In the 1948 Census of Agriculture (as cited by BARRERA et al. 1954), the principal crops of Leyte in terms of cultivated area were corn (74,800 ha.), coconut (71,010 ha.), rice (60,651 ha.), abaca (23,945 ha.) and sweet potato (18,858 ha.). Other minor crops included cassava (2,841 ha.), sugarcane (2,036 ha.) and tobacco (1,065 ha.).

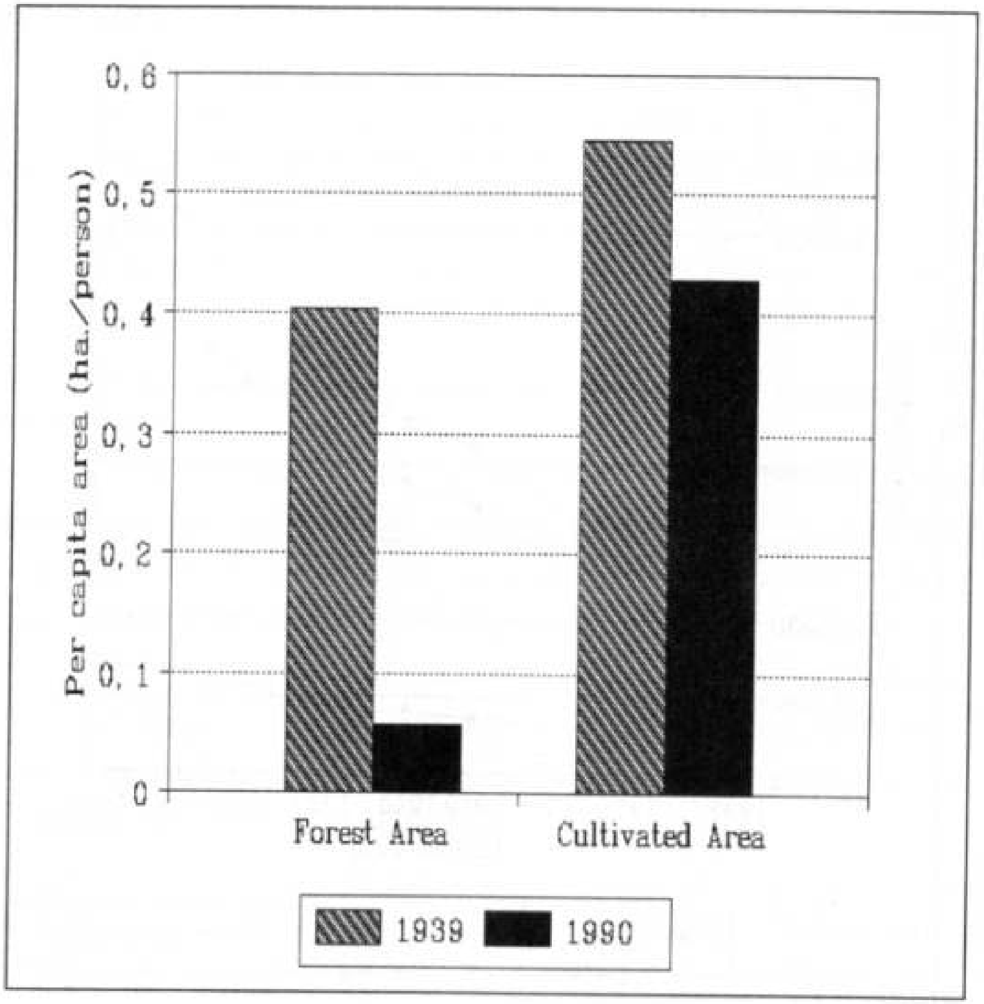

Figure 9. Comparison of the per capita area for forest cover and cultivable lands between 1939 and 1987 (adapted from data reported by BARRERA et al. 1954 and ERD-MO 1991)

By 1989, Leyte already had 209,689 ha. planted to coconut, 81,240 ha. to wetland rice (plus another 366 ha. to upland rice) and 11,161 ha. to sugarcane. This time, corn (1,295 ha.), abaca (559 ha.) and sweet potato (31 ha.) had become minor crops (Table 5; Figure 10). There had been trends to plant corn, bananas, abaca, upland rice and pineapples within existing coconut plantations (Appendix Table 3.6).

Among these crops, abaca, coconut and root crops planted in *kaingin* had been significant components of cultivated forest lands (ACOSTA 1991; DARGANTES &

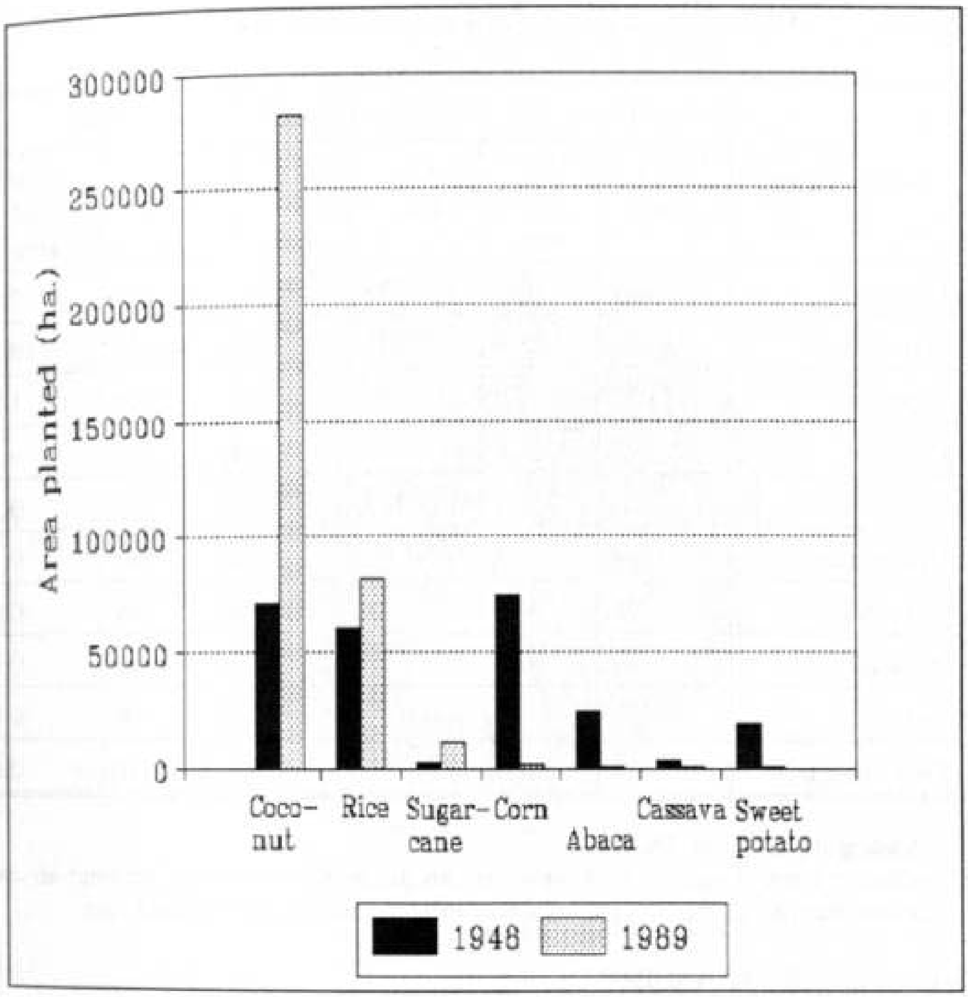

Figure 10. Comparison of the area planted to various crops in 1948 and 1989 (adapted from data reported by BARRERA et al. 1954 and DA-BSWM 1990)

KOCH 1995b). The commercial production of cattle and other animals, a major land use in open grasslands and brushlands is concentrated in the northwestern and southwestern portions of the mainland (ORMOC TASK FORCE SCIENTIFIC STUDY GROUP 1991; BARRERA et al. 1954).

Table 5. Major crops planted in Leyte mainland as of 1989

Name of crop	Leyte		Southern Leyte*		Total	
	Area (ha.)	% of land area	Area (ha.)	% of land area	Area (ha.)	% of land area
Coconut**	209,689	36.7	71,756	41.4	281,445	37.8
Wetland rice	73,920	12.9	7,320	4.2	81,240	10.9
Sugarcane	11,031	1.9	130	0.1	11,161	1.5
Corn	1,295	0.2			1,295	0.2
Abaca	402	0.1	177	0.1	579	0.1
Upland rice	169	0.0	197	0.1	366	0.0
Cassava	298	0.1			298	0.0
Pineapple	65	0.0			65	0.0
Coffee			39	0.0	39	0.0
Sweet potato	31	0.0			31	0.0

* Including the island of Panaon
**Including areas planted to such combinations as coconut-rootcrops, coconut-abaca, coconut-banana, coconut-corn, coconut-pineapple and coconut-upland rice

Source: DA-BSWM 1990

3.3.2 Sources and Levels of Household Income and Incidence of Poverty

Almost half of the households in Leyte depend on agriculture for their livelihood. Of the 349,167 households surveyed in 1988, 35% were engaged in crop farming and gardening, 8% earned wages as agricultural workers, 3% were engaged in animal production, or in forestry and hunting, and 3% received shares from various crops and/or livestock under various product-sharing arrangements with tenants, lessees and contract growers (Figure 11). Even the 6% of the households who were primarily engaged in fishing would have been engaged in crop farming or animal production during the day or during the off-season for fishing.

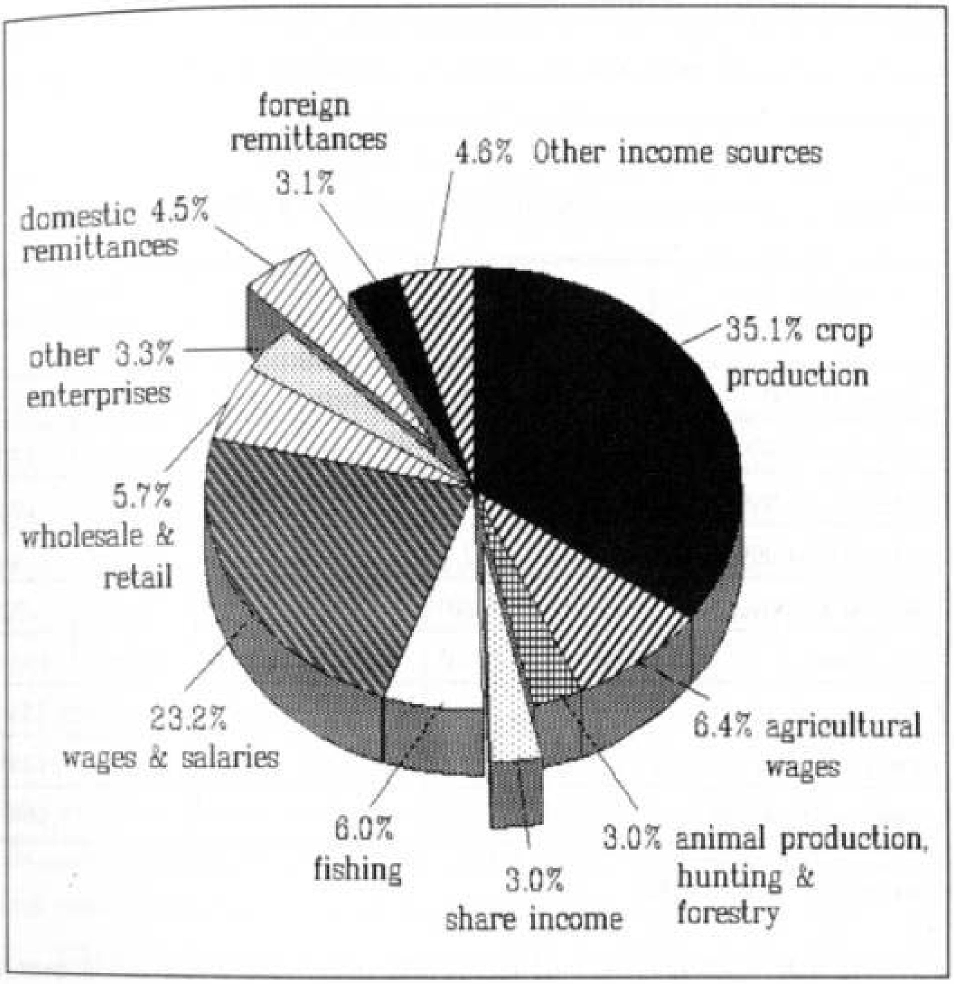

Figure 11. Percentage distribution of the households in the Leyte island group by main source of income in 1988

Among those earning incomes outside of agriculture, salary and wage earners accounted for 23% of the households, private enterprises for 9% and other sources 12%. Interestingly, 16% of the households in Southern Leyte relied mainly on money sent home by family members working abroad or in other parts of the country (Appendix Table 3.7).

In terms of amount of income, about two-thirds of the households in 1988 earned less than the poverty threshold of approximately USD 1,000 per annum for a six-member family (Table 6). Some 45% of the households even earned less than USD 600, an amount less than the level of income needed by a family of six to satisfy its nutritional requirements.

Table 6. Income level of the households in the Leyte island group in 1988

Income Level (in pesos)	Leyte		Southern Leyte		Total	
	n	%	n	%	n	%
Below 10,000	49,007	17.3	9,409	14.2	58,416	16.7
10,000 - 19,999	134,039	47.4	30,556	46.2	164,595	47.1
20,000 - 29,999	55,476	19.6	13,505	20.4	68,981	19.8
30,000 - 39,999	21,878	7.7	7,970	12.1	29,848	8.6
40,000 & above	22,682	8.0	4,647	7.0	27,329	7.8
Total	266,680	100.0	66,087	100.0	349,169	100.0
Ave. per annum	25,255		28,310		25,833	
Food Threshold	n.d.		n.d.		17,124	
Poverty Threshold	n.d.		n.d.		22,908	

Source: NSCB 1992

Despite these grim figures, they would show some improvement over the situation in 1985. Then, 78% of the households earned incomes less than the poverty threshold; with 60 % earning less than the food threshold (Appendix Table 3.8).

3.4 Projects and Activities Involving Forest Lands

3.4.1 Road Construction

Major roads cutting through the forest zone were built to improve the networks of communication, trade and commerce between population centers. Examples include the Mahaplag-Sogod section of the Pan-Philippine Highway, the section of the Abuyog-Baybay national road traversing the Cuapnit-Balinsasayao National Park, a portion of the Kananga-Capoocan national road which passes through the site of the Rainfed

Resources Development Project, and the section of the Hinunangan-St. Bernard "cross-country" road traversing the SLSP.

Other roads served to connect farms and markets, and to penetrate frontier areas which were affected by the communist insurgency. Referred to as ***barangay*** (village) roads, these connect villages which erstwhile were inaccessible to motor vehicles.

A major factor which contributed towards increasing the accessibility of forest areas would be logging roads. In 1988 for example, TPMC constructed 15.2 km. of roads within its area of operations, while planning to build another 13.2 km. for 1989. And as stipulated in its TLA, "[m]ain logging roads built within the concession area shall become public roads after five (5) years following their construction. During the 5-year period, however, the use of said roads by (residents of the) surrounding communities and other persons for legitimate purposes shall be allowed under reasonable terms and conditions as the Director of Forest Development may impose."

3.4.2 Logging

Commercial exploitation of timber had been a significant industry in Leyte. In the 1950s, 14 lumber concessioners operated in Leyte leasing a total of 38,008 ha. located in six towns (BARRERA et al. 1954). In 1963, however, extensive logging operations started with the granting of four licenses (CALUB 1993).

CALUB (1993) further reported that in 1971, a ban on logging was declared for the island of Leyte. [Nonetheless, YAMBOT (1975) reported that in 1972 Leyte had 9 timber licenses covering an aggregate area of 158,476 ha. with an allowable cut of 203,009 cu.m.] This ban further gained impetus with the issuance of BFD Administrative Order 31 in 1982 which continued to take effect until 1986. On this year, a timber license agreement (TLA) was awarded to the TPMC which was then allowed to cut, remove and utilize annually 80,000 cu.m. of timber from 26,600 ha. of forests. Five years later, however, TPMC's logging operations were ordered suspended, and in 1994, the TLA was cancelled.

On a smaller scale, two other entities obtained timber harvesting permits for certain areas in Leyte. The Natural Resources Development Corporation (NRDC) was granted in 1988 a *Baranganic* Logging Permit to operate in 2,000 ha. within the

Abuyog-Silago hinterlands. The Forest Stewards Association of Mahaplag (FOSAM) obtained special permits in 1987 and 1988 to harvest the ***Albizia falcataria*** **(Linn.)** planted by the logging companies in the Magsuganao forest in the 1960s.

3.4.3 Settlement Projects

As a government program, rural settlement is seen as the planned movement of people to areas with agricultural potential. In Leyte, there are three of these undertakings, namely: the Southern Leyte Settlement Project (SLSP--formerly known as the Imelda Settlement Project); the Kauswagan Agricultural Cooperative Settlement Project (KACSP); and, the Leyte Settlement Project (LSP).

The SLSP covers a total of 16,415 ha. in 22 villages in the municipalities of Hinunangan and St. Bernard, Southern Leyte. It delineated 7,764 farmlots covering 9,840 ha. for distribution to 2,289 households. Other land conversions included 2,289 homelots, 205 public lots and 51.9 km. of roads.

The KACSP, on the other hand, occupies 1,349 ha. in Barangay Barayong, Palo, Leyte. According to the project manager, 27.1 ha. have been allocated for 271 homelots. The farmlots and reserve forests had not yet been ascertained due to discrepancies in the 1978 Cadastral Survey and the 1990 Survey Returns.

The LSP, launched in 1994, covers 21,888 ha. in the municipalities of Mahaplag, Abuyog, Javier and Baybay, and 4,641 ha. in Hilongos. It intends to resettle landless families/tillers from surrounding areas, other qualified farming families from Leyte, and rebel returnees. Even though forest lands were excluded from its scope, forest lands in the villages of Hinaguimetan and Oguis, both of which are within the project site, already had occupants and were in fact cultivated. Moreover, the timberlands of Hinaguimetan were covered by ISFP applications.

3.4.4 The Leyte Sab-a Basin Development Project

The Leyte Sab-a Basin Development Authority (LSBDA), created in 1974 but dissolved in 1994, was an agency which had territorial jurisdiction over lands (forest lands, timberlands, pasturelands and reforestation areas), vegetation, minerals and waters within the towns of Alang-alang, Barugo, Palo, San Miguel, Sta. Fe, Babatñgon and

Jaro, and the City of Tacloban. Moreover, its powers included "preventive jurisdiction over timber and mineral lands ... [so that these] may not be disposed of ... or converted to agricultural, residential, or other purposes incompatible with their administration."

In pursuit of its objective "[t]o develop a food basket within the Province of Leyte and Region VIII by increasing agricultural productivity; and ... [t]o provide a model for the development of agricultural estates," the LSBDA resettled *kaingineros* at the KACSP and the Lanahan Resettlement Project sites, and, lately, a group of *Manobo* at Barangay Bagacay, Tacloban City. Aside from resettling the *kaingineros*, they were encouraged to engage in lowland agriculture. But after 15 years from its creation, the LSBDA still reported that the upland range of the Basin was still devoid of forest cover because of *kaingin*.

LSBDA then employed the local residents in an agro-reforestation project undertaken by a private firm. Aside from reforestation, the firm engaged in the commercial planting of export crops within its 225-ha. project site. This hewed to LSBDA's agro-forestry or upland development strategy to "provide livelihood to kaingineros [and] provide [a] steady supply of fruits and vegetables." Targetted for establishment were fruit tree farms for *atis* [***Annona squamosa*** **L.**], *guayabano* [***Annona muricata*** **L.**], papaya [***Carica papaya*** **L.**] and jackfruit [***Artocarpus heterophyllus*** **Lam.**], plantations for coconut, citronella [***Cymbopogon nardus*** **(Linn.) Redle**] and banana [***Musa x paradisiaca*** **L.**], and rattan plantations which were started by the *Manobo* tribe.

3.5.5 The National Livelihood Support Fund

Another program affecting forest lands was the erstwhile Kilusang Kabuhayan at Kaunlaran (KKK--the National Livelihood Movement) and which continues as the National Livelihood Support Fund (NLSF). In 1983, Proclamation No. 2282 reclassified certain public lands as A&D for the agricultural and resettlement purposes of the KKK Land Resource Management Program. This Proclamation was revoked in 1986; thereby reverting such lands to the public domain. In 1992, Memorandum Order No. 107 ruled that "lands covered by Proclamation No. 2282 which were reclassified as [A&D] agricultural lands prior to 29 March 1983 and used or administered by the KKK-NLSF as agricultural lands shall remain [A&D] agricultural lands ... [and all] lands actually classified as agricultural land prior to the effectivity of Proclamation No. 2282 and used or administered by the KKK-NLSF shall be turned over to the Department of Agrarian Reform [DAR] for disposition to farmer-beneficiaries ..."

By the end of 1994, a total of 14 parcels (out of 20) located in 20 towns had been surveyed for inclusion in the NLSF (Appendix Table 3.9). Of the 67,323 ha. covered by the survey, 58.7% were classified as timberland (Table 7). This area would account for 18% of the mainland's forest lands and 30% of its open and cultivated forest lands.

Table 7. Background information on the NLSF implemented by the DAR in Leyte mainland

Indicators	Leyte	Southern Leyte	Leyte mainland
No. of Parcels	16	7	20
No. of Municipalities covered	22	6	28
Total Area covered (ha.)	*	*	67,323
Area of A&D Lands (ha.)	*	*	27,778
Area of Forest Lands (ha.)	*	*	39,545
% to Forest Land Area	*	*	18.2
% to Cultivated Forest Land Area	*	*	30.3

* Three parcels go beyond the provincial boundaries of Leyte and Southern Leyte and the areas involved in each province had not yet been determined.

Source: DAR 1994

This program had encouraged farmers and other interested individuals to stake their claims to the subject lands on the ground, on paper or both. On the ground, the claimants parceled out among themselves lands which had not been heretofore occupied and cultivated. For the paper work, they applied for the issuance of tax declaration of real property covering their claims and/or filed applications with the DAR for inclusion of their claim in the NLSF.

3.5.6 Reforestation Projects

Reforestation projects are mainly undertaken in denuded timberlands and unclassified forest lands. Through these projects, some of the forest lands get converted into fruit tree plantations, like the ones initiated by the LSBDA, or into plantations of a few "fast-growing" and usually exotic species with specific industrial or commercial applications. Examples would include the Leyte Sab-a River Basin Development Project (LSRBDP) and the TPMC. As reported by PONCE et al. (1990), the LSRBDP reforested 180 ha. in 1990. Of this area, 21 ha. were planted with large-leaf Mahogany (***Swietenia macrophylla* King**), 61 ha. with Yemane (***Gmelina arborea* Roxb.**), 48 ha. with a combination of Yemane, large-leaf Mahogany, Teak (***Tectona sp.***) and various ***Acacia*** species, and another 50 ha. of mixed plantations.

In compliance with its TLA, the TPMC, as of 1993, reforested 2,043 ha. and undertook timber stand improvement (TSI) on 610 ha. DABUET et al. (1989), while conducting a study of its operations, reported that the TPMC reforested 476 ha., and undertook enrichment planting on 231 ha. and TSI on 200 ha. during the period 1987-1988. Although the species used were not reported, its production of seedlings focused mainly on two species, namely: ***Albizia falcataria* (Linn.)** and ***G. arborea***.

3.5.7 The Integrated Social Forestry Project

As of 1991, the Integrated Social Forestry Project (ISFP) undertaken by the DENR in Leyte mainland had issued 3,226 Certificates of Stewardship Contract (CSCs) covering an area of 5,858 ha.--representing 2.7% of the forest land area and 4.5% of the area of the cultivated forest lands (Table 8).

Implemented in 46 villages within 14 municipalities (Appendix Table 3.10), the number of CSCs issued in a project village could involve a quarter to more than a third of the households. In terms of area, 36% of the CSCs covered one ha. or less and another 32% covered 1.01 to two ha. In Southern Leyte, half of the CSCs covered only one ha. or less. Three percent of the CSCs had areas of more than five ha., the project's declared upper limit (Appendix Table 3.11).

Table 8. Background information on the ISFP implemented by the DENR in Leyte mainland

Indicators	Leyte	Southern Leyte	Leyte mainland
No. of municipalities covered	14	7	21
No. of villages covered	46	34	80
Area covered (ha.)	4,412	1,446	5,858
% of forest land area	2.6	3.0	2.7
% of cultivated forest lands	-	-	4.5
No. of CSCs issued	2,187	1,039	3,226
Ave. area per CSC (ha.)	2.0	1.4	1.8
Ave. no. of CSCs per village	48	31	40
% of no. of households per village	25.0*	35.6**	28.0

* Based on 44 villages. Two villages whose residents evacuated to other places during the 1990 census have been excluded from the computation.

** Based on 32 villages. Two villages listed as the location of the parcels covered by the CSCs were not in the list of villages covered by the 1990 census.

4 RESULTS

4.1 The Study Villages

4.1.1 Accessibility of the Study Villages and Forest Lands

Among the study villages, four were directly accessible through a concrete highway, while six could only be reached by foot. The others were accessible by roads with varying degrees of passability depending on the season. On the average, a study village could be reached from the town center through a five-kilometer concrete highway, a three-kilometer all-weather gravel road, a two-kilometer road which would be difficult to pass during the rainy season, a one-kilometer road which would not be passable during the rainy season, and finally a two-kilometer foot trail (Table 9).

Table 9. Average length (in km.) of the various types of roads connecting the study villages to the town center and the market center

Type of road going to the study village	Point of origin	
	Town center	Market center*
Concrete	5.2	11.9
All-weather dirt road	2.8	3.1
Dirt road difficult to pass during the rainy season	1.8	1.3
Dirt road impassable during the rainy season	1.1	1.1
Foot trail	2.0	2.0
Total distance to point of origin	12.8	19.4

* Market center refers to the place wherein village residents usually purchase consumer goods and other household needs.

In four study villages, the residents did not usually purchase their household needs in the town center. The distance to the market center was usually greater but they reasoned that there the range of available goods was wider and the prices of such goods and for their farm products were more reasonable. Most of the increase in distance, however, was in terms of the total length of concrete and all-weather roads. In going to the market centers, the residents also managed to avoid roads which were difficult to pass during the rainy season (Table 9; Appendix Table 4.1).

As mentioned earlier, roads had increased accessibility to forest lands. Among the indicators of accessibility, the distance of the village to the road (as measured by the length of the foot trails going to the town or the market center) and the distance between the village and the market center were found to be negatively correlated with forest loss as represented by the ratio between the area of cultivated forest lands and the total forest land area per village (Table 10). In combination with other factors prevailing in the village, distance to the market center exerted the greatest influence on the conversion of forest lands into agriculture (Table 17). This would mean that although accessibility served as a determinant in the cultivation of forest lands, proximity to market centers would have a greater impact on the process.

Table 10. Table of correlation coefficients between critically correlated* indicators of accessibility and forest loss

Row variables	Column variables	r value
Length of foot trail going to the town center	Ratio of cultivated forest lands to forest land area	-0.56
Length of foot trail going to the market center	Ratio of cultivated forest lands to forest land area	-0.54
Distance between village and market center	Ratio of cultivated forest lands to forest land area	-0.85
Distance between village and market center	Number of forest land cultivators	-0.54

*critical value (1-tail; prob.=0.05) = 0.52

4.1.2 Land Area and Land Use

The average study village had a total area of 665 ha., half of which was classified as A&D. The cultivated area, however, came to 99% of the total land area and affected 80% of the forest lands (Table 11; Appendix Table 4.2).

Table 11. Information on the land area and land use of the study villages

Indicator of land use	Mean	% of total land area
Total land area (ha.)	665	100.0
Area of A&D lands (ha.)	323	49.6
Area of forest lands (ha.)	370	50.4
Area of cultivated lands (ha.)	563	98.6

Coconut was a major crop in almost all the study villages. Rootcrops, specifically sweet potato and cassava, abaca, bananas and plantains, corn and wetland rice were cultivated in many of the villages. In a few villages, fruits, mainly citrus, and vegetables were reported as major income earners among the residents (Table 12).

Table 12. Major crops planted in the study villages

Name of major crop	No. of villages	% of study villages
Coconut	15	93.8
Sweet potato	14	87.5
Cassava	14	87.5
Abaca	13	81.2
Banana	12	75.0
Corn	11	68.8
Wetland rice	9	56.2
Assorted Fruits	3	18.8
Assorted Vegetables	2	12.5

4.1.3 Population

In 1990, the study villages had an average of 148 households for a population of 782 individuals. An average household had between five to six members.

Table 13. Summary information on the population of the study villages

Variable	1975	1980	1990
Population	663	726	782
Average annual growth rate (%)		2.9	0.3
Number of households	121	135	148
Household size (no. of members)	5 to 6	5 to 6	5 to 6
Number of forest land cultivators in 1993			47
% of households (based on 1990 census)			49.4

Compared to the results of the 1980 census, the 1990 population represented a mere 0.3% average annual growth rate for the study villages; an almost tenfold drop compared to the average annual growth rate of 2.9% between the 1975 and the 1980 censuses (Table 13). This low population growth rate, however, did not mean lower fertility levels as could be seen in near constant size of households between census years. It was mainly brought about by the evacuation of residents from villages affected by the insurgency war (see e.g. DARGANTES & KOCH 1995a). Between 1980 and 1990, the population in insurgency-affected villages decreased by an average of 1.0%, while the number of households by 0.7% annually (Figure 12). These emigrations could already be discerned when the 1980 census returns were to be compared to those of 1975, although their impact was not as noticeable as the more massive evacuations occuring in the 1980s (Appendix Table 4.4).

About half of the households in the study villages cultivated forest lands (Table 13). In some villages, however, the number of forest land cultivators exceeded the number of households reported in the 1990 census (Appendix Table 4.3) because some of them had not yet returned to reside in the villages, but nonetheless continued to tend their respective forest land parcels (DARGANTES & KOCH 1995a). On the average, forest land cultivators comprised two-thirds of the households in insurgency-affected

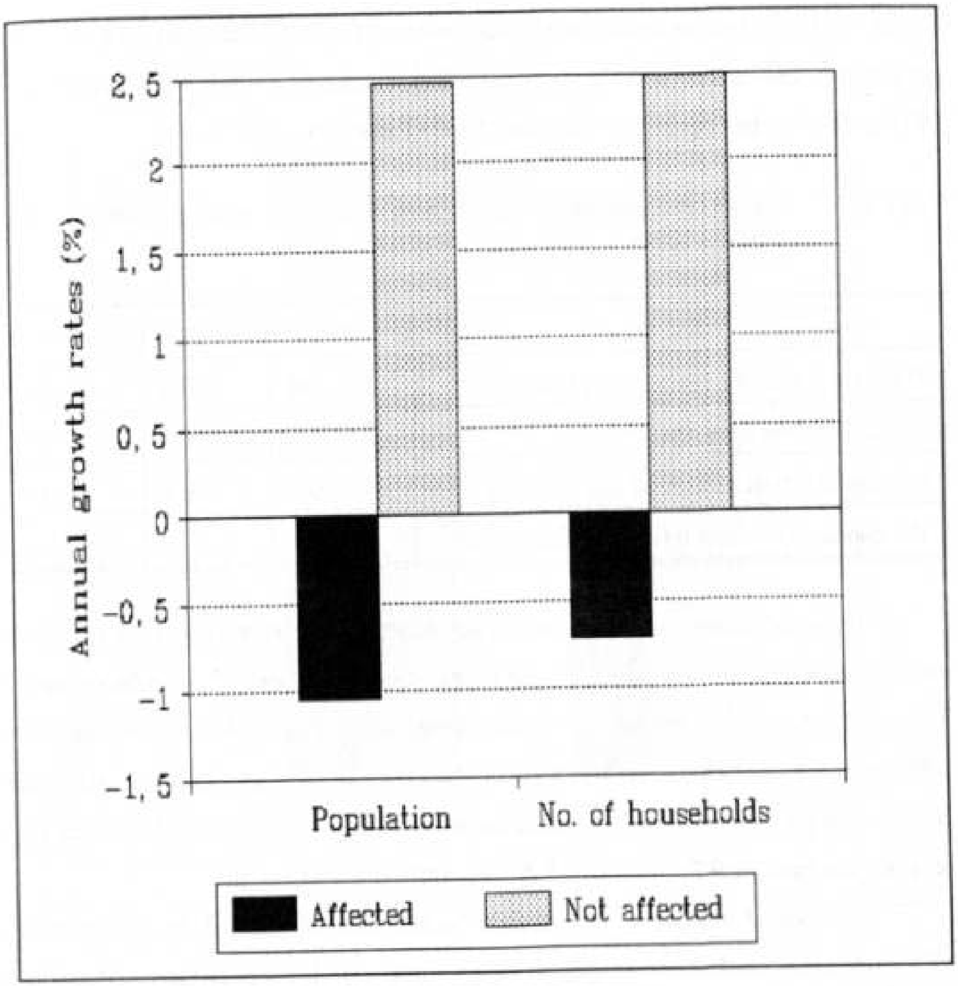

Figure 12. Comparison of the annual growth rates of the population and the number of households between the villages which were affected and not affected by the insurgency conflict

villages, as compared to less than two-fifths in the unaffected villages (Appendix Table 4.4). Taking the market center as point of reference, villages nearer these centers were likely to have more forest land cultivators than those farther away (Table 10).

Population density in the study villages seemed to drop from 148 persons per square kilometer in 1975, to 141 persons in 1980 and finally to 139 in 1990. Seen another way, the per capita land area in the study villages increased from 1.0 ha. in 1975 to

1.3 ha. in 1990; figures which would approximate the cultivated land area of 1.1 ha. per person. Per capita forest land area similarly increased from 0.4 ha. per person in 1975 to 0.6 ha. per person in 1980 and 1990 (Table 14).

Table 14. Summary information on the population-land area relationships in the study villages

Indicators	1975	1980	1990
Population density (persons/sq.km.)	148	141	139
Per capita land area (ha./person)	1.0	1.1	1.3
Per capita forest land area (ha./person)	0.4	0.6	0.6
Per capita cultivated land area (ha./person)			1.1

These indicators, however, would not mean less pressure exerted by population on available land. In areas not affected by the insurgency conflict, population density fluctuated between 255 persons per square kilometer in 1975, 240 in 1980 and 260 in 1990 or a net increase of 18%. Among the affected villages, however, population density steadily decreased from 94 persons per square kilometer in 1975 to 78 in 1990, or a net decrease of 9% (Figures 13 & 14; Appendix Table 4.6).

In terms of per capita land area, affected villages had 1.5 ha. per person in 1990, while in unaffected villages there was only 0.7 ha. per person. If only the cultivated areas were taken into consideration, there were still 1.3 ha. per person in affected villages compared to 0.6 ha. per person in unaffected ones (Figures 14 & 15; Appendix Table 4.6). These changes were further readily noticeable in the 25% drop in the per capita A&D land area in unaafected villages, whereas affected villages posted increases in this indicator between 1975 and 1990 (Figure 15; Appendix Table 4.7).

Although household density seemed to remain constant at 25 to 26 per square kilometer from 1975 to 1990, available land per household increased from 5.6 ha. in 1975 to 6.5 ha. and 7.0 ha. in 1980 and 1990, respectively; thus surpassing even the cultivated land area-to-number of households ratio of 5.9 ha. The forest land area-to-number of households ratios, which stood at 3.6 ha. in 1980 to 3.5 ha. in 1990, were both higher

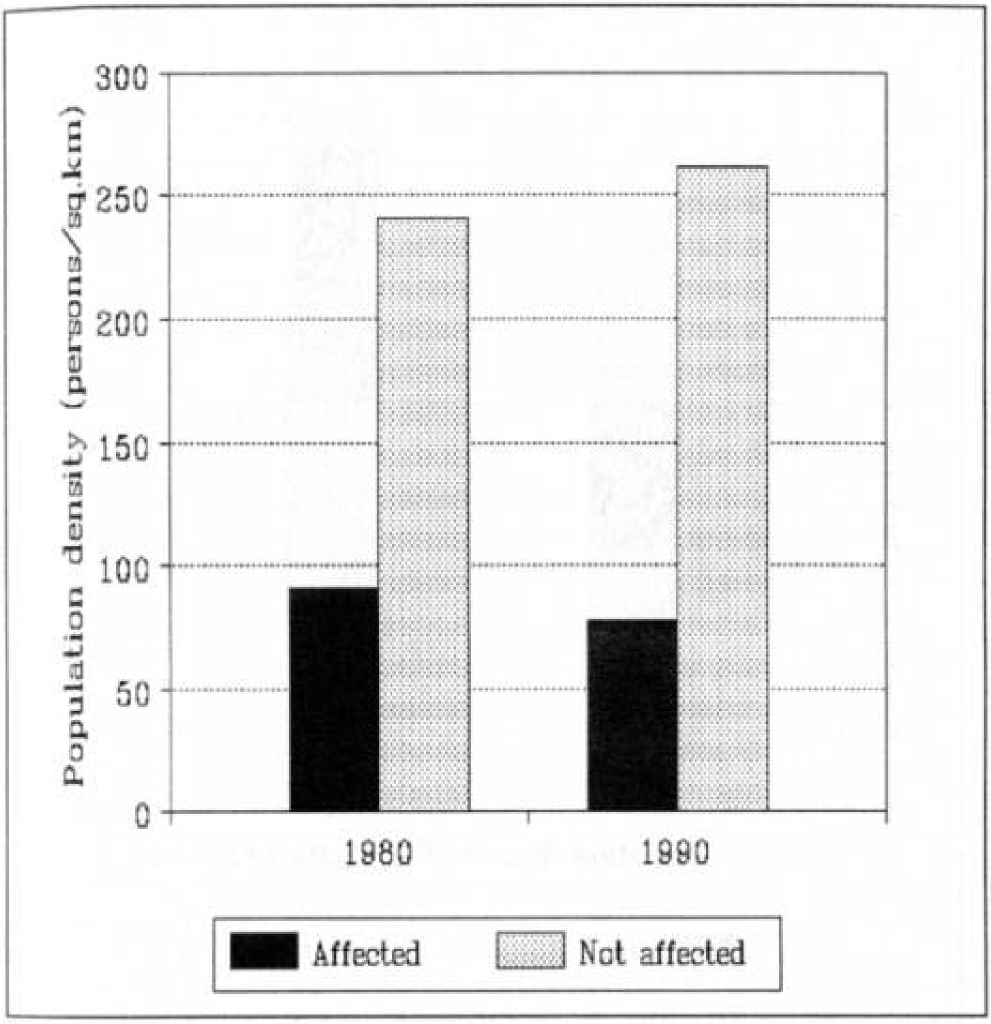

Figure 13. Comparison of the population density during census years 1980 and 1990 between villages which were affected and not affected by the insurgency conflict

than the 2.2 ha. per household prevailing in 1975. If only forest land cultivators were considered, the ratio would be 8.8 ha. of forest lands or 6.7 ha. of cultivated forest lands each (Table 15; Appendix Table 4.7).

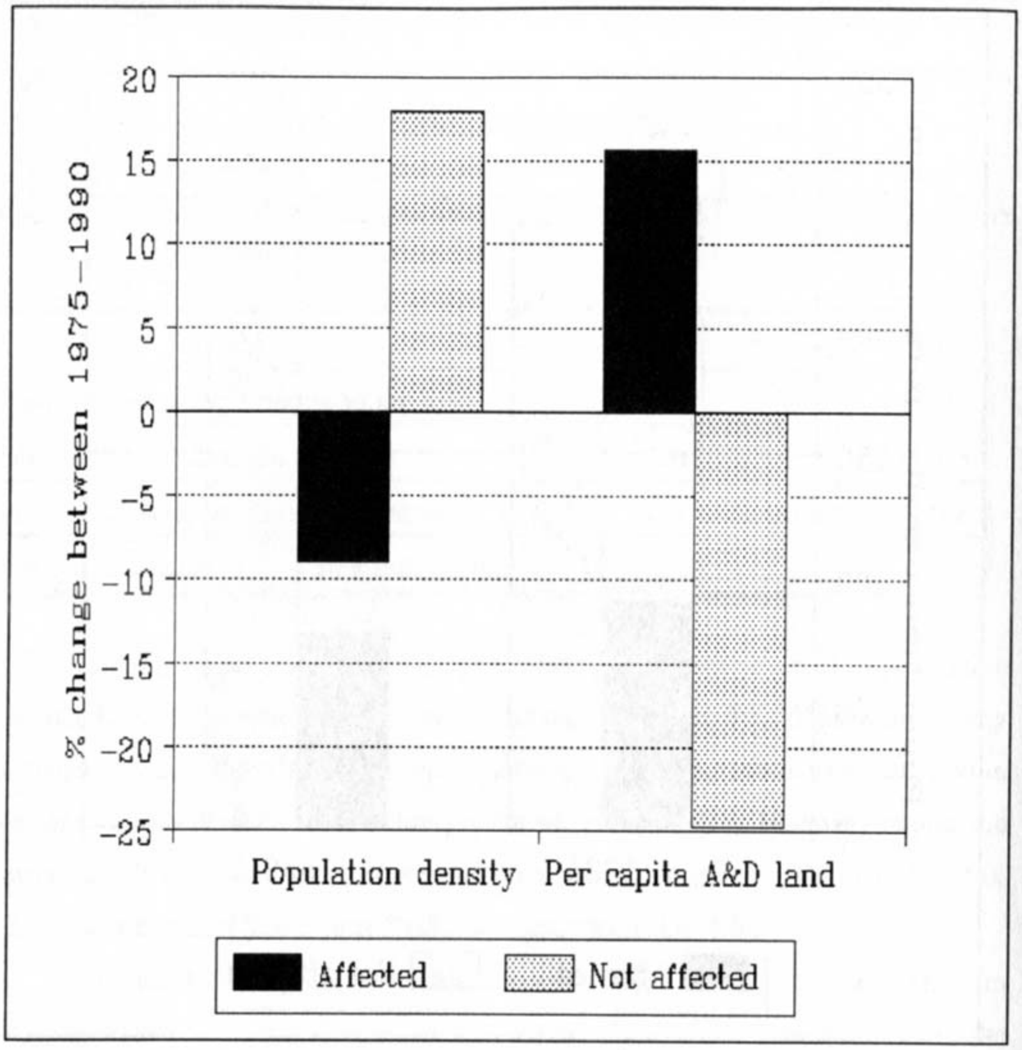

Figure 14. Comparison of the percentage changes in the population density and the per capita A&D land area between villages which were affected or not affected by the insurgency conflict

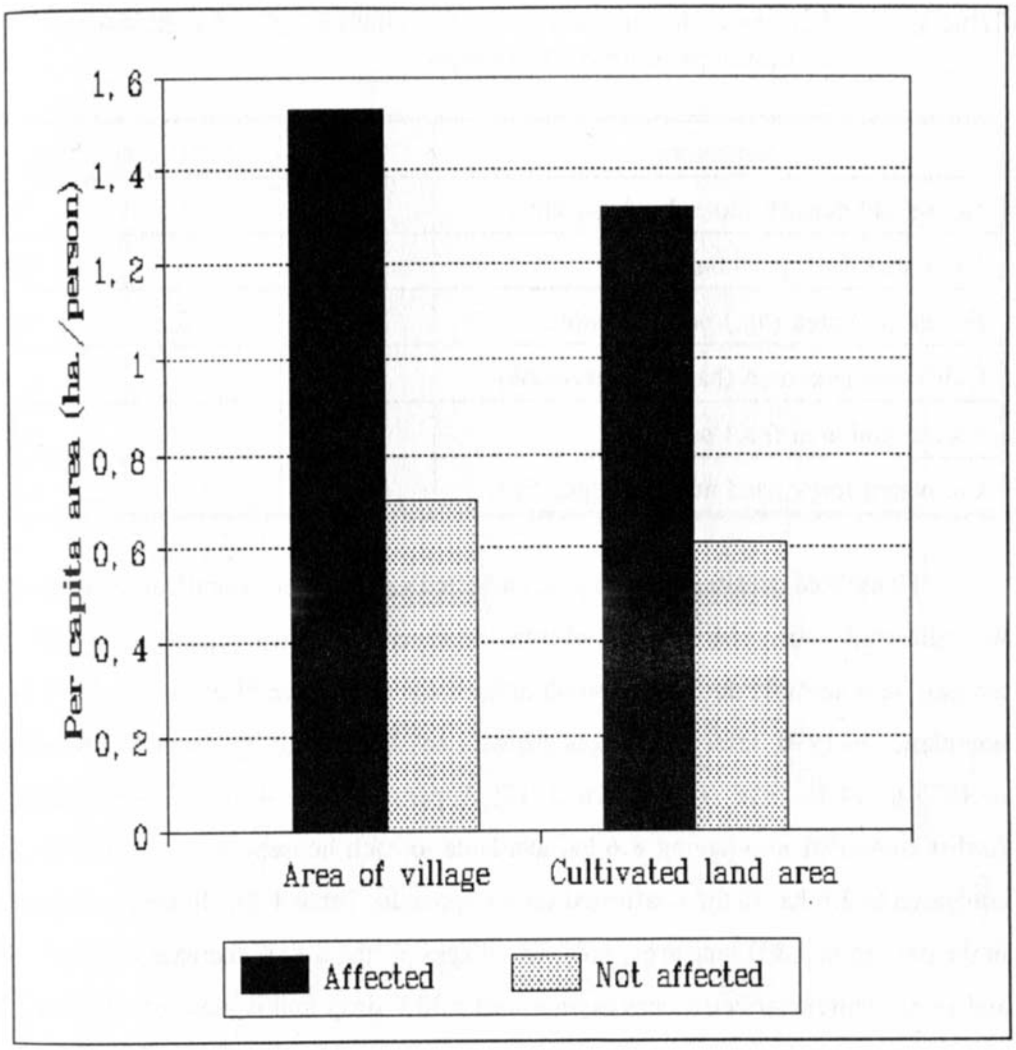

Figure 15. Comparison of the per capita area and the cultivated land area between villages which were affected and not affected by the insurgency conflict

Table 15. Summary information on the number of households-land area relationships in the study villages

Indicators	1975	1980	1990
Household density (households/sq.km.)	26	25	26
Land area (ha.) per household	5.6	6.5	7.0
Forest land area (ha.) per household	2.2	3.6	3.5
Cultivated land area (ha.) per household			5.9
Forest land area (ha.) per FLC			8.8
Cultivated forest land area (ha.) per FLC			6.7

Household densities in insurgency affected villages were significantly lower than in unaffected ones. Moreover, whereas unaffected villages registered a 30% net increase in household density, from 45 households per square kilometer in 1975 to 50 households in 1990, affected villages posted a net decrease of 7% from 17 households in 1975 to 14 in 1990 (Figures 16 & 17; Appendix Table 4.8). These differences further translated into having 8.6 ha. available to each household in affected villages compared to 3.6 ha. in the unaffected ones (Appendix Table 4.8). In terms of changes in the per capita A&D land area, affected villages posted a 12% increase between 1975 and 1990, while unaffected ones experienced a 30% drop in this indicator (Figure 17).

Given all these fluctuations in total population and number of households, village population in 1990 was found to be negatively correlated to the ratio of cultivated forest lands to forest land area (Table 16). Its impact was, however, less than what the indicators of accessibility exerted on the process of forest land conversion (Table 17).

Table 16. Correlation coefficient between 1990 village population and the ratio of cultivated forest lands to forest land area

Row variable	Column variable	r value
1990 population	Ratio of cultivated forest lands to forest land area	-0.60

*critical value (1-tail; prob.=0.05) = 0.52

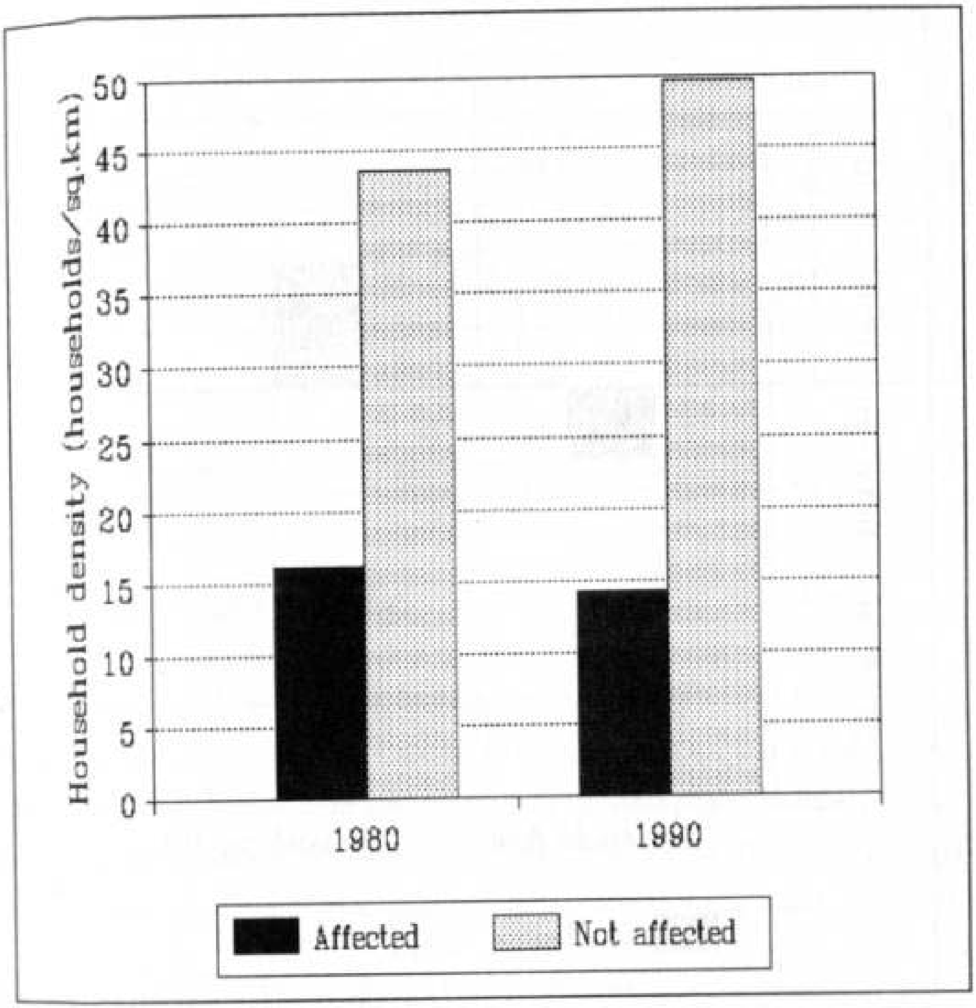

Figure 16. Comparison of the household densities during census years 1980 and 1990 between villages which were affected and not affected by the insurgency conflict

The regression model presented in Table 17 would indicate that changes in the area of forest lands placed under cultivation (reckoned as a fraction of the total forest land area per village) could mainly be attributed to the interplay of the three predictor variables. Although distance to the market center accounted for about two-fifths of the correlationship, the coefficients would indicate that making the villages more accessible to motor vehicles would present a more immediate impact on the area of cultivated forest lands.

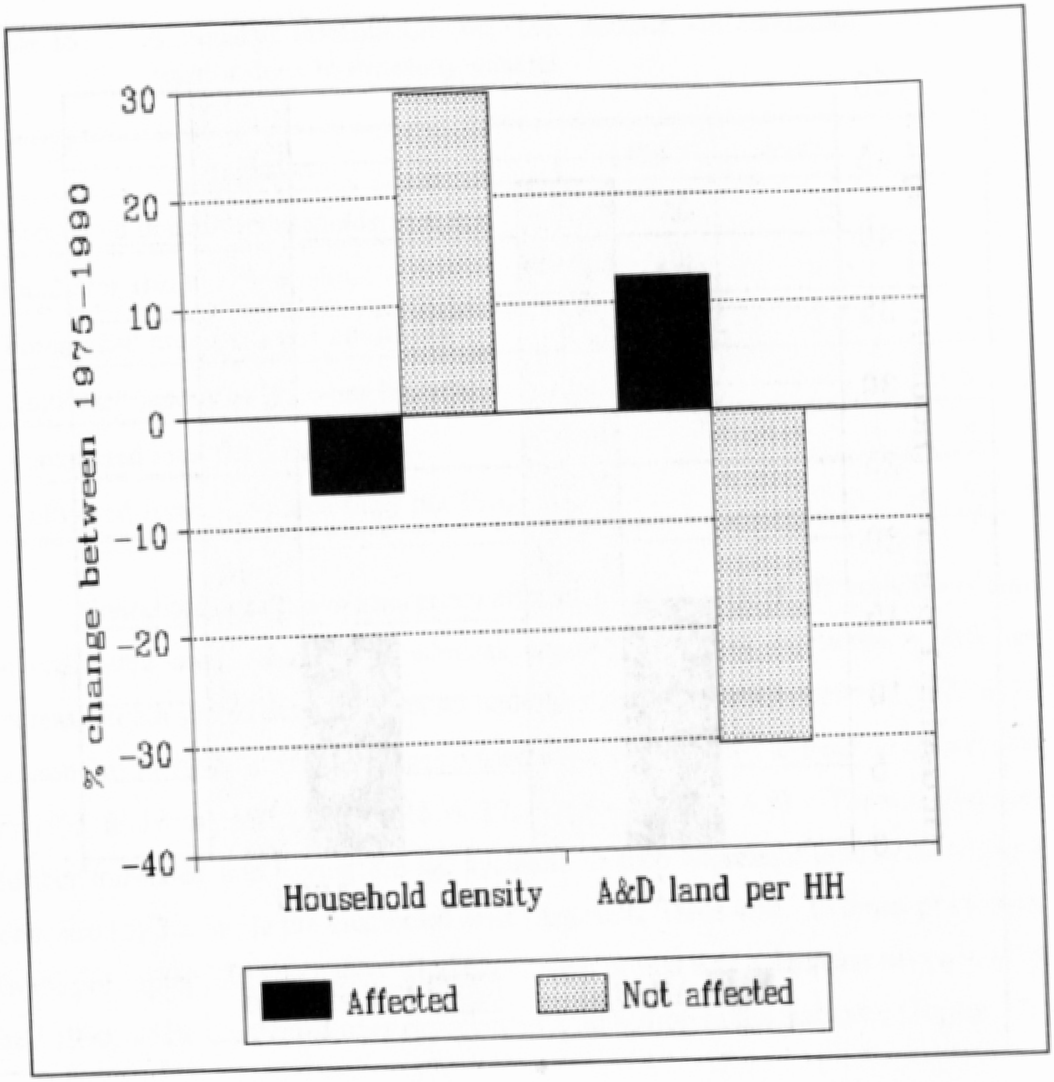

Figure 17. Comparison of the percentage changes in the household densities and the cultivated land area per household between villages which were affected and not affected by the insurgency conflict

Table 17. Regression analysis* between selected predictor variables and the ratio of cultivated forest lands to forest land area

Variable	coeff.	prob.	part. r^2
Distance of village to market center	-0.0088	0.07	0.39
Length of foot trail going to market center	-0.0490	0.14	0.28
1990 population of village	-0.0001	0.37	0.12
Constant	1.23		

*Adjusted R^2=0.72; R^2=0.80; R=0.90
Analysis of variance of model: F ratio=9.405; prob.=0.0075

4.2 The Forest Land Cultivators

4.2.1 The Respondents and their Households

The typical respondent was male, married, 48 years old and was able to finish Grade 4 (Table 18). Nonetheless, about one-fourth of the respondents were females and were usually widowed. Almost one-third of them were already over 60 years of age, and a little less than two-fifths had not undergone formal education (Appendix Table 4.9).

Table 18. Personal characteristics of the respondents

Characteristic	Value
Gender (% male)	74.2
Marital status (% married)	80.6
Age (years)	48
Educational attainment (years of formal schooling)	4

Looking at the whole household, a little more than half were composed of nuclear families. The families had seven members, or an average of five children each. The children were about 18 years of age and were likely to have completed the elementary grades (Table 19).

Considering that many of the children were already mature, the average household had only about five or six members; a figure similar to the average household size of the villages (Table 13). Of these, however, only three--usually the father, the mother and an unmarried child--participated in farm work. It was a common observation that one or two grandchildren lived with the respondents to form the extended household.

Table 19. Characteristics of the respondents' household

Characteristic	Value
Size of family (no. of members)	7
Average age of children (years)	18
Educational attainment of children (years of formal schooling)	6
Type of household (% nuclear)	54.8
Household size (no. of members)	5 to 6
Number of household members who help work in the farm	3

4.2.3 Landholdings

Most of the households cultivated three to four forest parcels for a total forest landholding of 4.0 ha. (Table 20). Going back to Table 15, the average forest landholding was close to the computed value of 3.5 ha. of forest land per household, but seemed too small compared to the computed ratio of 6.7 ha. of cultivated forest land per forest land cultivator. This difference could be traced to the communally-acknowledged rights of possession of fallowed areas (see e.g. DARGANTES & KOCH 1995a). Under this arrangement, a claim to a fallowed area would be respected even though the former cultivator no longer resided in the village or, as shown in some cases, could not anymore be identified.

Despite legal limitations on gaining ownership of forest lands, many of the households acquired communally-accepted rights of possession through various means. The most common was through inheritance, or the take-over of forest farms which elderly parents could no longer manage. In taking over these lands (aggregate size=2.5 ha.), the cultivator, considered a part-owner, usually shared the farm income with his/her living parents or other family members. The traditional form of gaining access into forest lands, achieved by opening up portions of the forest and claiming these newly-opened parcels (aggregate size=1.8 ha.), was found to be done by only eight households. On the other hand, an almost equal number of households (7) were found to have asserted full ownership over forest land parcels (aggregate size=2.3 ha.) after having paid-off the former claimants or cultivators. Institutionally different although conceptually similar ways of providing access to forest lands were the government's ISFP, of which three households were recipients, and the interpersonal usufruct arrangements entered into by six households and the previous claimants of their respective forest parcels. Both grant stewardship rights to the cultivators although the latter usually stipulated that the cultivator should be the one to pay the taxes due on the parcel.

(Based on a review of ISFP records, some of the parcels reported by the respondents to be covered by certain tenure systems were actually included in the program. The tenurial arrangement given by the respondent during the interview had been used here instead of the legal one in order to reflect the processes undergone by the farmers in securing their respective rights of possession to the concerned parcel.)

For four households, however, the cultivation of forest lands came in the form of tenancy. Sharing arrangements in tenanted forest lands involved various methods of dividing the proceeds of the cash crop sales (e.g. coconut and abaca). In most cases, however, the cultivator was being given the discretion whether to share with the claimant or not whatever subsistence crops were produced in the farm.

In terms of dominant crops, the most common was coconut; involving 18 households cultivating an average of 2.0 ha. The next dominant cash crop was abaca--cultivated by 14 households with an average aggregate farm size of 1.7 ha. Wetland rice, a dominant crop for nine households, was usually planted in 1.0 ha. irrigated terraces. Corn was cultivated by three households in 0.7-ha. parcels.

Not all of the forest parcels were cultivated during the time of data collection. Eleven households reported placing their parcels under forest fallow (average aggregate size=2.6 ha.), two households had high grass fallows (aggregate size=1.7 ha.) and four had low grass fallow (aggregate size=0.6 ha.). Many of the parcels reported as forest fallows were under "forced fallow" (see e.g. DARGANTES & KOCH 1995a) due to farmers' apprehension over the insurgency situation.

Table 20. Area of the forest farmholdings of the respondent-households by tenure status and dominant crop

Variable	Categories	n*	Mean
Number of parcels		31	3 to 4
Aggregate size (ha.) of farmholdings		30	4.0
Area (ha.) by tenure status	"Fully owned"	7	2.3
	Claimed	8	2.0
	Family property	24	2.5
	Program recipient	3	0.3
	Private usufract	6	3.3
	Tenanted	4	2.0
Area (ha.) by dominant crop	Coconut	18	2.2
	Abaca	14	1.7
	Wetland rice	9	1.0
	Corn	3	0.7
	Others**	5	1.5
	Low grass fallow	4	1.7
	High grass fallow	2	0.6
	Forest fallow	11	2.6

* n=number of households
**These included citrus, pineapple, ginger, chayote, banana and cacao.

Aside from cultivating forest lands, 16 households also cultivated farms in A&D lands. On the average, they tilled two parcels with an aggregate area of 1.9 ha. (Table 21).

Table 21. Area of the farms cultivated by the respondent-households in A&D lands by tenure status and dominant crop

Variable	Categories	n*	Mean
Number of parcels		15	1.8
Aggregate size (ha.) of farms		13	1.9
Area (ha.) by tenure status	Fully owned	3	2.0
	Family property	8	1.2
	Tenanted	7	1.2
Area (ha.) by dominant crop	Coconut	8	1.9
	Wetland rice	4	0.8
	Others**	4	1.2

* n=number of households
**These included corn, abaca, snap beans and pineapple.

Control over these parcels, however, was limited considering that only three households had full ownership over their respective farms. The other parcels were either still considered common family property, meaning they were cultivated under various sharing arrangements agreed upon by family members, or were merely tenanted. Further, family-owned lands and tenanted farms were smaller (aggregate area=1.2 ha.) compared to fully owned lands (aggregate area=2.0 ha.).

In terms of dominant crops, eight households were involved in coconut production in landholdings of 1.9 ha. The other common dominant crop, cultivated by five households, was wetland rice covering an aggregate area of 1.0 ha. (Table 21).

4.2.6 Income Status

Apparently, the forest land cultivators belonged to the lowest income group among the residents of Leyte. Their average annual income of P14,000 (approximately USD550), which included cash receipts as well as the imputed value of products used for household consumption, was only about half the 1988 average annual incomes of the residents of Leyte (P25,255) and Southern Leyte (P28,310). More importantly, their incomes fell below the 1991 poverty threshold of P2,457 per month as well as the 1991 food threshold of P1,866 per month for a family of six (Table 22).

Table 22. Sources of income and annual income of the respondent-households

Income source	Major sub-categories of income sources*	n**	Mean (in pesos)
Animal production	Piggery	17	2,152
	Poultry	22	475
	Sub-total	25	2,641
Off-farm occupation	Wages	16	4,476
	Non-wage occupation	6	1,448
	Sub-total	19	4,226
Farm production in forest lands	Coconut	19	2,138
	Abaca	12	1,224
	Grain crops	11	4,079
	Root crops	8	1,529
	Fruits	10	525
	Trees	4	718
	Sub-total	26	5,727
Farm production in A&D lands	Coconut	9	2,750
	Grain crops	5	8,891
	Fruits	5	1,215
	Sub-total	12	7,450
Remittances		8	4,638
Total annual income		31	13,604

* Please refer to Appendix Table 4.13 for complete list of sub-categories of income sources.
**n=number of households

A few of the households were not earning any income from their forest landholdings. Of the 26 who did, 19 earned income from coconut production, 12 from abaca, 11 from grains particularly wetland rice, ten from various fruit crops and eight from root and tuber crops. A few of them earned income from a variety of forest products such as timber, polewood and bamboos (4 households), as well as from assorted flowers and vegetables (3 households). As a whole, earnings from forest landholdings amounted to P5,727 and accounted for 44% of the annual income among the concerned households.

Of the 16 households with A&D lands, only 12 were able to earn income from their farms. Among them, nine were engaged in coconut production. Other crop sources of income included fruits (5 households), rice (4) and abaca (3). Production from A&D lands, at P7,450 contributed 47% to these households' income.

Aside from crop farming, another major source of income was the production of animals. The 25 households engaged in this income source mainly raised chickens both for home consumption and for sale, and pigs which were mainly sold during times of need for cash. Other animals from which a few households earned incomes were goats and carabaos. As a whole, backyard animal production brought in P2,600 to the household purse representing 20% of the total income.

Outside of their own farming and animal raising, 16 households strived to earn additional income as hired laborers in others' farms or as skilled or semi-skilled workers in non-farm occupations such as carpentry or by holding public positions in the village government. Six households, on the other hand, worked not on a wage basis but earned shares for their participation in such activities as coconut harvesting and processing, abaca harvesting and stripping and fuelwood gathering. These off-farm activities contributed P4,226 or 36% to the income of the concerned households.

In addition to what they earned directly for themselves, 8 households were recipients of remittances from family members working outside the village. This transfer income averaged P4,638 yearly or 26% of annual income.

Viewed as components of the aggregate annual income of a hypothetical forest land cultivator, however, forest landholdings would serve as the most significant source contributing 37% of the total annual income. This would be followed by off-farm occupation which would put in about 22%. Farming in A&D lands and backyard animal raising would contribute 18% and 16% respectively to the households' coffers.

Remittances from other family members, as a component of aggregate income, would contribute 7% to the yearly total (Figure 18).

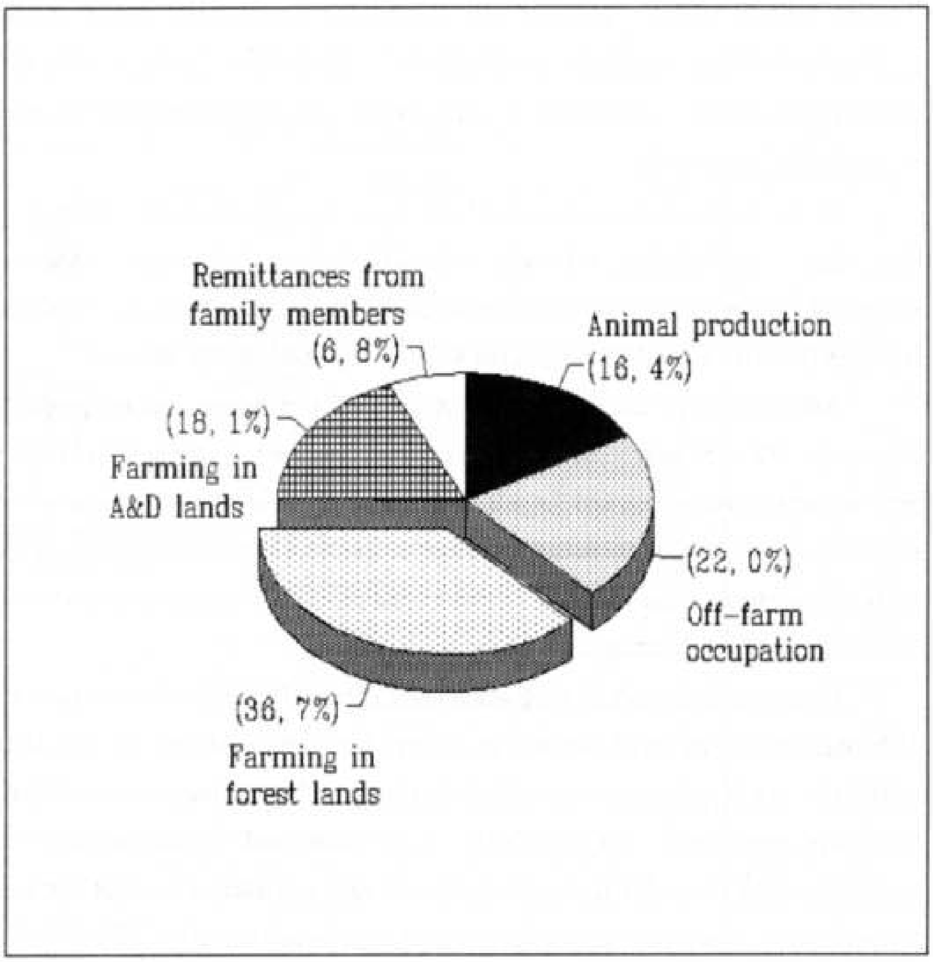

Figure 18. Percent contribution of various sources to the total income of a typical household of a forest land cultivator

The different sources of income were variably related to the level of forest occupancy, measured as a fraction of total landholdings (Table 23). Income from forest lands, measured as a fraction of total household income, was directly correlated to forest occupancy. Income from A&D lands and remittances from children and other household members, on the other hand, were correlated negatively to forest occupancy.

And so was the average educational attainment of the children of the forest land cultivators.

Table 23. Table of correlation coefficients between critically correlated* socio-economic variables and level of forest occupancy

Row variables	Column variables	r value
Forest landholding as a fraction of total landholding	Average educational attainment of children	-0.43
Forest landholding as a fraction of total landholding	Income from forest lands as a fraction of total income	0.56
Forest landholding as a fraction of total landholding	Income from A&D lands as a fraction of total income	-0.54
Forest landholding as a fraction of total landholding	Income from remittances as a fraction of total income	-0.39

*critical value (2-tail; prob.=0.05) = 0.39

This would indicate that income from forest lands, as a proportion of total household income, grew at the expense of bigger areas brought into cultivation. This served as a major force in the continued cultivation of forest parcels. As income derived from these farms increased, the more difficult it became for the cultivators to relinquish claim to their lands.

On the other hand, higher incomes from A&D lands would mean less attention to earning a livelihood from forest lands. This would similarly apply to those receiving remittances from other household members--mainly the grown up children--working somewhere else; especially when the children were better educated. Under these conditions, the need to claim additional forest lands had been dampened, or could have even ceased to be considered.

The regression analysis would, however, indicate that the four socio-economic variables could only account for about half of the variability in the level of forest occupancy. Of the four, income from A&D lands as a fraction of total income was the most significant accounting for 17% of the correlationship with the level of forest occupancy.

Despite this, however, the coefficients would indicate that increasing the share of remittances to total income would have a quite similar impact on forest land occupancy as improving income from A&D lands (Table 24).

Table 24. Regression analysis* between selected predictor variables and the level of forest occupancy

Variable	coeff.	prob.	part. r^2
Average educational attainment of children	-0.01	0.71	0.01
Income from forest lands as fraction of total income	0.23	0.19	0.08
Income from A&D lands as fraction of total income	-0.42	0.05	0.17
Income from remittances as fraction of total income	-0.44	0.27	0.06
Constant	0.85		

*Adjusted R^2=0.39; R^2=0.49; R=0.70
Analysis of variance of model: F ratio=4.954; prob.=0.0057

4.2.7 Perceptions and Opinions

From a variety of forest land uses which the respondents implemented in their respective farms, majority cited coconut production (58.1%) and food production (54.8%) as having contributed to the maintenance of their households' well-being. The other land uses cited as having benefitted the forest land cultivators were abaca production (38.7%) and the production of assorted fruits and vegetables (19.4%). Only two respondents reported as having derived benefits from reforestation and tree planting (Table 25).

Many respondents favored coconut production as a mode of forest land use based on their experience that this crop could provide them cash income on a regular basis. This situation was reinforced by the farmers' observations of the crops' good growth performance, by the farmers' possession of the necessary skills to process the nuts into copra, and by the ease with which the product could be sold. Similarly, these considerations affected the preference of some respondents for abaca production.

Table 25. Forest land uses identified by the respondents

Forest land use	n*	%
Coconut production (incl. multi-storey cropping)	18	58.1
Food production (grains and rootcrops)	17	54.8
Abaca production	12	38.7
Production of fruits and vegetables	6	19.4
Reforestation & tree planting	2	6.4

* n=number of households based on multiple response categories

In contrast, those who favored the growing of rice, corn and root crops were mainly interested to produce food for the family. Their preference was further bolstered by these crops' short cropping cycles and ability to withstand typhoons and to thrive under marginal conditions with minimal cultural intervention. Those who favored the production of fruits and vegetables were greatly influenced by their perception that these products were readily salable, and thus could serve as a reliable source of income. Interestingly, one of the two respondents who preferred the planting of trees also reckoned that this activity could be a reliable source of income; the other was mainly concerned with the prevention of erosion in his land.

Asked whether various forms of fallow vegetation could provide them benefits, majority of the respondents answered in the affirmative (Table 26). Only with respect to the low grass fallow dominated by ***Axonopus compressus* (Sw.) P. Beauv** did less than half give affirmative answers.

Among those who believed that a high forest fallow vegetation could be beneficial, their major consideration was that it could provide them timber and rattan for use in home construction and cottage industries. Another consideration was that a mature forest could provide water to irrigate their terraced rice paddies. In contrast, a significant number of these respondents perceived the beneficial contribution of mature forests in terms of its suitability to cultivation especially for such crops as abaca, root crops and vegetables. At the other extreme, one-third of the respondents were convinced that nothing could be gained from a mature forest because it would not have any useful plants and they were aware that harvesting timber and other wood products was legally prohibited.

Table 26. Number of respondents who believed that various forms of fallow vegetation could provide them benefits

Form of fallow vegetation	No. of repondents	% of repondents
High forest fallow/mature forest	20	64.5
Low forest fallow	26	83.9
High grass fallow (e.g. *S. spontaneum*)	19	61.3
Low grass fallow (e.g. *I. cylindrica*)	19	61.3
Low grass fallow (e.g *A. compressus*)	14	45.2

In the case of the low forest fallow, wood products and irrigation water decreased in importance as benefits whereas its suitability to cultivation became a dominant consideration. This was fostered by the perception that under a low forest vegetation, the soil would be fertile and therefore would be highly suitable for growing root crops. Only about one-tenth of the respondents thought that a low forest vegetation was non-beneficial because of the absence of useful crops.

With respect to the high grass fallow exemplified by the dominance of ***Saccharum spontaneum* L.** and ***Miscanthus floridulus* Labill. Schumann & Laut.**, the major consideration of the respondents was to plant corn or coconut in such areas. Interestingly, two respondents found this vegetational stage appropriate for the planting of trees. On the other hand, about 30% of the respondents opined that no benefit could be derived out of a high grass fallow because under such conditions crops would not grow well.

Most of the opinions pertaining to the high grass fallow also applied to the low grass fallow. Some respondents, however, pointed out that ***Imperata cylindrica var. cylindrica* (Linn.) P. Beauv.** (which they differentiated from ***I. cylindrica var. latifolia***, a less sturdy variety) provided a good roofing material. As for the low grass fallow dominated by ***A. compressus***, more than one-third of the respondents could not make up their minds as to whether it could provide benefits to them or not. Meanwhile, 16% were convinced that in this vegetational stage, the soil was considerably depleted to support worthwhile crop production. Nonetheless, others believed that such areas could still be cultivated for crops like corn or upland rice, rootcrops, fruits and vegetables. One respondent opined that these areas could benefit the farmers by providing pastures for their draft animals--the water buffalo--and other small ruminants.

4.3 Characteristics of Cultivated Forest Parcels

4.3.1 Physical Attributes of Cultivated Forest Parcels

The forest farm parcels visited in the course of the study were located within a radius of five kilometers from the village center, and seven kilometers from the nearest road which could be reached by motor vehicles. Although most of the respondents lived within three kilometers from their forest farms, a few resided outside the village where their farms were located.

Table 27. Descriptive statistics on the physical attributes of selected forest farm parcels

Variables	n	Min.	Max.	Mean	s.d.
Distance to farmer's residence (km.)	12	0	11	2.7	3.0
Distance to village center (km.)	12	0	5	2.2	1.4
Distance to nearest road (km.)	12	0	7	1.9	2.0
Elevation at lowest point (m. ASL)	12	70	680	208	181.0
Elevation at highest point (m. ASL)	12	100	720	241	187.5
Minimum slope (degrees)	12	8	35	18	7.7
Maximum slope (degrees)	12	21	55	34	9.9

The forest parcels ranged in elevation from 70 to 720 m. above sea level (ASL), and in inclination from eight to 55 degrees. Many, however, were located between 210 to 240 m. ASL with inclinations between 18 to 34 degrees (Table 27). Moreover, forest farms located farther away from the village or the road were more likely to be steeper as measured by maximum slope (Table 29).

With respect to their soils, loam was found in three parcels, clay loam, loamy sand and sandy loam in two parcels each, and silty clay loam, silty clay and clay in one parcel each. On the average, forest land soils would contain 55% sand, 25% clay and 20% silt; proportions which would indicate loam soils (Table 28).

Table 28. Descriptive statistics on the characteristics of the topsoil of selected forest farm parcels

Variable	n	Min.	Max.	Mean	s.d.
Clay content (%)	12	4.53	49.11	25.02	14.23
Silt content (%)	12	9.53	31.63	20.24	6.49
Sand content (%)	12	30.59	82.53	54.99	16.76
pH value	12	3.97	7.42	4.95	0.93
Nitrogen as NH_4 (ppm)	12	19.48	65.85	40.83	13.00
Nitrogen as NO_3 (ppm)	12	0	24.11	5.47	7.23
Total carbon (%)	12	1.08	5.49	2.62	1.24
Available phosphorus (ppm)	12	0	17.98	3.92	5.42
Potassium (ppm)	12	9.52	92.41	44.06	27.80
Magnesium (me/100g soil)	12	4.49	38.76	18.17	11.62
Calcium (me/100g soil)	12	2.62	26.57	11.99	7.79
Iron (ppm)	12	1.60	57.60	24.22	19.60

Generally, the soils were slightly acidic (pH value=5.0). Nitrogen level in the form of NH_4 (at 40.8 ppm.) was moderate but was highly variable as NO_3 with values ranging from zero to 24 ppm. Potassium (at 44.1 ppm.) and magnesium (at 18.2 milli-equivalent per 100g soil) were similarly moderate. Total carbon ranged from 1.08% to 5.49%, but with an average of 2.6%, many of the parcels could be characterized as still relatively fertile. Levels of available phosphorus (at 3.9 ppm.) and calcium (at

12.0 me/100g soil), on the other hand, were low. The deficiency in available phosphorus could be attributed to the high level of iron (at 24.2 ppm.) in the soils.

Further analysis revealed that soil texture was correlated with elevation; meaning that at higher altitudes, the soils of the forest farm parcel were more likely to contain less clay and more sand (Table 29). This relationship had been attributed by ASIO (1996) to three phenomena. First, the movement of water from higher elevation would, as a matter of course, bring along the finer soil particles, thus leaving behind the more coarser materials, namely: sand. Second, Leyte, being a volcanic island, would have had a series of eruptions from which came most of the present soils. Materials from the latest eruptions were deposited at the topmost portions, and being of recent origin, they developed into young soils containing less clay than sand. (As further shown in Appendix Table 4.19, concentrations of these two soil components were negatively correlated.) Third, at higher elevations which would be generally steep, weathering of parent material would be slower because water, a primary requisite in the process, could not stay long in the soil due to fast lateral movement. In other words, at higher elevations, formation of clay would be inhibited and its accumulation undermined.

Table 29. Table of correlation coefficients between critically correlated* physical attributes of the selected forest parcels

Row variables	Column variables	r value
Distance from village center	Distance from farmer' residence	0.64
Slope (maximum inclination)	Distance from village center	0.75
Slope (maximum inclination)	Distance from nearest road	0.64
% Clay	Elevation (at highest point)	-0.60
% Sand	Elevation (at highest point)	0.69
Total carbon	Elevation (at highest point)	0.79

*Critical value (2-tail; prob.=0.05) = 0.574

Among the topsoil properties included in the analysis, total carbon showed a positive correlation with elevation (Table 29). ASIO (1996) attributed this relationship to the slower rate of bio-mass decomposition at higher altitudes. On the other hand, the correlationship could indicate that parcels at higher altitudes were placed under cultivation comparatively more recently or were less intensively cultivated than those at lower elevations.

4.3.2 Vegetation in the Forest Farm Parcel

Vegetation in forest farm parcels consisted of a combination of cultivated plants, an assortment of forest trees, mainly pioneer species, and other plants which the farmers commonly classified as weeds. It also had a vertical differentiation which in this study had been stratified into: Stratum 1 for plants with heights of one meter or less; Stratum 2 for plants with heights between one to two meters; Stratum 3 for plants between two to six meters; and Stratum 4 for plants taller than six meters.

Stratum 1 held the concentration of plants in terms of number of species present and of percentage vegetative cover. Most of these plants, however, were weeds accounting for 16 species and 92.1% of vegetative cover (Table 30). Usually, two species would be cultivated at this stratum. The crop species included sweet potato [***Ipomoea batatas*** **(L.) Poir.**], taro [***Colocasia esculenta*** **(L.) Schott**], cassava [***Manihot esculenta*** **Crantz**], corn [***Zea mays*** **L.**], yautia [***Xanthosoma sagittifolium*** **(L.) Schott**] and pineapple [***Ananas comosus*** **(L.) Merr.**]. Three tree species could be found at this stratum. They consisted primarily of seedlings and coppicing pioneer trees which had been cut during land clearing, and thus provided minimal vegetative cover.

Strata 2 and 3 were vegetatively less crowded both in terms of number of species and percentage cover. In parcels with crops growing up to more than two meters, Stratum 3 was normally dominated by abaca and/or by bananas and plantains (***Musa x paradisiaca*** **L.**). Under such conditions, Stratum 2 would also be dominated by the young plants of these crops. In parcels not planted to abaca, fruit trees like papaya (***Carica papaya*** **L.**) occupied Stratum 3. Stratum 2, in this case, was then occupied by corn.

The stratum six meters above the ground was primarily dominated by coconut. In a few cases, fruit trees, usually jackfruit, shared this stratum with coconut. Pioneer and forest trees growing up to more than six meters were rare. In non-coconut plantations, especially parcels planted to abaca, these trees provided vegetative cover of between 5% to 70%.

Table 30. Number of species and vegetative cover of different plant groups occuring in forest farm parcels

Stratum	Plant group	Average no. of species	Average % cover
Str. 1 (0 - 1 m. above ground level)	Cultivated plants	2	20
	Non-cultivated trees	3	8
	Others	16	92
Str. 2 (1 - 2 m. above ground level)	Cultivated plants	1	4
	Non-cultivated trees	1	2
	Others	1	4
Str. 3 (2 - 6 m. above ground level)	Cultivated plants	1	6
	Non-cultivated trees	1	9
	Others	1	3
Str. 4 (more than 6 m. above ground level)	Cultivated plants	1	32
	Non-cultivated trees	less than 1	8
	Others	less than 1	less than 1

Taking the number of cultivated planted species and the percentage cover they provided in the different strata as indicators of the intensity of cultivation, certain vegetational attributes of the forest farm parcels could be identified (Table 31). For instance, more cultivated species in Stratum 1 were present in farms with fewer cultivated species growing up to more than six meters tall. This would indicate that coconut plantations with or without fruit trees were less likely to be planted to rootcrops. Or conversely, the production of rootcrops and other food crops was limited to areas without coconuts or other tall-growing species.

Intensive presence of the cultivated species in Stratum 1 similarly affected the number of other species growing to a height of one to two meters. This relationship would reflect the influence of crop maintenance on the establishment of such weeds as ***S. spontaneum***, ***M. floridulus*** and a wild species of banana. Clear-cutting of these species as well as their associated vegetation introduced conditions favorable to the planting of low-growing food crops. Weeding and maintenance activities ensured that the resurgence of such weeds were hindered.

Table 31. Table of correlation coefficients between critically correlated* indicators of intensity of cultivation and other atttributes of the forest parcels

Row variables	Column variables	r value
No. of cultivated species (Str. 1)	No. of cultivated species (Str. 4)	-0.59
% cover of cult. species (Str. 1)	No. of other species (Str. 2)	-0.67
No. of cultivated species (Str. 3)	% cover of tree species (Str. 1)	0.74
% cover of cult. species (Str. 3)	% cover of tree species (Str. 1)	0.90
% cover of cult. species (Str. 3)	No. of tree species (Str. 4)	0.62
% cover of cult. species (Str. 3)	% cover of tree species (Str. 4)	0.75
No. of cultivated species (Str. 4)	% cover of other species (Str. 2)	0.72

*Critical value (2-tail; prob.=0.05) = 0.574

The intensive cultivation of crops which could grow up to more than two meters was found to be related to the proliferation of trees at strata above and below the crop. Both the number of species and the percentage cover of crops at Stratum 3 were positively correlated with the vegetative cover of the undergrowth tree species. This was brought about by the coppicing of the saplings of various ***Ficus*** species which were cut during land clearing. On the other hand, farmers also allowed the seedlings of certain tree species to get established, grow and provide shade to the abaca. This was exemplified by the presence of ***Leukosyke capitellata*** **(Poir.) Wedd.** (70% cover at Stratum 4 and up to 2% cover in Stratum 1), ***Vitex parviflora*** **A. Juss** (32% cover at Stratum 4 and about 1% cover in Stratum 1), a ***Ficus*** species (10% at Stratum 4 and 2% in Stratum 1) and ***Leucaena glauca*** **(Moench) Benth.** (7% at Stratum 4 and 11% in Stratum 1).

The presence of more cultivated plants in the upper stratum also meant the occurence of more weed species growing at one to two meters tall. Considering that the number of cultivated species growing up to Stratum 4 was likewise negatively correlated to the number of cultivates present in Stratum 1, the emergence of 1-2 m. tall weeds could be traced to the non-implementation of farm maintenance activities. In here, the absence of weed control measures was a consequence of the absence of crops at Stratum 1 and influenced by the belief that the two-meter weeds could not adversely affect the crops which were more than six meters tall.

The total number of cultivated species was likewise affected by other attributes of the parcel (Table 32). Indirectly, parcels which were farther away both from the farmer's residence and the village center were more likely to have fewer cultivates or to be less intensively planted to these crops than those which were nearer. This could be attributed to the ensuing difficulty to monitor and implement maintenance activities in the more distant farms. Moreover, the cultivation of root crops which usually increased crop diversity was not undertaken because 1) products in distant farms were more susceptible to theft, and 2) they would be heavy and cumbersome to bring home or to the market. These difficulties were surmounted when coconut or abaca were cultivated in the parcel. With either of these crops, monitoring and maintenance activities became less demanding (undertaken 2-4 times a year depending on the harvesting regime), theft was more difficult to conceal (due to the very limited number of buyers of copra and fibers, the products of these crops), and both products had more economic value, on a weight basis compared to root crops, such that their transport to the village center or the market center became worthwhile.

In a more direct correlationship, steeper parcels had fewer cultivated species, depending on the farmers' evaluation as to which crops could best thrive therein. This matching of crops to parcel attributes could be discerned, for example, in the correlation between the percentage cover of cultivated plants dominating Stratum 2, particularly corn, and the clay and nitrogen (as NO_3) content of the soil. Abaca, which occupied mainly Stratum 3, was likely to be found in parcels which were sandy or less silty and less acidic. The negative correlation between the percentage cover of the crop dominating Stratum 4 (coconut) and the nitrogen content (as NH_4) of the soil would substantiate the claim of farmers that they planted coconuts based on their understanding that this crop could thrive better (compared to abaca) in degraded parcels (DARGANTES & KOCH 1995a&b).

Table 32. Table of correlation coefficients between critically correlated* physical attributes and indicators of the intensity of cultivation of the forest parcels

Physical attributes	Indicators of cultivation intensity	r value
Distance from farmer's residence	% cover of cult. species (Str. 1)	-0.62
Distance from village center	% cover of cult. species (Str. 1)	-0.72
Distance from farmer's residence	Total no. of cultivated species	-0.80
Distance from village center	Total no. of cultivated species	-0.64
Slope (maximum inclination)	Total no. of cultivated species	-0.65
% Clay	% cover of cult. species (Str. 2)	0.67
Nitrogen (as NO_3)	% cover of cult. species (Str. 2)	0.73
% Silt	No. of cultivated species (Str.3)	-0.64
% Sand	% cover of cult. species (Str. 3)	0.61
pH-value	% cover of cult. species (Str. 3)	0.75
Nitrogen (as NH_4)	% cover of cult. species (Str. 4)	-0.65

*Critical value (2-tail; prob.=0.05) = 0.574

The diversity of crops in Stratum 1 was found to be higher in forest parcels cultivated by farmers whose landholdings were mostly composed of forest lands and who were earning more from off-farm occupations (Table 33). It was, however, negatively correlated with extent of landholdings in A&D lands, either in terms of area available to each household member or as a fraction of total landholdings.

Mixed cropping in Stratum 2 was more likely to be practiced in parcels cultivated by farmers with larger forest landholdings or aggregate landholdings (Table 33). The number of cultivated species occuring at this stratum decreased, however, as the children got older and subsequently lived separately from their parents who themselves had grown older. More intensive cultivation of crops dominating this stratum (mainly corn) also meant being able to derive income from forest lands which formed a more significant component of total household income.

Table 33. Table of correlation coefficients between critically correlated* household characteristics and indicators of the intensity of cultivation of the forest parcels

Household characteristics	Indicators of cultivation intensity	r value
Size of A&D land per HH member	No. of cultivated species (Str. 1)	-0.58
A&D land as fraction of total land	No. of cultivated species (Str. 1)	-0.66
For. land as fraction of total land	No. of cultivated species (Str. 1)	0.66
Amount of off-farm income	No. of cultivated species (Str. 1)	0.62
Average age of children	No. of cultivated species (Str. 2)	-0.63
Size of forest landholding	No. of cultivated species (Str. 2)	0.87
Aggregated size of landholding	No. of cultivated species (Str. 2)	0.85
Income from forest parcel as fraction of total income	% cover of cult. species (Str.2)	0.58
Total household income	No. of cultivated species (Str. 3)	0.63
Average education of children	% cover of cult. species (Str. 3)	0.70
Income from A&D lands	% cover of cult. species (Str. 3)	0.82
Total household income	% cover of cult. species (Str. 3)	0.69
Income from A&D lands as fraction of total income	% cover of cult. species (Str. 3)	0.60
Household size	No. of cultivated species (Str. 4)	-0.69
Size of A&D landholding	Total no. of cultivated species	-0.72

*Critical value (2-tail; prob.=0.05) = 0.574

Households with higher total income were likely to cultivate parcels with a more diverse cropping system, which was achieved through the mixed planting of abaca, bananas and plantains, papaya, coconut and coffee, or a higher cropping intensity at Stratum 3. These parcels were more likely owned by farmers who earned higher incomes from A&D lands (either in money terms or as a fraction of total income) and who had children with higher levels of education.

The number of cultivated species dominating Stratum 4, or more specifically the cultivation of coconuts and the presence of fruit trees, was more likely to decrease in parcels cultivated by farmers with larger households. On the other hand, the diversification of crops, regardless of stratum, became less likely among farmers with bigger farms in A&D lands.

Obverse to intensity of cultivation (as an indicator of forest conversion) would be the resurgence of forest fallow vegetation which could be depicted as a multi-strata relationship (Table 34). For example, percentage cover provided by tree species at a height of up to one meter was correlated with the percentage cover of tree species at the strata of six meters and above. But as mentioned earlier, the intensity of tree presence in these strata was affected by the presence of abaca in Stratum 3.

Table 34. Table of correlation coefficients between critically correlated* indicators of the resurgence of forest fallow vegetation and other atttributes of the forest parcels

Row variables	Column variables	r value
% cover of tree species (Str. 1)	% cover of tree species (Str. 4)	0.70
% cover of tree species (Str. 2)	% cover of other species (Str. 3)	0.61
No. of tree species (Str. 3)	% cover of other species (Str. 3)	0.64
% cover of tree species (Str. 3)	Total no. of cultivated species	-0.65

*Critical value (2-tail; prob.=0.05) = 0.574

Conversely, the dominance of other plant species in Stratum 3 was associated with a more intensive cover provided by tree species in Stratum 2 and a greater number of tree species present in Stratum 3. (As shown in Table 35, the presence of other species in Stratum 3 could account for 42% of the correlationsip between selected predictor variables and percentage cover provided by tree species in Stratum 2). Greater dominance of trees at a height of two to six meters was accompanied by a decrease in the number of cultivated species in the parcel.

Table 35. Regression analysis* between selected predictor variables and the percentage cover of tree species occuring at Stratum 2

Variable	coeff.	prob.	part. r^2
% Silt	-0.19	0.02	0.49
% cover of other species (Str. 3)	0.14	0.03	0.42
Constant	4.98		

*Adjusted R^2=0.63; R^2=0.70; R=0.84
Analysis of variance model: F ratio=10.454; prob.=0.0045

The resurgence of forest fallow vegetation as indicated by the presence of tree species dominating Strata 1, 3 and 4 was found to occur more in less acidic soils (Table 36); with soil pH accounting for 58% of the correlationship between selected predictor variables and the percentage cover provided by tree species in Stratum 1 (Table 37). Moreover, parcels with trees reaching heights of more than six meters usually had higher levels of available phosphorus and calcium.

The presence of trees in Stratum 2, on the other hand, was more likely in parcels with less silt content as well as lower levels of magnesium and calcium (Table 36). Of these variables, however, silt content was the more significant determinant of this indicator of resurgence of forest fallow vegetation, accounting for almost half of the correlationship (Table 35).

The positive correlation between the distance of the parcel to the farmers' home and the intensity of the presence of trees at two to six meters (Table 36) would, obviously, reflect the previous observation that parcels located farther away were less intensively cultivated. Taken with the other variables, however, distance of the farm did not emerge as a significant predictor of the resurgence of forest fallow vegetation (Table 41).

Table 36. Table of correlation coefficients between critically correlated* physical attributes and indicators of the resurgence of forest fallow vegetation in the forest parcels

Physical attributes	Indicators of forest fallow	r value
Distance from farmer's residence	% cover of tree species (Str. 3)	0.86
% Silt	% cover of tree species (Str. 2)	-0.69
pH-value	% cover of tree species (Str. 1)	0.71
pH-value	% cover of tree species (Str. 3)	0.63
pH-value	No. of tree species (Str. 4)	0.73
pH-value	% cover of tree species (Str. 4)	0.81
Available phosphorus	No. of tree species (Str. 4)	0.82
Available phosphorus	% cover of tree species (Str. 4)	0.82
Mg (me/100g soil)	No. of tree species (Str. 2)	-0.64
Ca (me/100g soil)	No. of tree species (Str. 2)	-0.61
Ca (me/100g soil)	No. of tree species (Str. 4)	0.58

*Critical value (2-tail; prob.=0.05) = 0.574

Table 37. Regression analysis* between selected predictor variables and the percentage cover of tree species occuring at Stratum 1

Variable	coeff.	prob.	part. r^2
Off-farm income as fraction of total income	-11.91	0.03	0.44
pH-value	4.86	0.01	0.58
Constant	-8.07		

*Adjusted R^2=0.66; R^2=0.72; R=0.85
Analysis of variance model: F ratio=11.641; prob.=0.0032

Diversity in the occurence of tree species at Stratum 1 was primarily to be found in parcels cultivated by farmers who had larger A&D landholdings (in comparison to forest landholdings) and who earned significant portions of their incomes from animal raising (Table 38). The contribution of backyard animal production to total income was, however, the more significant variable; accounting for three-fifths of the correlationship. As shown in Table 39, a ten percent contribution of backyard animal raising to total household income could mean an additional tree species growing up to this stratum. This happened because farmers who derived more income from animal raising were less likely to be engaged in rootcrops or food production in the forest parcels.

Vegetative cover provided by tree species in Stratum 1 was more affected by the farmers' landholdings and sources of income (Table 38). Farmers who had bigger farms in A&D lands and whose incomes from A&D farms significantly contributed to total income were likely to be cultivating forest parcels wherein tree seedlings were getting established or saplings which were cut during land clearing were starting to coppice. On the other hand, farmers earning significant incomes from off-farm occupations were likely to cultivate forest parcels with lower vegetative cover at Stratum 1 attributable to tree species.

Of these variables, however, off-farm income (as a fraction of total income) was a more significant determinant of vegetative cover of tree species occuring at Stratum 1 (Table 37). Taken together with soil pH-value, it would account for 44% of the correlationship. In a forest parcel with an average pH-value (=5.0), a ten percent contribution of off-farm occupation to total income would reduce vegetative cover provided by seedlings and coppices by some two percent.

Vegetative cover provided by tree species growing up to one to two meters was more likely to be higher in parcels cultivated by farmers with smaller households (Table 38). Taken with the other variables, however, household size did not prove to be a significant determinant of the resurgence of forest fallow vegetation (Table 35).

Table 38. Table of correlation coefficients between critically correlated* household characteristics and indicators of the resurgence of forest fallow vegetation in the forest parcels

Household characteristics	Indicators of forest fallow	r value
A&D land as fraction of total land	No. of tree species (Str. 1)	0.68
For. land as fraction of total land	No. of tree species (Str. 1)	-0.68
Income from animal raising as fraction of total income	No. of tree species (Str. 1)	0.77
Size of A&D landholding	% cover of tree species (Str. 1)	0.75
Income from off-farm occupation as fraction of total income	% cover of tree species (Str. 1)	-0.58
Income from A&D lands as fraction of total income	% cover of tree species (Str. 1)	0.63
Household size	% cover of tree species (Str. 2)	-0.61
Average education of children	No. of tree species (Str. 3)	0.70
Per cap. area of A&D landholding	No. of tree species (Str. 3)	0.59
Size of A&D land per HH member	No. of tree species (Str. 3)	0.72
A&D land as fraction of total land	No. of tree species (Str. 3)	0.68
For. land as fraction of total land	No. of tree species (Str. 3)	-0.68
Income from A&D lands as fraction of total income	No. of tree species (Str. 3)	0.93
Size of A&D landholding	% cover of tree species (Str. 3)	0.67
Average education of children	No. of tree species (Str. 4)	0.72
Income from A&D lands	No. of tree species (Str. 4)	0.87
Average education of children	% cover of tree species (Str. 4)	0.75
Income from A&D lands	% cover of tree species (Str. 4)	0.96
Total household income	% cover of tree species (Str. 4)	0.62
Size of A&D landholding	Total no. of tree species	0.61
For. land as fraction of total land	Total no. of tree species	-0.69
Income from off-farm occupation as fraction of total income	Total no. of tree species	-0.61
Income from animal raising as fraction of total income	Total no. of tree species	0.58

*Critical value (2-tail; prob.=0.05) = 0.574

Table 39. Regression analysis* between selected predictor variables and the number of tree species occuring at Stratum 1

Variable	coeff.	prob.	part. r^2
Income from animal raising as fraction of total income	9.30	0.003	0.60
Constant	1.93		

*Analysis of variance model: F ratio=14.910; prob.=0.0032

Diversity of tree species growing up to Stratum 3 was higher in parcels cultivated by farmers with bigger A&D landholdings, with higher incomes derived from A&D farms and with better educated children (although this variable turned out to be a non-significant predictor of tree species diversity at this stratum). The results in Table 40 would further indicate that in these parcels a wild species of banana, ***S. spontaneum*** and ***Kolowratia elegans*** were significant components of the vegetation. The coefficients, however, would further show that for an average farmer, doubling his/her income from A&D lands might or might not translate into the establishment of an additional tree species in the forest parcel, but a one hectare increase in his/her A&D landholding could mean the establishment of two additional species.

Table 40. Regression analysis* between selected predictor variables and the number of tree species occuring at Stratum 3

Variable	coeff.	prob.	part. r^2
Income from A&D lands	0.00	0.00	0.98
% cover of other species (Str. 3)	0.21	0.00	0.96
A&D land as fraction of total land	-5.64	0.00	0.95
Per capita area of A&D landholdings	15.43	0.00	0.93
Size of A&D lands per HH member	-2.62	0.00	0.76
Constant	-0.02		

*Adjusted R^2=0.99; R^2=0.99; R=1.00
Analysis of variance model: F ratio=179.780; prob.=0.000002

Intensity of vegetative cover of tree species growing up to a height of two to six meters was also positively correlated with possession of farms in A&D lands (Table 38). This variable together with the total number of cultivated species could account for only about half of the observed correlationship (Table 41). Meaning, other factors not included in the analysis were likewise influencing the extent of dominance of these tree species.

Table 41. Regression analysis* between selected predictor variables and the percentage cover of tree species occuring at Stratum 3

Variable	coeff.	prob.	part. r^2
Total no. of cultivated species	-5.05	0.32	0.11
Size of A&D landholding	6.63	0.24	0.15
Constant	21.67		

*Adjusted R^2=0.40; R^2=0.51; R=0.72
Analysis of variance model: F ratio=10.454; prob.=0.0045

More tree species growing beyond six meters were likely to be found in parcels cultivated by farmers who derived more income from their A&D farms and who had better educated children (Table 38). Income from A&D farms by itself could already account for 62% of the correlationship (Table 42). The coefficients would, however, suggest that doubling the farmers' income from their respective A&D farms without educating their children could mean an additional tree species to the stratum. Allowing their children to complete the elementary grades without a change in income level could bring about similar results. Doing both could mean a five-fold increase in the number of tree species.

Table 42. Regression analysis* between selected predictor variables and the number of tree species occuring at Stratum 4

Variable	coeff.	prob.	part. r^2
Income from A&D lands	0.00	0.01	0.62
% cover of cultivated species (Str. 3)	-0.05	0.15	0.27
Average education of children	0.20	0.21	0.21
Ca (me/100 mg. soil)	-0.04	0.27	0.17
Constant	-0.35		

*Adjusted R^2=0.73; R^2=0.83; R=0.91
Analysis of variance model: F ratio=8.424; prob.=0.0082

These same relationships were similarly present when vegetative cover provided by these trees were used as indicators of the resurgence of forest fallow. This time, however, children's education served as a less significant determinant than total household income which exerted a negative influence on the indicator of forest resurgence. Nonetheless, with this indicator, income from A&D lands already accounted for 91% of the correlationship (Table 43).

Table 43. Regression analysis* between selected predictor variables and the percentage cover of tree species occuring at Stratum 4

Variable	coeff.	prob.	part. r^2
Total household income	-0.0002	0.18851	0.18
Income from A&D lands	0.0022	0.00001	0.91
Constant	1.8866		

*Adjusted R^2=0.93; R^2=0.94; R=0.97
Analysis of variance model: F ratio=74.604; prob.=0.000002

Taking all the tree species occuring in the forest farm parcels regardless of the stratum they occupied, positive correlations were observed between this indicator and the size of A&D landholding and the ratio of income from animal raising to total income, while negative correlations were observed with the fraction of forest landholding to total landholding and the ratio of income from off-farm occupations to total income (Table 38). Of these variables, income from two sources exerted significant but opposing influence on the establishment of tree species on the forest parcel (Table 44). The results would show that a farmer earning the average amount of income from off-farm occupation but without income from animal raising would have one tree species less in his/her parcel. Having an average income from animal raising even without off-farm income could mean one more tree species in the parcel.

Table 44. Regression analysis* between selected predictor variables and the total number of tree species

Variable	coeff.	prob.	part. r^2
Income from off-farm occupation as fraction of total income	-3.47	0.01	0.50
Income from animal raising as fraction of total income	5.47	0.02	0.49
Constant	4.36		

*Adjusted R^2=0.60; R^2=0.67; R=0.82
Analysis of variance model: F ratio=9.139; prob.=0.0068

4.3.3 Forest Land Use and Tenure Systems

From all the interviews conducted, data for a total of 293 forest land parcels were obtained (Table 45). On the average, each parcel had an area of 1.3 ha. These parcels were managed under various forms of tenurial arrangements. Many of these parcels were operated as family property (37.2%). Other parcels were "fully owned" by the cultivators (22.5%), claimed (19.1%), under private usufruct arrangements (12.6%) or tenanted (6.1%). Among these various tenurial arrangements, parcels attributed to the ISFP were the smallest (average size=0.2 ha.) while those directly claimed from the forest were the largest (average size=2.1 ha.).

In terms of dominant crop or vegetation, many of the parcels were planted to coconut (32.8%) and abaca (22.2%). Among the food crops, 7.5% of the parcels were planted to wetland rice, 2.0% to corn, 1.4% to sweet potato and 4.4% to various fruits and vegetables. The other parcels were under various stages of fallow, with vegetation characterized by low grasses (3.8%), high grasses (3.8%), low forest (16.0%) and high forest (6.5%).

Table 45. Area of forest farm parcels by tenure status and major crop

Variable	Categories	n*	Mean
Size of each farm parcel (ha.)		293	1.3
Area (ha.) of farm parcel by tenurial arrangement**	"Fully owned"	66	1.1
	Claimed	56	2.1
	Family property	109	1.3
	Program recipient	7	0.2
	Private usufract	37	1.1
	Tenanted	18	1.4
Area (ha.) of farm parcel by dominant crop***	Coconut	96	1.5
	Abaca	65	1.3
	Wetland rice	22	0.5
	Corn	5	1.0
	Sweet potato	4	0.6
	Others****	13	1.0
	Low grass fallow	11	1.0
	High grass fallow	11	1.3
	Low forest fallow	47	1.5
	High forest fallow	19	2.1

* n=number of forest parcels

** A one-way analysis of variance done for the different tenure categories yielded the following: F ratio=6.160; prob.=0.001

*** A one way analysis of variance done for the different categories of dominant crops (coconut, abaca, food crops to cover grains and rootcrops, and fruits and vegetables) and dominant vegetation (grass fallow and forest fallow) yielded the following: F ratio=2.948; prob.=0.013

**** These included cassava, taro, ginger, chayote, green onion, string beans, bananas and plantains, citrus, cacao and tobacco.

To a certain extent, the type of dominant crop and/or fallow vegetation was affected by the tenure arrangements prevailing in a particular parcel (Table 46). For example, coconut was more likely to be a dominant crop in "fully owned" and tenanted farms. As expounded in DARGANTES & KOCH (1995a), conversion of forest lands into coconut plantations was accompanied by a process of transfer of ownership through sale. Thus, most coconut-growing forest land cultivators were either actually the new owners (as their claim to full ownership reflects) or the tenants of plantations which the buyers could not manage themselves.

Meanwhile abaca tended to be dominant in claimed, family owned and "fully owned" forest lands. Apparently, claimed parcels were cultivated by first generation forest occupants who have not transferred ownership to somebody else. As such, their parcels were still well in the abaca plantation stage of forest land cultivation. In the family-owned and "fully-owned" parcels, the existence of abaca meant a carry over of the production system from the original claimant or some other intermediate-generation cultivator to the current one.

Table 46. Cross-tabulation of observed percentages between dominant crop or vegetation of and tenurial arrangement prevailing in the forest parcel

Dominant crop/ type of vegetation	Tenurial arrangements					
	"Fully owned"	Claimed	Family property	ISFP/ Private usufruct	Tenanted	Total
Coconut	8.9	5.3	10.2	5.0	3.0	32.3
Abaca	5.6	5.6	8.6	1.6	0	21.4
Food crops	1.3	1.0	5.3	2.6	2.0	12.2
Fruits & veg.	0	0.3	1.6	2.3	0	4.3
Grass fallow	4.3	5.3	8.2	3.6	1.0	22.4
Forest fallow	1.6	1.3	3.3	1.0	0	7.3
Total	21.8	18.8	37.3	16.2	5.9	100.0

X^2-value=44.632; d.f.=20; prob.=0.0012

On the other hand, food crops, particularly grains and rootcrops, were common in lands which were family owned, tenanted or under stewardship from the government or from private individuals. This relationship would portray the classic case of cultivating a non-permanent crop in a farm covered by an unstable tenurial arrangement. Farmers cultivating family-owned parcels were constrained to introduce more long-term crops considering that these were still subject to subdivision among family members. This lack of assurance had a similar effect on parcels under tenancy, stewardship and private usufract. Moreover, prevailing tenancy and private usufruct arrangements in Leyte allowed the cultivators to raise food crops with the sharing of the produce with the "owner" or usufruct-giver merely being a voluntary gesture from them.

Grass fallows were more likely to be found in claimed forest lands than in parcels under other forms of tenurial arrangements. This could be traced to the claimants' adherence to a system of shifting cultivation with shorter fallow periods. Repeated cycles of food production with longer cropping periods or shorter fallow intervals had led to a grass dominated fallow vegetation.

Forest fallows were common in family owned lands but rare in tenanted lands, ISFP areas and parcels covered by private usufract arrangements. This could be traced to the cultivators' hesitance to introduce long-term crops due to the absence of a definite right of possession to family-owned parcels. Moreover, in cases wherein a parcel was subject to subdivision among heirs, the cultivator became one of the owners, a dual role found not conducive to the implementation of more intensive cultivation as exemplified by food and cash crops production due to the possibility of a consequent imposition of land rent (by the other heirs) for the utilization of the forest parcel. In this case, a forest fallow would indicate the lack of definitive rights of possession to a parcel.

4.4 Forest Land Cultivation Practices

4.4.1 Farmers' Selection of Farm Sites

Of the 293 forest parcels covered by the interviews, only 38.6% were under forest vegetation at the time of initial cultivation by the respondent. The others were already planted to coconut (23.9%), abaca (22.2%), wetland rice (5.5%) or some other crops (2.7%), or under grass vegetation (6.8%). Initially, parcels under forest vegetation were the biggest (average size=1.9 ha.), while those with grass vegetation were the smallest (0.47 ha.). Those already under cultivation averaged between 0.7 ha. among those planted to wetland rice and 1.2 ha. among coconut lands (Table 47).

Table 47. Crops or type of vegetation existing in the forest parcels at the time of initial cultivation

Crop/Type of vegetation	No. of parcels	Ave. area (ha.)
Wetland rice	16	0.7
Coconut	70	1.2
Abaca	65	1.1
Other crops*	8	0.9
Grass fallow	20	0.5
Forest fallow	113	1.9

*These included upland rice (2), chayote (2), taro (1), cacao(1), corn (1) and citrus (1)

Among the cultivated parcels, the major consideration in taking over their management was their availability which came in the form of offers for the sale, mortgage or temporary use of the land, or in the form of inheritance. Other considerations included the farmers' need for more land to manage and their desire to become emancipated from the burden of paying land rent (Table 48). Half of the parcels planted to other crops were chosen based on their proximity to the village or to the farmers' residence.

A few parcels planted to abaca (10.8%) were selected by the farmers based on the type of soil, while 10.0% of the parcels planted to coconut were selected because of their having had a "history of cultivation." Consideration of the soil and the history of cultivation actually involved a complex of interrelated conditions indicated by the absence of large trees (or conversely the presence of pole-sized trees and saplings) and by a sparse undergrowth. Under these conditions, farmers reckoned that the soil would be fertile and the control of unwanted vegetation not arduous.

Table 48. Percentage distribution of forest parcels according to the antecedent variables taken into consideration by the respondents in their selection as farm site*

Antecedent variables	Wetl. rice	Coco-nut	Abaca	Other crops	Grass fallow	Forest fallow
Availability of parcel	81.2	80.0	78.5	50.0	45.0	33.6
Type of soil	0	7.1	10.8	0	15.0	17.7
Need for land	6.2	1.4	12.3	0	20.0	12.4
Previous use of land	0	1.4	0	12.5	10.0	21.2
Distance to settlement	0	5.7	7.7	50.0	5.0	7.1
For use in the future	6.2	4.3	4.6	0	0	8.8
Type of terrain	6.2	2.9	3.1	0	0	8.8
Emancipation	6.2	0	10.8	25.0	5.0	0.9
History of cultivation	0	10.0	6.2	0	0	0
Inaccessibility	0	0	0	0	0	4.4
Presence of water	6.2	2.9	0	12.5	0	0.9

*multiple responses

In the selection of areas under grass fallow, availability was a major consideration although not as pervasive as in cultivated parcels. Together with the farmers' need for land and their perception of the soil's favorable condition, prospective claimants looked into the previous use of a parcel as a selection consideration. By this, the respondents took extra effort to ensure that the previous cultivators of the parcels were no longer in the community and/or had expressed disinterest to cultivate the parcels concerned.

Among the parcels with forest vegetation, only 33.6% were selected because they were offered for sale or temporary use, or inherited. The second most common selection criterion was the previous cultivator's absence from the community and/or disinterest to recultivate the parcel, or the pervading knowledge among community members that the parcel had not been claimed by somebody else. Interestingly, 4.4% of the parcels were selected based on their inaccessibility--especially to free-range animals raised by other village residents and to forest guards.

The most prevalent process in the acquisition of farms planted to wetland rice, abaca and other crops involved inheritance (Table 49). In parcels planted to cash crops such as coconut (31.4%) and abaca (41.5%), right of possession and consequently cultivation was turned over through purchase. On the other hand, tenancy was common in irrigated rice fields (18.8%) and coconut plantations (15.7%). Private usufruct arrangements prevailed in parcels planted to coconut (24.3%) and other crops (25.0%) and under grass fallow (20.0%), but not in abaca plantations and parcels under forest vegetation. Stewardship under the ISFP commonly covered grass fallows.

Table 49. Percentage distribution of forest parcels according to the processes involved in the selection of the forest farm site*

Processes involved	Irrig. rice	Coco- nut	Abaca	Other crops	Grass fallow	Forest fallow
Inheritance	68.8	28.6	43.1	50.0	30.0	35.9
Purchase	12.5	31.4	41.5	25.0	5.0	10.3
Discussion with others	0	0	1.5	0	20.0	35.9
Private usufruct	0	24.3	7.7	25.0	20.0	10.3
Tenancy	18.8	15.7	3.1	0	0	1.7
Participation in ISFP	0	0	1.5	0	25.0	0.8
Registration of claim	0	0	1.5	0	0	5.1

*multiple responses

These different processes would point out two things. First, forest lands had increasingly been considered as alienable and disposable property as manifested by sale or mortgage transactions and the registration of claims for taxation. Second, some lands, although under forest vegetation were no longer "ownerless" or "claimantless," and therefore not anymore open to occupation and claim by others. This would explain why discussions among claimants over matters pertaining to their occupation and cultivation of lands under forest fallow involved only 35.9% of the parcels.

4.4.2 Forest Land Cultivation Practices

The process of conversion of forest lands took a number of circuitous routes (Figure 19). The first stage, however, would involve the forests' transformation into farms under shifting cultivation (54.72%), into abaca-based (11.11%), coconut-based (13.67%) or abaca-and-coconut-based (11.10%) farming systems, into vegetable production areas (7.69%) and into wetland rice paddies (1.7%).

As shown in Table 50, newly-cleared forests would give way to such crops as corn or, as previously practiced, upland rice (12.0%), root crops (13.7%) and fruit trees, bananas and plantains (1.7%). These few parcels planted to fruit trees and bananas usually continued to exist as they were, were altered with the establishment of coconut or abaca as additional crops, or got transformed into grain farms. Nonetheless, some 27.4% of the parcels which were under forest fallow upon their take over by the cultivators, especially those claimed by farmers who wanted to have some land for use in the future (Table 33) or those still considered common family property (Table 49), were maintained under forest fallow.

Parcels which went through the grain cultivation stage in the shifting cultivation system mostly proceeded into the rootcrops production stage; a sequence similar to the one decribed by CONKLIN (1957). Others were maintained as corn farms, although others took on new crops such as abaca, coconut or vegetables (Table 51). In a few parcels, grain cultivation was continuously implemented until such time that a grass fallow succeeded it (Appendix Table 4.27).

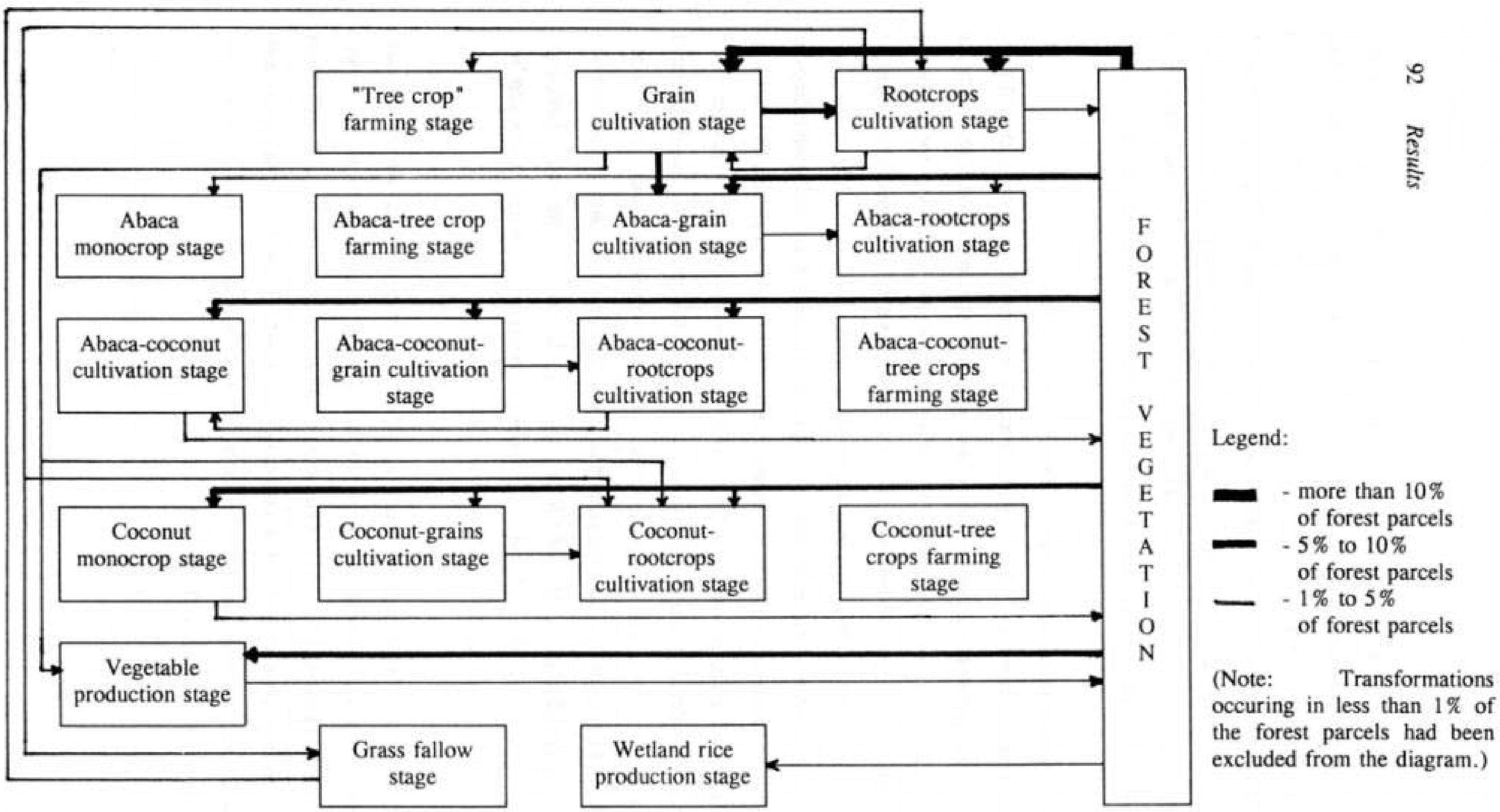

Figure 19. Schematic diagram of the land use transformations undergone by forest parcels in the course of cultivation

Table 50. Cultivation systems into which parcels with forest vegetation were transformed

Cultivation system	Sub-category	%
Shifting cultivation	Grain cultivation	12.0
	Rootcrops cultivation	13.7
	"Tree-crop" farming	1.7
	Forest fallow	27.4
Abaca-based farming system	Abaca monocrop	4.3
	Abaca-grain cultivation	5.1
	Abaca-rootcrops cultivation	1.7
Coconut-based farming system	Coconut monocrop	6.8
	Coconut-grain cultivation	3.4
	Coconut-rootcrops cultivation	2.6
	Coconut-based multiple cropping	0.8
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	4.3
	Abaca-coconut-grain cropping	2.6
	Abaca-coconut-rootcrops croppping	3.4
	Abaca-coconut-tree crops cropping	0.8
Vegetables-based production systems	Vegetable-abaca cropping	1.7
	Vegetable production	3.4
	Vegetable-rootcrops production	2.6
Wetland rice		1.7

From rootcrops production, some farmers cultivating 13.6% of the parcels transformed their areas back into corn fields (Table 51). (In some cases, this transformation was not thorough because sweet potato served as preceeding crop, intercrop and eventually residual crop to corn.) At this stage, abaca and coconut were already manifested in 43.2% of the parcels.

Table 51. Sequence of cultivation systems among parcels under grain, rootcrops and "tree crops" cultivation stages

Preceeding cultivation system	Succeeding cultivation system	%
Grain cultivation	Grain cultivation	5.7
	Rootcrops cultivation	45.7
	Abaca-based farming	14.4
	Coconut-based farming	14.4
	Vegetables-based production	11.5
Root crops cultivation	Grain cultivation	13.6
	Rootcrops cultivation	2.3
	Abaca-based farming	11.4
	Coconut-based farming	27.4
	Forest fallow	13.6
	Grass fallow	15.9

An almost equal number of parcels were transformed into forest fallows or became grass fallows after rootcrops production. This difference could be traced to a parcel's intensity of land use. Rootcrops production after a regime of intensive grains cultivation was likely to be succeeded by grass vegetation. When done immediately after forest clearing or after a short grains cultivation stage, the succeeding fallow was dominated by pioneer tree species.

Plantations with abaca as a monocrop were likely to remain as they were (21.0%), although an almost equal number would be transformed into a mixed culture of abaca and coconut (19.0%). In some instances, rootcrops, particularly ***X. sagittifolium*** and ***C. esculenta***, bananas and plantains and forest trees, particularly ***Erythrina fusca*** **Lour.** and ***V. parviflora*** would be mixed with the abaca. When confronted by the problem of the insurgency conflict, the farmers abandoned their plantations (11.6%) which then reverted to a form of forest fallow where abaca remained to be a significant component for some time (Table 52).

Abaca plantations where grain cropping was also practiced were later transformed into mixed cropping systems of abaca and rootcrops (31.2%), or abaca, coconut and rootcrops (18.8%). Some (25.0%) were still planted to grain crops, but this time coconut would have been added to the mix. In others, grain crops were replaced by fruit and tree crops (18.8%) or even by a forest fallow (6.2%).

Table 52. Sequence of cultivation systems among parcels under various abaca-based production systems

Preceeding cultivation system	Succeeding cultivation system	%
Abaca monocrop	Abaca monocrop	21.0
	Abaca-rootcrops cultivation	12.6
	Abaca-forest fallow	11.6
	Abaca-coconut-based farming	39.0
Abaca-grain cropping	Abaca-rootcrops cultivation	31.2
	Abaca-tree crops cultivation	18.8
	Abaca-coconut-based farming	43.8
Abaca-rootcrops cultivation	Abaca monocrop	12.5
	Abaca-grain cropping	12.5
	Abaca-forest fallow	29.2
	Abaca-coconut-based farming	33.3

In mixed plantations of abaca and rootcrops, farmers usually introduced coconut (33.3%). Another common transformation for these parcels, especially when the cultivators were hindered from performing farm maintenance activities due to the insurgency conflict, was to let the plantation revert into a forest fallow. A few parcels evolved into abaca monocropping or abaca-grain mixed cropping (Table 52).

Coconut plantations, on the other hand, were more persisitent forms of land use with 24.3% of the parcels maintaining their monocrop structure over time (Table 53). Some parcels, nonetheless, moved from a single crop to a mixed crop with abaca (17.5%), fruit and forest trees and bananas (9.7%) or a variety of grains and rootcrops

(Appendix Table 4.31). Parcels located in areas affected by the insurgency reverted to a form of forest fallow where coconut was a significant component. In cases where the coconuts had been severely damaged by typhoons, the parcels were allowed to revert into forest or grass fallows depending on the intensity of measures previously undertaken to control unwanted vegetation within the plantation.

In coconut plantations where corn was cultivated, the most common succession plants were rootcrops (Table 53). Unlike in abaca plantations, the dominant rootcrops in coconut plantations were sweet potato and cassava. In some cases, the hardy upland variety of taro was planted as a relay crop to corn.

After the coconut-rootcrops cultivation phase, the plantations were transformed into coconut-based multiple cropping systems (27.9%), or reverted into a monocrop structure (25.6%) or into a mixed culture with grains (20.9%). For some plantations (11.6%), especially those in areas affected by the insurgency, pioneer tree species got reestablished after the rootcrops had been exhausted. In the other parcels, abaca was introduced as an additional crop to the existing combination of coconut and rootcrops (Appendix Table 4.33).

Table 53. Sequence of cultivation systems among parcels under various coconut-based production systems

Preceeding cultivation system	Succeeding cultivation system	%
Coconut monocrop	Coconut monocrop	24.3
	Coconut-forest fallow	14.6
	Abaca-coconut-based farming	29.1
Coconut-grain cropping	Coconut-rootcrops cultivation	77.3
Coconut-rootcrops cultivation	Coconut monocrop	25.6
	Coconut-grain cropping	20.9
	Coconut-based multiple cropping	27.9
	Coconut-forest fallow	11.6
	Abaca-coconut-based farming	11.6

Parcels having a mixed cropping system of abaca and coconut were likely to progress into either a stage where fruit and tree crops had been introduced or a type of forest fallow containing both crops. The former occured in parcels which were maintained by the cultivators while the latter usually evolved in abandoned abaca-coconut plantations. In some of the parcels (14.6%), rootcrops were incorporated into the mixed cropping system, while in others (12.2%), abaca ceased to be a component of the mix (Table 54).

The grain-to-rootcrops sequence of cropping succession was still prevalent in abaca-coconut plantations where grain was cultivated on short rotations. In other parcels, the grain crop was not replaced but both crops were maintained or the plantation was allowed to go through a forest fallow by not controlling the reestablishment of pioneer trees (Table 54). Even those parcels which went through a rootcrops phase were likely to move into these two stages in abaca-coconut-based farming.

Table 54. Sequence of cultivation systems among parcels under various abaca-coconut-based production systems

Preceeding cultivation system	Succeeding cultivation system	%
Abaca-coconut mixed cropping	Coconut-based farming	24.4
	Abaca-coconut-rootcrops cultivation	14.6
	Abaca-tree crops cultivation	24.4
	Abaca-coconut-forest fallow	24.4
Abaca-coconut-grain cropping	Abaca-coconut mixed cropping	35.0
	Abaca-coconut-rootcrops cultivation	55.0
	Abaca-coconut-forest fallow	10.0
Abaca-coconut-rootcrops cultivation	Coconut-based farming	10.9
	Abaca-coconut mixed cropping	34.1
	Abaca-coconut-tree crops cultivation	25.0
	Abaca-coconut-forest fallow	22.7

Another successional type of cropping after rootcrops cultivation in an abaca-coconut plantation was one wherein fruit and forest trees were incorporated into the system. From this stage, however, the plantation would revert to a structure having abaca and coconut as the dominant components or would go through the type of forest fallow peculiar to this type of cultivation system (Table 54). Such fallow phase could not last as the pioneer trees would be cut to return the plantation into its two-crop structure, or into a plantation with rootcrops or fruit and trees as components of the mix (Appendix Table 4.37).

Parcels devoted to vegetable production could persist for some time or get transformed into an abaca-based farming system containing a combination of abaca and grains, rootcrops or fruit and tree crops (Table 55). Some parcels (12.0%) were converted into rootcrops fields after the growing of vegetables. Others were allowed to return to forest fallow (16.0%), while others, especially those which went through a history of grain cultivation, were replaced by a grass fallow (12.0%)

Table 55. Sequence of cultivation systems among parcels under vegetable and wetland rice production systems

Preceeding cultivation system	Succeeding cultivation system	%
Vegetable production	Rootcrops cultivation	12.0
	Forest fallow	16.0
	Abaca-based farming	24.0
	Vegetable production	20.0
	Grass fallow	12.0
Wetland rice cultivation	Wetland rice	60.7
	Grass fallow	28.6
Grass fallow	Grain cultivation	18.2
	Rootcrops cultivation	33.3
	Wetland rice	24.2
	Grass fallow	12.1

The cultivation of wetland rice in terraced hillsides could actually persist for some time (Table 55). In parcels which were marginally served by indigenous irrigation systems, a decrease in the volume of water could mean the abandonment of the terraced paddies; thus reverting these areas into grass fallow.

Consistent with the opinion of some farmers that grass fallows could be cultivated, parcels under this type of vegetation were converted into rootcrops fields, and those with available water for irrigation into rice paddies (Table 55). Parcels without possibility for irrigation, and which were usually under high grass fallow, were planted to corn. Some of the parcels were merely left uncultivated.

5 DISCUSSION

Forest loss in Leyte, indicated by the 72% decrease in forest cover from 1939 to 1990, paved the way for the 55% increase in cultivated and open lands within the same period. Moreover, these conversions were accompanied by changes in the areas planted to various crops. In 1948, corn, abaca and sweet potato occupied large areas, but by 1989 these had become minor crops. Within this same period, area planted to coconut tripled, that to wetland rice increased by 34% and that to sugarcane more than quadrupled. Placed in the context of the model of KOCH et al. (1990), these transformations would portray the interplay of ecosystem elements and socio-economic pressures on land as a resource and the vulnerability of forest lands as an ecosystem to the productionist goals pursued by individual farmers, by farm households and by society as a whole.

5.1 Factors Influencing the Occupation and Cultivation of Forest Lands in Leyte

The occupation of forest lands serves as the critical initial step in their cultivation and eventual conversion. Taking the parcels with forest fallow vegetation at the time of initial cultivation as a reference to this process, various factors were found to have played important roles in the selection of farm sites. These considerations included the parcel's availability, previous use of the land, the type of soil and of terrain, the need and desire for land, and the parcel's accessibility.

Previous use of land, the second dominant decision criterion in farm site selection refered to a parcel's being not in use (CONKLIN 1957) as indicated by the presence of forest vegetation and, therefore, cultivable without conflict with other farmers. Lands under forest fallow were considered not in use when the claimants no longer resided in the village (as exemplified by some of the uninterviewed randomly-selected respondents) or were not anymore known to the village residents, and when no other resident-farmer expressed interest to cultivate them. Abandonment of cultivated forest lands was also done by farmers faced with extremely unfavorable site conditions--e.g. the endemic presence of Schistosomiasis in one study village.

Logged-over areas also belonged to the category of not utilized lands. Timber harvesting, which started in the 1950s and became more extensive in the 1960s, set the stage for the widespread occupation of forest lands. The removal of merchantible timber made the land attractive to cultivate considering that the vegetation was already more amenable to clearing, and the soil still favorable to crop production. And as farmers had made known, type of soil and, to a certain extent, type of terrain were the physical attributes which they considered in selecting farm sites suitable for growing their preferred crops. Placed within the framework of their predisposition to cultivate logged-over areas or areas under forest fallow (primarily based on the perception that lands under forest vegetation would be a waste if not utilized for crop production), forest loss would provide a classic manifestation of RUTHENBERG's (1980) principle of farming.

The need for cultivable land, either as a means to satisfy basic subsistence requirements or as a means to emancipate oneself from the burden of paying land rent, and the occupation of forest lands by those who already had cultivable areas, purportedly to avail of land to hand over to their children as inheritance or to be used in the future as food production parcels once their other farms got dominated by cash crops, manifest the pressures exerted by socio-economic factors which had led farmers to occupy forest lands.

One major source of pressure had been population growth. Looking at Leyte mainland, its 1990 population of 1.64 million represented a 97% increase over that of 1939. In the face of such an increase in population, expanding the livelihood base--which would mean land in an agricultural economy--was a natural adaptive mechanism among landless peasants and small-scale farmers with growing families. In pursuit of the intended expansion, forest land cultivation came about as a feasible alternative, especially when farmers realized that a higher forest occupancy rate also meant a bigger contribution of forest farming to their total income. Moreover, it allowed the landless to gain access to a basic means of production and/or to escape from getting tied into feudal agrarian relations, and provided small-scale farmers the opportunity to increase their landholdings.

When seen in relation to changes in land use, however, further conversions of forest lands into cultivable areas had not automatically meant increases in the size of landholdings which could be placed under agricultural production. For example, the 86% decrease in per capita forest cover between 1939 and 1990 was still accompanied by a 21% decrease in the per capita area of cultivated and open lands. Expressed differently, the drop in forest cover per person, from 0.4 ha. in 1939 to 0.1 ha. (or 0.2 ha.) in 1990, still allowed the per capita area of cultivated and open lands to sink from 0.5 ha. per person in 1939 to 0.4 ha. in 1990. As a net effect, the island was stripped of forest cover but the area of arable land at the household level remained fragmented into small landholdings merely due to the number of family members who later became inheritors of the lands.

At the village level, the pressure exerted by population got overshadowed by the role of markets for farm products. By this, proximity and accessibility to market centers increased the susceptibility of forest lands to cultivation by the landless and by small-scale farmers and to speculation by the bigger landholders and local entrepreneurs. Accessibility, enhanced by roads between population centers, between farms and markets, within insurgency-affected areas, or within logging concessions, paved the way for farmers to become more market-oriented, a situation mainly manifested by the cultivation of such cash crops as abaca and coconut, and sometimes by the sale of some of their subsistence crops. Even at the household level itself, intensification of subsistence crop production was done in farms located near the home or the village center both of which could serve as exit points for products intended for the market.

The lower significance of population as a determinant of forest occupation and cultivation could, nonetheless, be traced to differences in demographic developments between villages affected by the communist insurgency and those which were not. Although the insurgency conflict somewhat eased the pressure exerted by population on the forest lands of the affected villages, the situation was mainly temporary and could have even contributed to the higher concentration of people in the unaffected villages. The resolution of the insurgency conflict could even open up a new wave of forest land occupations (as exemplified by villages with more forest land cultivators than registered residents), especially if reckoned within the context of the resumption of commercial logging in 1986 to 1994 which undoubtedly left behind logged-over areas. Nonetheless, the insurgency conflict demonstrated that people would actually dissociate themselves from cultivating forest lands if they had enough reason to do so. And, the reasons need not always be life-threatening.

Another criterion in the selection of a forest farm site was its proximity to the village settlement, the road, the farmer's residence or his other farms. From among these, the important point of reference was primarily determined by the objective of the land use system. For parcels intended for cash crop production, the selection process would mainly be influenced by access and proximity to market centers. Among farmers whose major interest was the production of basic subsistence requirements, selection was mainly dictated by the parcel's proximity to their homes. The higher negative correlation between the intensity of food crop production and the distance of the farm to the village (as compared to the distance of the farm to the home) would merely demonstrate that subsistence crops had assumed other roles; namely, as cash earners. An underlying influence to site selection in these situations were considerations such as the susceptiblity of the farm produce to theft and the ease to transport them to the home or the village center.

Obversely, a few farmers found accessibility and proximity incompatible to their production objectives; and thus made inaccessibility the criterion in the selection of a forest farm site. Faced with the threat of being accosted by forest guards, they selected sites which were difficult to reach--and thus to monitor. Others, wary about the devastation which could be brought about by unfenced or free-range animals of the other villagers, opted for parcels located at some distance from the settlement. They, however, admitted that cultivating too inaccessible areas similarly faced the problem of crop damage caused primarily by wild pigs and monkeys.

But the most prevalent determinant of forest occupation and cultivation was the farmers' knowledge of a parcel's availability. Mainly, availability came in the form of inheritance. Its other forms included offers for sale or usufruct and tenancy arrangements, and government programs.

The need to bestow resources to an upcoming generation, the underlying reason for the process of inheritance-giving, would serve as a major paradox in the loss of Leyte's forests. While forest conservation could be premised on the appeal for a judicious utilization of present resources in order that these could be similarly available to future generations, forest loss worked on the intention of providing the immediately succeeding generation with a usable resource from which they could generate desirable products. And apparently, reconciling this divergence would require a reassessment of the underlying motive behind inheritance.

Making the livelihood base secure and rewarding enough could serve as an over-all framework in this motive. Among the resource-poor households in Leyte, primarily those dependent on farming, animal production, forestry or agricultural jobs, availability of forest lands would provide the irresistible opportunity to a more profitable and more secure livelihood. Placed in the context that most of the forest land cultivators were earning less than the 1988 poverty threshold, passing on the resource to the next generation of cultivators provided for a mechanism for the preservation of the means of livelihood. For the non-inheritors, secure and rewarding livelihoods anchored on forest land cultivation were achieved by buying out former claimants, by entering into usufruct or tenancy agreements with erstwhile cultivators or with inheritors who were unwilling to cultivate the parcels themselves, or by participating in government programs. All these mechanisms not only provided access to forest lands but also sanctioned forest occupancy.

The matter of granting access to forest lands and of sanctioning forest occupancy could complicate on-going efforts in agro-forestry and social forestry as well as attempts at forest conservation and restoration. Although agro-forestry and social forestry could be seen as attempts to provide access to land to the rural population "while setting up mechanisms for its maintenance at a stage of land use which is part forest and part agriculture," the results of this study indicated that they had instead served as "the initial and institutionalized stage for the gradual but inevitable conversion of forest land into other uses" (DARGANTES & KOCH 1995a). Community acceptance (as exemplified by such transactions as inheritance, purchase and usufruct agreements) and government recognition (e.g. the Certificate of Stewardship Contract under the ISFP) of forest claims were related to intensive cultivation of food crops or the conversion of the land into agricultural plantations. Absence of definitive rights to possession (e.g. family-owned lands), on the other hand, was associated with parcels allowed to revert to forest fallow.

Even though forest land cultivation would represent the attempt of farmers to improve their conditions, the results would also indicate that better livelihood had taken on a broader dimension than mere farm production. One example would be the relationship that households with better educated children had lower forest occupancy rates. Seen within the context of inheritance-giving, it would show that some forest occupants had not limited their options to land as the only resource to bestow to family members in order for them to gain access to better means of livelihood. As such, this would demonstrate that forest cover need not always be sacrificed in order to provide resource poor farmers with worthwhile means of livelihood.

5.2 Factors Associated with Forest Land Use Practices

Modes of forest land uses had been increasingly varied depending on the circumstances revolving specific parcels. Although a little more than half of the land uses implemented after forest clearing could still be characterized as following traditional shifting cultivation practices (see e.g. CONKLIN 1957), the rest of the parcels were directly converted into permanent agriculture. Even among those parcels which went through the initial stages of traditional shifting cultivation (grain production and rootcrops production phases), less than 7% actually reverted to forest fallow vegetation.

The process of land use transformation occured within the context of a parcel's physical characteristics and the cultivator's socio-economic circumstances. Taking the transformation of a parcel from forest fallow to grain cultivation as an example, this occured in parcels which were predominantly clayey (and were therefore likely to be located at lower elevations and less steep), and high in nitrogen in the form of NO_3. The transformation into rootcrops production (and to a lesser extent into vegetable production) was likely to be conditioned by the parcel's level of accessibility to the home or to the village center. In cases where water could be tapped for irrigation, the parcel got converted into terraced rice paddies. If not, the parcel was continuously farmed with corn and rootcrops as major components until such time that further cultivation was no longer worthwhile, and thus it reverted to a grass fallow vegetation.

With respect to the characteristics of the cultivators, the above transformations were undertaken by those who derived the most benefit from producing food. These farmers were likely to be cultivating family-owned lands or lands covered by private usufruct agreements or by government programs, or tenants. Common among them was that whatever they produced accrued to themselves, and land rent was almost non-existent. They also had bigger landholdings much of which were forest lands from which came significant portions of their incomes. They would be young couples.

This last characteristic would then imply that these farmers were second or even third generation cultivators of forest lands. As such, their parcels would likely be destined for conversion into permanent forms of agriculture; a process which itself was influenced by ecosystem elements and socio-economic conditions.

Land conversion from forest fallow into permanent agriculture would usually go through a stage involving the cultivation of abaca. As discussed by DARGANTES & KOCH (1995b), abaca production could proceed from either the grain or rootcrops production phases of a traditional shifting cultivation regime, or it could be directly introduced together with other crops. Abaca was mostly planted in sandy and less acidic soils by economically better off farmers who had bigger A&D landholdings and whose children were better educated. All of these would further support the observation that abaca production was mostly done by original claimants who managed to earn relatively adequate incomes (both in relation to their needs and to the other forest land cultivators) from such a form of land use, or by other better off farmers who bought out the former claimants but continued the existing mode of land use.

Abaca could continue as a crop for very long if adequately maintained. Other economically disadvantaged farmers, however, tried to extract maximum returns from their farms and inadvertently wrecked the sustainability of the crop. And as grasses emerged in the plantations, farmers started to plant coconuts which eventually smothered the abaca plants into insignificance or even extinction.

This shift in land use was also accompanied by changes in the physical attributes of the parcel as well as in the socio-economic character of the cultivator. For example, intensive cultivation of coconut coincided with declining soil fertility as indicated by the level of nitrogen in the form of NH_4. For their part, the cultivators were likely to be new occupants with smaller households. They were new in the sense that they either took over the parcels as buyers, inheritors, temporary users under private usufruct agreements or tenants.

Moreover, either the declining soil fertility in coconut plantations did not apply to the entire area, or the new cultivators were extremely economically disadvantaged that they had to identify portions of the plantation to cultivate for food production. These sub-parcels were farmed following practices similar to a traditional shifting cultivation regime. The difference was that the plantation had a mainstay crop of coconut while the sub-parcels produced subsistence crops for home consumption and partly for income augmentation.

Although a few (4%) of all parcels returned to forest fallow vegetation after going through the stages of abaca and coconut production, most of these reversions were temporary having been influenced mainly by problems in the insurgency situation. Improvement in the peace and order situation had been shown to lead to the recultivation of the affected plantations, thus the loss of incipient forest vegetation to permanent agriculture.

5.3 Conclusions

The conversion of forest lands into agricultural areas could be circuitous or direct. Nonetheless, in the interest of forest conservation, the major and most direct route to the maintenance of forest cover would still be the non-utilization of parcels for crop production. But keeping a parcel under forest fallow had been demonstrated by farmers to be possible only when they had other resources outside of these parcels or when an unfavorable peace and order situation forced them to explore other sources of livelihood. And farmers' land use practices had shown that the number of parcels transformed from forest fallow vegetation into cultivated fields was higher than the number of parcels allowed to revert to fallow.

Going back to the social correlates of forest occupancy, there would definitely be options to enhance the ability of farmers to maintain their parcels under forest fallow. Income from agricultural activities in A&D lands had been demonstrated to be a negative factor in the occupation of forest lands. Improving farmers' productivity and raising their incomes from their farms in A&D lands could then dampen enthusiasm to clear forest vegetation.

Such a thrust would, nonetheless, necessitate a strengthening of the delivery of support services considering that these were considerably weak in the villages. As gathered, only 56% of the villages were served by the Department of Agriculture. Its field personnel, moreover, could visit only half of these villages for at most once a month; the rest had to do with two to four times a year. Of course, personnel of agencies like the Fiber Industry Development Authority and the Philippine Coconut Authority were present in a few of the villages. Their thrusts, however, were into the intensification of abaca and coconut production, and both of these crops had been major components of agricultural systems which had displaced forest vegetation.

A catch to the above recommendation would be that increased incomes could increase the desire for more land to place under cultivation, something which could be realized when there is enough capital to accelerate the process of conversion. This brings to the fore the two other social correlates of forest occupancy: the level of education of the children and the amount of remittances from them to their parents. Raising levels of education and creating the environment whereby the children of forest land cultivators could find sources of livelihood outside of forest land cultivation would be a long term strategy. In other words, the preservation of remaining forests would be enhanced through broad socio-economic concerns such as education and jobs.

Level of income from production activities in forest lands, as a positive social correlate to their occupancy, would have a direct implication on forests and forest land cultivators. So far, the growing importance of forest lands as a source of income was accomplished by increasing the area placed under cultivation. But as what a minority managed to demonstrate, forests as a form of land use could provide income to the household. Redirecting the majority toward this form of land utilization would allow cultivators to earn incomes from their forest lands. Farmers had shown that their occupancy of forest lands was in consideration of the returns they got from the activity. If forestry as a form of farmer-managed land use could be made to provide better income than agriculture, RUTHENBERG's (1980) principle of farming could be recast to become a principle of forest conservation which could then read:

> Natural forests are mostly economic (e.g. minimization of losses in downstream production areas and maximization of yield of such scarce resources as wood and irrigation water) and to a minor degree non-economic (e.g. generating a feeling of closeness to nature). Natural systems are productive in terms of human objectives. The basic principle of forest conservation is to maintain the natural system to produce the goods desired by humans. The man-made system, being of artificial construction, requires continuous economic inputs obtained from the environment to maintain its output level. Forest conservation is simply the furtherance of the productive steady and stable state.

Forests, particularly in an island ecosystem like Leyte, make up an important component of the environment which should be conserved for development to be sustainable. Modes of forest land cultivation which supress the characteristic of natural regeneration would threaten the sustainability of the farming system itself and would push the ecosystem to its stress limits.

By far, the poverty of the forest cultivators had been used as a premise in not pursuing forest conservation (see e.g. LA VIÑA 1991). Such fears persisted even though one major reason for launching the ISFP in the Philippines was the conviction "that among the less priveleged sectors of society, the *kaingineros* and other occupants of forest lands could be made effective agents of the state in food production and in the rehabilitation of forest lands" [see Philippine Presidential Letter of Instructions (LOI) No. 1260]. But so far, the aggregated land use data for Leyte island and the land use practices of the farmers both reflect that food production had not been the main pursuit of this sector, and rehabilitation had not been given the chance to come about. Agricultural land had been increasingly devoted to cash crops mainly for export with food production undertaken at the expense of forest lands. If rehabilitation were to be interpreted as the return of forest cover, then farmers should be made to understand this goal so that they could devote time and effort to attain it.

True, the regeneration of forest vegetation would hamper the farmers' food production efforts, but this should not be made a hindrance to the pursuit of forest restoration. At the current state of affairs, a parcel allowed to revert to forest fallow vegetation could provide the cultivator very little economic benefits; but it would bring about reforestation without cost to the government. If they could be compensated for the standing volume of trees in their respective parcels as well as for the increases in tree volume over time, then the forest rehabilitation objective of social forestry could be attained. And allowing them to harvest and directly profit from forest products such as timber and rattan poles, or to share in the benefits derived from other forest values, such as less destruction to infrastructure and prevented crop losses in downstream production areas, would put social forestry as the program to make forests a means for the betterment of the poor while not compromising the ability of future generations to meet their needs. Besides, both these measures could serve as a new stanza on the positive impact of humans on tropical rain forests and on themselves.

6 SUMMARY

The island of Leyte, Philippines portrays on a smaller scale the worldwide problem of forest loss. In 1990, its forests covered 12% of total land area, as compared to the 42% cover in 1939. Such loss has been attributed to the conversion of timberlands to shifting cultivation, commercial agriculture and non-forest plantations, and to the destructive practices of loggers.

This study aimed: 1) to identify the factors leading to and the processes involved in the cultivation of forest lands; and 2) to identify the factors associated with the farmers' forest land use practices and the changes occuring in these land use systems.

The study covered 16 villages, from which two sets of survey respondents were selected. One set was composed of 31 randomly-selected respondents who were interviewed about their household characteristics, economic conditions, perceptions and opinions, and land use practices and tenure arrangements in forest parcels. Of the 31 respondents, 12 were selected for more detailed observations of their farms and in-depth interviews with other household members or persons engaged in forest land cultivation. The other set of 69 non-randomly selected forest land cultivators were interviewed regarding their forest parcels as well as their farms in alienable and disposable (A&D) lands.

The major considerations among Leyte's forest land cultivators in selecting forest farm sites included availability, distance from the settlement, type of soil, and type of terrain. Availability came as offers for the sale, mortgage, or temporary use of forest lands, in the form of government programs, or as inheritance. The other considerations reflected the farmers' need and desire for cultivable land.

Government programs which made forest lands available to cultivation included settlement, food production and livelihood projects. Accessibility to forest lands, a significant determinant to their cultivation especially if reckoned in relation to market centers, had been enhanced by roads connecting population centers, farm-to-market roads, roads to penetrate insurgency-affected areas, and logging roads. Also contributing to forest loss were some reforestation projects which converted forest lands into plantations of fruit trees or of fast-growing, exotic species, and the ISFP which had issued more than 3,000 Certificates of Stewardship Contract covering an area of around 6,000 ha.

The prevalent processes in the acquisition of forest land parcels involved inheritance, purchase, private usufruct and tenancy arrangements. Informal discussions to assign sites to interested farmers and to agree on boundaries were undertaken in parcels under forest or grass fallow vegetation. These processes would indicate that forest lands had increasingly been considered as alienable and disposable property, and were no longer "ownerless" or "claimantless".

In Leyte, newly-cleared forests got transformed into grain farms (mainly planted to corn), rootcrop farms (usually with sweet potato, cassava and taro), non-forest plantations (abaca and/or coconut), vegetable farms and wetland rice paddies. Even parcels which went through the grains and rootcrops cultivation stages eventually got converted into abaca and/or coconut plantations. From the various land use transformations, only about 7% reverted to forest fallow vegetation. On the other hand, 27% of claimed forest lands were retained as forest fallows.

The transformation of forest parcels into various forms of land use were associated with their respective physical characteristics and with the cultivators' socio-economic circumstances. It reflected the farmers' matching of land endowments such as soil properties and land form with appropriate crops. Underlying the process of transformation were the farmers' own objectives--either to produce food mainly for consumption, to raise crops which could provide cash income, or a combination of both.

Forest land conversion could be circuitous or direct, but the most direct route to forest conservation remained to be the non-utilization of parcels for crop production. Placing a parcel under fallow was, however, found to be mainly possible if the farmers had alternatives such as income from A&D lands. For the long term, raising the level of education and creating the environment whereby the children of forest land cultivators could find sources of livelihood outside of forest land cultivation could contribute to the preservation of remaining forests.

Higher income from forest lands had been achieved by increasing the area placed under cultivation. But as what a minority of the respondents demonstrated, forests as a form of land use could provide income to the household. Redirecting the majority toward this form of land utilization would entail making forestry a better source of income than agriculture.

The poverty of the forest cultivators had been used as a premise in not pursuing forest conservation even within the context that the *kaingineros* and other occupants of forest lands could be made effective agents in food production and in forest rehabilitation. But so far, food production had not been the main pursuit of this sector, and rehabilitation had not been given the chance to come about. If rehabilitation were to be interpreted as the return of forest cover, then farmers should be made to understand this goal so that they could devote time and effort to attain it.

Forest regeneration would hamper the farmers' food production efforts. But a parcel allowed to revert to forest fallow vegetation, although giving the cultivator very little economic benefits, would bring about cost-free reforestation. If the farmers could be compensated for the standing volume of trees in their respective parcels over time, then forest rehabilitation could be attained. And allowing them to profit from forest products as well as share in the benefits derived from the forest could lead to the betterment of the poor while not compromising the ability of future generations to meet their needs.

7 ZUSAMMENFASSUNG

Die philippinische Insel Leyte repräsentiert in kleinem Maßtab das weltweite Problem des Verlustes tropischer Wälder. Im Jahr 1990 waren lediglich noch 12% der gesamten Fläche von Wald bedeckt, gegenüber 42% im Jahr 1939. Die hohe Verlustrate läßt sich erklären mit der Umwandlung von Wald in landwirtschaftliche Nutzflächen verschiedener Art sowie den destruktiven Praktiken der kommerziellen Holznutzung.

Die Untersuchung hatte zum Ziel, (1) die Faktoren und Prozesse aufzudecken, die zur Umwandlung von Waldflächen in Kulturland führen, und (2) die Faktoren zu untersuchen, die mit den Praktiken der Landnutzung und den Veränderungen solcher Systeme von Seiten der Landwirte zusammenhängen.

Die Untersuchung bezog sich auf die philippinische Insel Leyte. Aus den Anwohnern der 16 für die Studie ausgewählten Ortschaften wurden zwei Gruppen gebildet: Eine Gruppe umfaßte 31 stichprobenartig ausgewählte Familienvorstände, die hinsichtlich ihrer Haushaltsverhältnisse, finanziellen Situation, Meinungen sowie Nutzung und Besitzverhältnisse ihrer Waldparzellen befragt wurden. Aus diesen wurden weiterhin 12 für genauere Beobachtungen ihrer Waldparzellen und tiefergehende Interviews, auch mit Familienmitgliedern und anderen bei der Bewirtschaftung beteiligten Personen, ausgesucht. Die andere bestand aus 69 Bewirtschaftern von Waldflächen, die als zusätzliche Gruppe in Hinblick auf die Nutzung ihrer Waldparzellen und ihre Besitzverhältnisse befragt wurden.

Die Hauptaspekte der Bewirtschafter von Waldbeständen bei der Flächenauswahl betrafen die Verfügbarkeit einer Parzelle, die Entfernung vom Wohnort sowie Boden- und Geländebeschaffenheit. Verfügbarkeit betraf die Frage ob entsprechende Standorte zum Kauf, zur Pacht, als Erbe, zur vorübergehenden Nutzung oder im Rahmen von Regierungsprogrammen angeboten werden. Die anderen Faktoren zeigten die wirtschaftliche Notwendigkeit der Bauern.

Regierungsprogramme mit dem Angebot von Waldland betreffen Ansiedelungs-, Nahrungsproduktions- und Lebensunterhaltsprojekte. Der Zugang in die Waldgebiete, ein entscheidender Faktor bezüglich ihrer Entfernung zu den Marktorten, wurde verbessert durch Straßenbaumaßnahmen zur Verbindung von Ortschaften, unter militärischen Gesichtspunkten sowie zum Abtransport gefällter Bäume. Auch im Rahmen von Wiederaufforstungsprojekten durch Obstbaumkulturen oder schnellwüchsige, exotische Baumarten, und durch das Integrated Social Foresty Project (ISFP) mit über 3000 Verwaltungsveträgen, die eine Fläche von rund 6000 ha. betreffen, wurden Waldflächen umgewandelt.

Der Erwerb von Waldlandparzellen erfolgt hauptsächlich durch Erbe, Kauf, privaten Nießbrauch und Pacht. Absprachen über die Zuweisung von Flächen und der Grenzziehung erfolgten in Parzellen unter Wald oder Grasbrache. Dies zeigte, daß Waldland zunehmend als verfügbares und veräußerbares Eigentum angesehen wurde und nicht mehr als "besitzlos" oder "unbeansprucht."

In Leyte wurden neu gerodete Waldflächen umgewandelt in Anbauflächen von Getreide (hauptsächlich Mais), Knollenfrüchten (gewöhnlich Süßkartoffel, Maniok und Taro) und Gemüse, sowie in Anpflanzungen aus Faserbanane und/oder Kokosnuß sowie in Naßreisfelder. Manchmal wurden auch die Getreide- und Knollenfrucht-Stadien weiter in Faserbanane/Kokosnuß-Pflanzungen überführt. Von den verschiedenen Nutzungsformen wurden nur etwa 7% wieder in eine Waldbrache zurückgeführt. Andererseits wurde bei 27% des beanspruchten Waldlandes die Brachevegetation beibehalten.

Die Umwandlung von Waldland in verschiedene Formen der Nutzung richtete sich nach den Standortsbedingungen und den sozioökonomischen Verhältnissen der Bewirtschafter, d.h. es wurde von ihnen anhand der Eignung für bestimmte Kulturen bewertet. Die Auswahl erfolgte entsprechend den Bedürfnissen - entweder die Nahrungsmittelproduktion für den Eigenbedarf oder zum Verkauf, oder eine

Kombination aus beiden.

Die Umwandlung von Waldland könnte direkt oder über Umwege erfolgen, aber der effektivste Weg zum Schutz solcher Flächen ist nach wie vor der Verzicht auf eine Nutzung für die Nahrungsmittelproduktion. Die Möglichkeit, eine Parzelle wieder brach fallen zu lassen, besteht jedoch, wenn die Bewirtschafter alternative Einkommensquellen aus Ackerland hatten. Auf längere Sicht könnte eine bessere Gestaltung der Bedingungen hinsichtlich der Ausbildung der Kinder der Bewirtschafter zu einem Schutz der restlichen Wälder beitragen, indem Möglichkeiten des Einkommens außer einer Waldlandbewirtschaftung geschaffen wurden.

Ein höheres Einkommen durch die Nutzung von Waldland wurde größtenteils dadurch erzielt, daß die Flächen unter landwirtschaftliche Nutzung genommen wurden. Bisher hat erst eine Minderheit der Nutzer gezeigt, daß auch Wald als Nutzungsform ein Haushaltseinkommen erzielen kann. Wenn auch die Mehrheit der Bewirtschafter von dieser Form der Landnutzung überzeugt werden könnte, würde dies dazu beitragen, daß sich die Forstwirtschaft zu einer besseren Einkommensquelle entwickelt als Landwirtschaft.

Die Armut der Waldbewirtschafter wurde als Argument gegen die Walderhaltung angeführt, verbunden sogar mit der Erwartung, daß *kaingineros* (Wanderfeldbauern) einen wesentlichen Beitrag für die Nahrungsmittelproduktion und Wiederbewaldung leisten können. Bisher war aber die Produktion von Nahrungsmitteln kein Hauptbestandteil auf diesem Sektor, und einer Wiederbewaldung wurde auch noch keine Möglichkeit gegeben. Würde Wiederbewaldung als die Neuentstehung und dann die Erhaltung der Waldbedeckung interpretiert, sollte den Bewirtschaftern dieses Ziel nahe gebracht werden, so daß sie ihre Zeit und Leistung verwenden könnten, es zu erreichen.

Durch Wiederbewaldung würde allerdings die Nahrungsmittelproduktion der Bewirtschafter behindert. Ein braches Stück Land kehrt langsam in den bewaldeten

Zustand zurück. Der Bewirtschafter zieht daraus kaum ökonomischen Nutzen, aber es wird auch eine kostenlose Wiederaufforstung erhalten. Wenn die Bewirtschafter einen Ausgleich dafür bekommen würden, daß sie das Wachstum von Bäumen auf ihrem Land sicherstellen, könnte das Ziel einer Wiederaufforstung erreicht werden. Dabei sollte dem Betreiber erlaubt werden, Waldprodukte zu ernten und Anteile der anderen aus Wald enstehenden Güter zu bekommen, um somit zu einer Verbesserung seines Lebensstandards beizutragen. Damit wäre gleichzeitig gewährleistet, daß auch die Bedürfnisse späterer Generationen erfüllt werden können.

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APPENDIX 1

NOTES ON THE PROBLEM OF FOREST LOSS IN LEYTE AND THE CONCEPTUAL FRAMEWORK USED IN THE CASE STUDIES

1.1 Forest Cover Inventories and Land Classification in Leyte

Appendix Table 1.1 Forest cover inventories in the Leyte island group

Land use/ Type of vegetation	1939*		1987**	
	Area (ha.)	Percent	Area (ha.)	Percent
Total area inventoried	798,690	100.00	799,500	100.00
Open & cultivated land	454,290	56.88	702,800	87.90
Land with forest cover	334,930	41.93	93,000	11.63
Commercial forest	278,270	34.84	n.d.	n.d.
Non-commercial forest	56,660	7.09	n.d.	n.d.
Old growth forest	n.d.	n.d.	18,400	2.30
Second growth forest	n.d.	n.d.	58,900	7.37
Mossy forest	n.d.	n.d.	15,700	1.96
Swamps & marshes	9,470	1.19	3,700	0.46

n.d. no data available
Sources: * BARRERA et al. 1954
** ACOSTA 1990

Appendix Table 1.2 Area (in ha.) according to land classification in the Leyte island group for the period 1980 to 1986*

Location	Land Classification	1980	1981	1982	1983	1984	1985	1986
Leyte	A&D land	431,510	406,282	374,059	372,074	436,173	436,173	417,245
	Forest land	195,316	220,544	252,767	254,756	186,826	186,826	205,026
	Unclassified forests	23,055	10,555	131,320	71,204	23,202	0	0
	Forest reserves	0	0	0	0	1,475	1,475	15,588
	Timberland	172,261	209,989	121,447	183,552	158,548	181,750	185,867
	National parks	0	0	0	0	3,601	3,601	3,571
Southern Leyte	A&D land	117,658	117,658	92,523	82,129	100,316	100,316	100,316
	Forest land	55,822	55,822	80,957	91,351	60,075	60,075	60,075
	Unclassified forests	0	0	30,272	5,621	0	0	0
	Timberland	55,822	55,822	50,685	85,730	60,075	60,075	60,075
Leyte Island Group	A&D land	549,168	523,940	466,582	454,203	536,489	536,489	517,561
	Forest land	251,138	276,366	333,724	346,107	246,901	246,901	265,101
	Unclassified forests	23,055	10,555	161,592	76,825	23,202	0	0
	Forest reserves	0	0	0	0	1,475	1,475	15,588
	Timberland	228,083	265,811	172,132	269,282	218,623	241,825	245,942
	National parks	0	0	0	0	3,601	3,601	3,571

*From 1986 to 1992, no change in land classification has been reported.

Appendix Table 1.3 Forest cover inventories in relation to forest lands in Leyte

Land use/ Type of vegetation	1972*		1990**	
	Area (ha.)	Percent	Area (ha.)	Percent
Total area inventoried	104,187	100.0	217,500	100.0
Open & cultivated land	13,871	13.3	130,700	60.1
Open land	7,491	7.2	n.d.	n.d.
Cultivated land	6,380	6.1	n.d.	n.d.
Land with forest cover	90,316	86.7	86,800	39.9
Old growth forest	67,369	64.7	10,100	4.6
Second growth forest	21,102	20.2	76,700	35.3
Reproductive brush	1,845	1.8	n.d.	n.d.

n.d. no data available
Sources: * YAMBOT 1975
** ERD-MO 1990

1.2 Agroecosystem Establishment as a Product of the Interactive Relationship between Ecosystems and Socio-economic Systems

When humans lived as hunters and gatherers, their actions did not drastically alter ecological structures. With the domestication and cultivation of plants and animals, natural ecosystems gave way to agricultural systems which eventually transformed entire landscapes. For their part, most agricultural plants and animals possess characteristics that predispose them to domestication. They have life-history traits that are opportunistic, with short life cycles of rapid growth (r-strategy). Mostly, the plants allocate large portions of their energy and nutrients to organs--e.g. nutritious fruits, seeds and tubers--which are consumed by humans. Farm animals, on the other hand, efficiently convert fibrous plant material into high protein meat and milk, and exhibit submissive and gregarious behaviour which facilitate herding, and/or breeding and rearing in captivity (STINNER & STINNER 1989).

In the furtherance of the production objective, studies on the biology and husbandry requirements of agricultural plants and animals have been directed towards the exaggeration of the beneficial species characteristics. The outcomes of these studies and the management of such information primarily serve as bases for the control of agroecosystem structure and dynamics (commonly manifested as land use patterns and agricultural practices), of the distribution and dispersion of species (mainly as a consequence of input availability across ecosystems), and ultimately, of the utilization of ecosystem products (whether for subsistence, for trade or for industrial applications).

While pursuing higher productivity, conflicts arise in the control of conponents of the agroecosystem, and in the exercise of the control mechanism itself. In the control of agroecosystem components, conflicts stem from the application of alternative production methods (e.g. monoculture vs mixed culture), from the presence or absence of materials to maintain or enhance species productivity (e.g. hybrid seeds, soil fertility enhancers, fodder and feeds, etc.), or from the competing uses of agricultural output (e.g. corn as food vs feed ingredient, vegetables and fruits for local consumption or for export, etc.). On the other hand, conflicts in the exercise of the control mechanism emanate from the type of decisions reached as well as the methods used in reaching these decisions. This shows that research information and technology, and their management, being components of the control mechanism, not only have implications on social welfare but also on ecosystem structure and dynamics.

A study of agroecosystems inevitably looks at "the relationship between farming practices and the environment that sustains them" (BAYLISS-SMITH 1982) including the influence of ecological and societal pressures upon the decisions and behaviour of farmers. BAYLISS-SMITH (1982) identified the ecological factors to be solar radiation (as primary source of energy), crop type and cover (as determinants for the conversion of solar radiation into usable energy), rainfall (as a major determinant of cropping seasons), and availability of nutrients (as determinant of the health, growth and productivity of the organism). [RAMBO & SAJISE (1984) refered to these as the interacting ecosystem components of water, soil, climate and living organisms.] Societal influence, according to BAYLISS-SMITH (1982), operates through population pressures (as a major determinant of the intention to maximize production), technological innovations (the applications of labor reduction processes for the maintenance of agricultural systems), structures of social organization (as stages in the the process of social evolution), and the values to which farmers conform to when making decisions (as adaptations of farmers to ecological problems). [RAMBO & SAJISE (1984) refered to these values as ideology.] All these ecological factors and societal influences correspond to the POET variables (population, organization or non-material culture like customs and beliefs, environment or natural resources in the habitat, and technology) more commonly associated with human ecology (BHARADWAJ 1992).

1.2 Human Ecology Applied to the Study of Agroecosystems

Human ecology, the field of sociology which deals with the study of the interrelationship of human societies and the physical environment (HAMM 1986), was founded by sociologists Louis Wirth, Robert Ezra Park, Ernest W. Burgess and Roderick McKenzie (BHARADWAJ 1992). It initially took the processes of city development as its research agenda. As an analytical framework, it evolved various theories to explain human and environmental interrelationship, developed methods to study such interrelationship and expanded its scope to include other phenomena in addition to the study of urbanization processes.

Human ecology came to be used in the analysis of agroecosystems to allow physical, biological and social scientists to see how their specialized fields are interrelated when looking at situations experienced by farmers (RAMBO & SAJISE 1984).

With the systems perspective of the human ecology framework, RAMBO & SAJISE (1984) stipulated that "each specific local system is always interacting with neighboring local systems (a manifestation of horizontal integration into system networks) and systems of lesser scale below it and greater scale above it (called vertical integration into systems hierarchies)." In analyzing a particular social or ecological system, therefore, its position in relation to other systems must be taken into account to assess the influences of its horizontal and vertical relationships.

In terms of agroecosystems performance, the human ecology perspective endeavors to improve the 1) productivity or the desired output of a system; 2) stability or the property of short-term homeostasis or constancy of productivity despite environmental changes; 3) sustainability or the ability of a system to persist despite repeated stress or a major perturbation; and, 4) equitability or the pattern of distribution of the products of the agroecosystem among the humans who interact with it (CONWAY 1984). Expressed differently, RAMBO & SAJISE (1984) pointed to the following concerns of human ecology research:

1) the assessment of the carrying capacity of various types of agroecosystems considering that as productivity approaches its biological limits, the danger of agroecosystem collapse due to overstress increases;

2) development of strategies for regenerating overstressed systems resulting from human mismanagement as shown by falling productivity;

3) design of systems that offer maximum buffering capacity to cope with an unpredictable perturbations in the future; and,

4) analysis of relationships between changing agroecosystems and the quality of human life in order to avoid unanticipated impacts.

Moreover, RAMBO & SAJISE (1984) recognize that this framework "provides a viable conceptual basis for empirically analyzing ... the issues of social, economic, and political dominance and exploitation" while acknowledging that in the development of human ecology, issues of competition, conflict, exploitation and resulting human misery have largely been ignored. With respect to the study of system dynamics, they posited that "ecologists have had a great advantage over social scientists in that their work has been guided by Darwin's [theory of evolution]. . . Social scientists have been hampered in their research by the lack of any generally accepted theory of change in social systems comparable to Darwinian theory in the biological systems." They opined that "structural-functionalism . . . is a static model with no built-in mechanisms for explaining the occurence of change. [On the other hand,] Marxism . . . is explicitly concerned with explaining change but . . . is based upon underlying assumptions that are incompatible with the Darwinian model employed in ecological analysis." In the absence of a model to propose, they believed "that one of the most important tasks of social scientists concerned with human ecology research on agroecosystems is to develop an approach that is compatible with the Darwinian model employed by their ecologist colleagues."

1.3 Social System-Ecosystem Unity

Moving towards a new framework to deconstruct the social system-ecosystem dichotomy while examining the components and interactions of both systems within the context of the situation at hand and not within the framework of defined paradigms, the agroecological world view expounded by NORGAARD (1987) and the socio-ecosystems view described by DARGANTES (1993) could serve as starting points.

1.3.1 The Agroecological World View

This perspective is concerned with the evolution of each organism within the context of a larger evolving system--with people considered to be a part of the local evolving systems. It holds that even though species may travel, the evolutionary path of the larger system remains unique to a specific area. And in the course of this evolution, the resulting nature of a biological system reflects the nature of the people as manifested by their social organizations, knowledge, technologies and values. As example, the decision on which species to allow to dominate a landscape or on which forms of biological relationships to assist depends on people's values, knowledge, technology and social organization. Conversely, the nature of the people is a reflection of the characteristics of the physical and biological environment which "lead to different ways of knowing, select for different forms of social organization, support different technologies and encourage different values" (NORGAARD 1987). In this view, the ecosystem includes the knowledge system, the value system, social organization, technology and the biological system.

1.3.2 "Socio-ecosystems" View

The other perspective looks at interrelationships between components of a social system and the ecosystem, and considers an ecosystem to be a "functional system which includes the organisms of a natural community together with the environment" (PARKER et al. 1989). It suggests that "all natural communities or assemblages of organisms which live together, and interact with one another, are closely related to the environment," and proposes that "organism" be defined to include humans, and "assemblages of organisms" to include forms of human organization. And, the term socio-ecosystem is used here to describe this framework and to differentiate it from other ecosystem sub-categories and hierarchies.

From the point of view of ecology, human intervention defines the naturalness of an ecosystem. When the behaviour of the individuals present in the ecosystem are manifested by other species, the intervention is considered to be part of the natural ecosystem. This notwithstanding, human behaviour occurs within a spatial and temporal unit of an ecosystem. It generates interactive and external effects which have consequences on the components of the system (including the source of the behaviour) and on the system itself (including the environment). Among humans, these interactive and external effects determine the structure and dimensions of the relationships between and among the participants, which in turn have different kinds of effects on system structure and dimension. In other words, social structures and dimensions not only interact with other social structures and dimensions, but also with ecosystem structures and dimensions. Thus, regardless of whether an ecosystem is natural or not, humans and society, and their interventions form an integral part of the ecosystem itself.

By applying the model of KOCH et al. (1990), observable patterns of land use (or intervention) indicate the type and intensity of the interaction of the various socio-economic and ecosystem components. Such application can somehow alleviate the complaint of GODRON & FORMAN (1983) that "[l]andscape modification by humans is, at first glance, a hopelessly complex horizontal axis against which to seek trends. It is even considered independent of biome type and human culture." In the same vein, it provides an initial framework with which to clarify the patterns which would emerge "when each of the structural characteristics of landscapes is separately examined against this axis" (GODRON & FORMAN 1983).

APPENDIX 2

NOTES ON THE SELECTION OF STUDY SITES AND THE COLLECTION AND PROCESSING OF DATA

2.1 Selection of Study Sites

2.1.1 Identification of Municipalities with Jurisdiction over Forest Lands

Appendix Table 2.1 List of cities/municipalities with forest lands, area of forest lands and number of villages with forest lands

Province	City/Municipality	Area of forest lands (in ha.)	No. of villages with forest lands
Leyte	1. Abuyog	13,765	30
	2. Alangalang	1,250	7
	3. Albuera	12,120	11
	4. Babatngon	7,472	7
	5. Barugo	119	
	6. Bato	423	5
	7. Baybay	30,392	34
	8. Burauen	7,143	15
	9. Calubian	48	
	10. Capoocan	15,640	20
	11. Carigara	1,692	7
	12. Hilongos	692	10
	13. Hindang	6,835	1
	14. Inopacan	14,792	16
	15. Isabel	758	9

Appendix Table 2.1 (Continued...)

Province	City/Municipality	Area of forest lands (in ha.)	No. of villages with forest lands
Leyte	16. Jaro	1,688	10
	17. Javier	6,980	13
	18. Kananga	2,114	14
	19. La Paz	5,618	9
	20. Leyte	1,779	23
	21. Mahaplag	9,259	19
	22. Matag-ob	486	6
	23. Matalom	3,993	7
	24. Merida	747	5
	25. Ormoc City	9,173	28
	26. Palo	107	
	27. Palompon	1,100	19
	28. San Isidro	202	
	29. San Miguel	4,423	7
	30. Santa Fe	568	
	31. Tabango	340	
	32. Tacloban City	5,210	6
	33. Villaba	2,198	52
	Subtotal	169,126	340
	Mean	5,125.03	12.59
	s.d.	6,486.86	8.57

Appendix Table 2.1 (Continued...)

Province	City/Municipality	Area of forest lands (in ha.)	No. of villages with forest lands
Southern Leyte	34. Anahawan	1,140	4
	35. Bontoc	7,287	12
	36. Hinunangan	1,575	12
	37. Hinundayan	1,054	6
	38. Libagon	6,412	14
	39. Liloan	*	3
	40. Maasin	5,116	28
	41. Macrohon	1,164	15
	42. Malitbog	680	31
	43. Padre Burgos	1,306	
	44. Saint Bernard	3,657	22
	45. San Juan	460	12
	46. Silago	8,563	13
	47. Sogod	3,550	10
	48. Tomas Oppus	6,407	7
	Subtotal	48,371	189
	Mean	3,455.07	13.50
	s.d.	2,804.38	8.36
	TOTAL	217,497	529
	MEAN	4,627.60	12.90
	S.D.	5,664.90	8.41

* Liloan is a town which has villages both on Leyte mainland as well as on Panaon island. Available data did not show the area of the forest lands within Leyte mainland belonging to the municipality.

2.1.2 Selection of Study Villages

The normal variable used for computing the sample variance required in the equation for the determination of sample size was the number of forest land cultivators per village. Appendix Table 2.2 shows the data set for this variable.

Appendix Table 2.2 The data set and relevant statistical output used in determining the number of villages to be included in the survey

Name of municipality	Name of village	No. of forest land cultivators
Baybay, Leyte	1. Guadalupe	76
	2. Patag	63
	3. Pangasugan	34
	4. Marcos	43
Bontoc, Southern Leyte	5. Anahao	35
	6. Bunga	29
	7. Mahayahay	18
	8. Paku	17
Mean		39.38
Sample variance		432.27

Appendix Table 2.3 lists the 16 study villages covered by the survey. It also summarizes the number of forest land cultivators identified in each village.

In one of the villages without forest land cultivators, the forest land was less than ten hectares in size, dominated by outcrops of corraline limestone (karst landscape), and had a predominantly bush vegetation. According to the villagers, nobody cultivated it because they reckoned that implementing the various farming practices would be extremely difficult. Besides, the claimant, who owned most of the agricultural land adjacent to it, had warned them not to cultivate it.

Appendix Table 2.3 List of study villages with the number of forest land cultivators per village

Province	Name of municipality	Name of village	No. of forest land cultivators
Leyte	Alang-alang	1. Langit	0
	Abuyog	2. Old Taligue	23
	Baybay	3. Altavista	15
	Baybay	4. Kagumay	13
	Jaro	5. Canhandugan	28
	Javier	6. Odiong	41
	Leyte	7. Wague	0
	Mahaplag	8. Hinaguimetan	72
	Mahaplag	9. Oguis	94
	Ormoc	10. Danao	77
	Tacloban	11. Bagacay	66
		Subtotal	429
		Mean	39.00
		s.d.	33.11
Southern Leyte	Hinunangan	12. Manlico	184
	Libagon	13. Punta	12
	Libagon	14. Talisay	9
	Maasin	15. Tigbawan	70
	Malitbog	16. Caraatan	47
		Subtotal	322
		Mean	64.40
		s.d.	71.51
		TOTAL	751
		MEAN	46.94
		S.D.	47.35

In the other village, the cultivation of forest lands was mostly temporary. (At the time of visit to the village, nobody was reported to be cultivating the forest lands.) According to key informants from the village, some migrants came and cultivated portions of the forest lands. After a short while, they abandoned their farms, most of the time without even harvesting anything, and cited waterlogging and the endemic Schistosomiasis as reasons for leaving. Such abandonment could not be classified as a fallow phase in the shifting cultivation cycle considering that recultivation was not done by the former cultivator or by members of his/her household. Data from the municipal agrarian reform office also showed that some farm lands adjacent to the forest zone which were up for distribution to landless farmers did not have any takers.

2.1.3 Selection of Survey Respondents

Data obtained from the 69 forest land cultivators present at the time of the first visit to the village served as inputs into the computation of the sample size. The normal variable used for computing the sample variance was the aggregate size (in ha.) of forest farms per cultivator. Appendix Table 2.4 provides some relevant statistical outputs based on this data set.

Appendix Table 2.4 Relevant statistical output based on the data set on aggregate area of forest land claimed by the non-randomly selected respondents of the survey

Class intervals	No. of respondents	% of respondents
less than 1.00 ha.	10	14.49
1.00 - 1.99 ha.	14	20.29
2.00 - 2.99 ha.	6	8.70
3.00 - 3.99 ha.	8	11.59
4.00 - 4.99 ha.	8	11.59
5.00 - 5.99 ha.	5	7.25
6.00 - 6.99 ha.	5	7.25
7.00 - 7.99 ha.	4	5.80
8.00 - 8.99 ha.	5	7.25
9.00 ha. and bigger	4	5.80
TOTAL	69	100.00
	MEAN	3.97
	SAMPLE VARIANCE	12.25

Of the 13 randomly-selected respondents who were not interviewed, six had migrated outside of the island of Leyte. Two were on temporary (but extended) absence from their village and were reported to be engaged in lowland rice harvests. Time constraints prevented the researcher from seeking out these respondents.

Five identified respondents declined or refused to participate in the interviews. Four of them were reported to have problems with respect to the sharing of inherited forest land parcels, while the other felt bitter when a new settler claimed his forest farm parcel and told him that he could stay on only as a tenant. Despite these problems, all of them were reported to be still cultivating their forest farm parcels.

Appendix Table 2.5 Reasons for the non-interview of the respondents identified to be included in the sample survey

Reason	Frequency	Percent (to n=44)
Migrated outside Leyte island	6	13.6
Declined/Refused to be interviewed	5	11.4
Temporarily absent from the village	2	4.5
Total	13	29.5

2.2 Data Collection

2.2.1 Protocol

Going through the municipal mayors, village chairpersons and representatives of various agencies, as part of normal protocol, facilitated such activities as the identification of forest land cultivators, and the conduct of the survey and key informant interviews and case studies. On the other hand, it also led to some reactions which could ultimately have implications on forest land use. First, some mayors and government agency representatives expected the research to presage development projects within forest lands. Second, village officials who had similar thoughts endeavored to have the people close to them included in the interviews. (This was one reason for not selecting subsitutes for the randomly selected respondents who could not be interviewed.) Third, respondents, mainly because of information they got prior to the interview, thought that the researcher (as a government representative) was either a tax assessor or collector, a forest guard, a social forestry officer or an agrarian reform worker. Clearly some responses were formulated based on the type of work attributed by the interviewee to the researcher. Although post-interview conversations removed most of the misconceptions, the rate of refusal to participate in the interviews point out the critical role of protocol procedures.

2.2.2 Collection of Village-level Data

In obtaining the necessary information for each village, difficulties were encountered with respect to the sources of the data and to the form the data were available. Usually depending on the capabilities of the village officials, some villages kept records, while others did not. At the municipal level, sometimes the data pertaining to the study village had not been updated or the records had already been destroyed.

In the absence of records, panel and individual interviews of village officials, pioneer settlers and old residents, and other community leaders were conducted to generate some historical data. For some villages, this did not work primarily because of the absence of knowledgeable persons.

2.2.3 Development of Survey Instruments

Four instruments were formulated for the survey primarily because of the foreseen length of time the interviews would require if conducted in one session. By dividing the whole gamut of data requirements into four instruments, data collection using various methods--particularly face-to-face interviewing and unobstrusive observation--became possible. So while the FIS obtained generalized data on the farming activities of the respondent, the FFCIS and the ISFPAL, with their provision for direct observation of certain indicators, delved into the details without sounding redundant or becoming bothersome. These two instruments also allowed for a more detailed knowledge about the respondent's income from agriculture without focusing so much on this sensitive topic in the HIS.

The decision to use the Cebuano versions of the FIS, HIS and ISFPAL was reached after the first visits to the study villages during which the *Waray*-speaking farmers in northeastern Leyte were found to speak the language when talking to Cebuano speakers. On the other hand, the FFCIS was no longer translated from its original English form because it obtained data through direct observation or through unstructured interviews.

2.2.5 Conducting the Survey Interviews

By the very nature of the interviews, responses did not come solely from the identified respondent, but also from his/her spouse, and in other instances, from children helping in the farm activities. The number of interview sessions depended on the number of forest farm parcels, the intensity of cultivation and the free time of the respondents. Usually, the FIS and the HIS constituted the first session. The FFCIS was used in the second session, and the ISFPAL either followed the FFCIS during the second session or constituted the third session itself. The schedule of the succeeding sessions was usually set at a date when both spouses or the forest land cultivator and the children involved in farm operations would be present for the interview. As observed, this set-up allowed for the cross-checking of answers to straight-forward questions, but it also led to more complicated judgemental responses or opinions due to the inputs of the other participants in the interview process.

2.2.6 Conducting the Case Studies

Initially, 13 case study respondents were identified. One case household, however, declined to continue with the in-depth interviews after the researcher undertook the detailed observation of the forest farms. As gathered from other informants, the respondent was accused by other inheritors of the forest lands claimed by his parents-in-law as using the study to gain advantage in the upcoming subdivision of the property. He also expressed his concern to the researcher about the inquiries into his other cultivated parcels which were not part of the lands claimed by his parents-in-law. During the conduct of the case study, the identification and registration of claimants of lands covered by the Leyte Settlement Project were going on. Up to the time when the researcher left the village, this respondent had not registered his cultivated/claimed forest parcels with the personnel of the municipal agrarian reform office.

APPENDIX 3

NOTES ON LEYTE

3.1 Physical Characteristics

3.1.1 Soil Characteristics

Appendix Table 3.1 Area of the various soil types within the Leyte island group

Relief & drainage class	Soil type	Area (ha.)	Percent
Poorly drained lowland flat	Hydrosol	9,584	1.2
	Pawing fine sandy loam	5,431	0.7
	Palo clay loam	61,260	7.7
	Undifferentiated San Manuel soils	10,623	1.3
Moderately drained lowland flat	San Manuel silt loam	45,925	5.8
	San Manuel loam	1,278	0.2
	San Manuel fine sandy loam	5,671	0.7
	Mandawe clay	8,945	1.1
	Bantog clay loam	399	0.1
	Medellin clay	2,556	0.3
	Umingan clay loam	20,766	2.6
	Umingan fine sandy loam	479	0.1
	Dagami clay loam	1,757	0.2

Appendix Table 3.1 (Continued...)

Relief & drainage class	Soil type	Area (ha.)	Percent
Well drained lowland flat	Obando fine sand	8,945	1.1
	Taal fine sandy loam	4,473	0.6
	Beach sand	3,115	0.4
Well-drained rolling uplands with non-calcareous soils	Guimaras sandy clay loam	1,038	0.1
	Tacloban clay	23,561	3.0
	Guimbalaon clay	53,113	6.6
	Luisiana clay	27,235	3.4
	Palompon clay	22,683	2.8
	Malitbog clay	11,661	1.5
	Maasin clay	58,784	7.4
	Himayangan clay loam	6,300	0.8
	Rough stony land	16,852	2.1
	Rough mountainous land	301,426	37.7
Well-drained rolling uplands with calcareous soils	Lugo clay	39,615	5.0
	Faraon clay, steep phase	42,490	5.3
	Bolinao clay	2,236	0.3
	Faraon-Bolinao complex	559	0.1
Total		798,760	100.0

Source: BARRERA et al. 1954

3.1.2 Climatic Conditions

The data presented in Appendix Table 3.2 were obtained as computer files of the Agroclimatic Information System, a collaborative undertaking of the PAG-ASA and the EDPC. The monthly averages for each station were based on the available data for each particular month. Annual totals for years with missing monthly data were computed using the monthly average as substitute for the missing value.

Appendix Table 3.2 Monthly amount of rainfall (in mm.) as measured at four stations within Leyte Island

Station	Measure	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Maasin, Southern Leyte[1]	Mean	221	125	97	69	70	130	157	153	158	221	196	184	1,782
	s.d.	158	111	108	61	56	62	88	107	81	113	143	121	415
ViSCA, Baybay, Leyte[2]	Mean	285	177	134	134	91	194	265	256	223	261	300	286	2,607
	s.d.	161	126	99	93	66	102	89	154	131	143	135	205	530
Sab-a Basin, Tacloban City[3]	Mean	279	201	141	124	128	184	177	144	188	290	361	312	2,500
	s.d.	168	137	99	115	73	55	133	55	93	117	152	182	502
Tacloban City[4]	Mean	303	204	159	132	154	181	178	139	165	205	292	325	2,392
	s.d.	173	125	114	87	89	68	96	83	91	112	144	186	394

[1]Based on data from 1972 to 1990
[2]Based on data from 1977 to 1994
[3]Based on data from 1977 to 1988
[4]Based on data from 1971 to 1994

Source: EDPC (1994)

Appendix Table 3.3 Monthly amount of rainfall (in mm.) and number of rainy days measured at three stations within Leyte Island from 1902 to 1933

Station	Measure	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Maasin, Southern Leyte	Amt. of rainfall	269	156	132	74	120	173	264	204	262	251	309	321	2,536
	No. of rainy days	12	8	7	6	6	9	12	10	12	12	12	13	118
Ormoc City	Amt. of rainfall	183	112	97	79	104	199	283	232	268	252	254	203	2,264
	No. of rainy days	17	12	12	11	12	16	19	17	18	21	19	19	194
Tacloban City	Amt. of rainfall	342	217	164	136	156	186	162	132	152	215	302	381	2,545
	No. of rainy days	22	17	17	15	15	17	17	15	16	20	21	23	214

Source: BARRERA et al. 1954

Data presented in Appendix Table 3.3 were obtained from summaries done by BARRERA et al. 1954.

3.3 Social Political and Demographic Charateristics

3.3.1 Population

Appendix Table 3.4 Population of Leyte mainland during various census years and estimated average annual growth rates between census years

Census Year	Leyte		Southern Leyte		Total	
	Population	Ave. annual growth rate	Population	Ave. annual growth rate	Population	Ave. annual growth rate
1903	294,892		63,759		358,651	
1918	440,328	2.7	102,525	3.2	542,853	2.8
1939	689,207	2.2	144,766	1.5	833,973	2.1
1948	751,679	1.0	157,181	0.9	908,860	1.0
1960	876,071	1.3	176,778	1.0	1,052,849	1.2
1970	1,020,128	1.5	216,081	2.0	1,236,209	1.6
1975	1,099,848	1.6	239,720	2.1	1,339,568	1.6
1980	1,191,227	1.5	262,037	1.8	1,453,264	1.6
1990	1,368,510	1.4	273,281	0.4	1,641,791	1.2

Appendix Table 3.5 Changes in the per capita forest cover and in the per capita cultivated and open areas between the census and resource inventory years of 1939 and 1990

Indicators	Year		% Change
	1939	1990	
Population (mainland)	833,973	1,641,791	96.9
Population density (person/ha.)	1.2	2.3	96.9
Area of forest cover (ha.)	334,930	93,000	-72.2
Area of cultivated and open land (ha.)	454,290	702,800	54.7
Per capita area of forest land (ha./person)	0.4	0.1	-85.9
Per capita area of cultivated land (ha./person)	0.5	0.4	-21.4
Population (municipalities with forest lands)	745,832	1,473,039	97.5
Per capita area of forest land (ha./person)	n.d.	0.1	
Population (villages with forest lands)	n.d.	388,547	
Per capita area of forest lands (ha./person)	n.d.	0.2	

n.d. = no data available

3.4 Economic Conditions

3.4.1 Major Sources of Income

Please see Appendix Table 3.6 and Table App. 3.7.

3.4.2 Household Income Levels and Incidence of Poverty

Please see Appendix Table 3.8.

Appendix Table 3.6 Area devoted to crops/cropping systems in the provinces of Leyte and Southern Leyte

Name of crop/Cropping system	Leyte		Southern Leyte		Total	
	Area (ha.)	% of land area	Area (ha.)	% of land area	Area (ha.)	% of land area
Abaca	402	0.07	177	0.10	579	0.08
Cassava	298	0.05			298	0.04
Coconut	206,124	36.08	70,319	40.53	276,443	37.12
Coconut-corn/Coconut-rootcrops	244	0.04	12	0.01	256	0.03
Coconut/Coconut-abaca	356	0.06	203	0.12	559	0.08
Coconut/Coconut-banana	901	0.16	931	0.54	1,832	0.25
Coconut/Coconut-corn	1,890	0.33			1,890	0.25
Coconut/Coconut-pineapple	27	0.00		0.00	27	0.00
Coconut/Coconut-upland rice	147	0.03	291	0.17	438	0.06

Appendix Table 3.6 (Continued...)

Name of crop/Cropping system	Leyte		Southern Leyte		Total	
	Area (ha.)	% of land area	Area (ha.)	% of land area	Area (ha.)	% of land area
Coffee			39	0.02	39	0.01
Corn	1,295	0.23			1,295	0.17
Pineapple	65	0.01			65	0.01
Sugarcane	11,031	1.93	130	0.07	11,161	1.50
Sweet Potato	31	0.01			31	0.00
Upland Rice	169	0.03	197	0.11	366	0.05
Wetland Rice	73,920	12.94	7,320	4.22	81,240	10.91

Source: DA-BSWM (1989)

Appendix Table 3.7 Main sources of income among households in the Leyte island group in 1985 and 1988

Main source of income	Leyte				Southern Leyte				Total			
	1985		1988		1985		1988		1985		1988	
	n	%	n	%	n	%	n	%	n	%	n	%
Wages and salaries	76,123	28.5	94,483	33.4	10,478	17.4	15,992	24.2	86,601	26.5	110,475	31.6
Agricultural	24,118	9.0	24,286	8.6	1,909	3.2	5,038	7.6	26,027	8.0	29,324	8.4
Non-agricultural	52,005	19.5	70,197	24.8	8,569	14.3	10,954	16.6	60,574	18.5	81,151	23.2
Entreprenurial activities	146,494	54.9	149,909	53.0	30,657	51.1	35,371	53.5	177,151	54.2	185,280	53.1
Agricultural	117,568	44.1	122,530	43.3	23,529	39.2	31,497	47.7	141,097	43.2	154,027	44.1
Farming[1]	93,127	34.9	96,352	34.0	20,900	34.8	26,184	39.6	114,027	34.9	122,536	35.1
Fishing	21,307	8.0	16,377	5.8	2,629	4.4	4,593	7.0	23,936	7.3	20,970	6.0
Others[2]	3,134	1.2	9,801	3.5	0	0	720	1.1	3,134	1.0	10,521	3.0
Non-agricultural	28,926	10.8	27,378	9.7	7,128	11.9	3,874	5.9	36,054	11.0	31,252	9.0
Wholesale & retail	20,081	7.5	15,915	5.6	3,564	5.9	3,874	5.9	23,645	7.2	19,789	5.7
Other enterprises	8,845	3.3	11,463	4.0	3,564	5.9	0	0.0	12,409	3.8	11,463	3.3

Appendix Table 3.7 (Continued...)

Main source of income	Leyte				Southern Leyte				Total			
	1985		1988		1985		1988		1985		1988	
	n	%	n	%	n	%	n	%	n	%	n	%
Other sources of income	44,063	16.5	38,690	13.7	18,914	31.5	14,722	22.3	62,977	19.3	53,412	15.3
Net share[3]	11,236	4.2	8,931	3.2	1,909	3.2	1,715	2.6	13,145	4.0	10,646	3.0
Cash (abroad)[4]	7,012	2.6	5,105	1.8	1,655	2.8	5,758	8.7	8,667	2.7	10,863	3.1
Cash (domestic)[5]	8,312	3.1	11,054	3.9	9,116	15.2	4,816	7.3	17,428	5.3	15,870	4.5
Other sources	17,503	6.6	13,600	4.8	6,234	10.4	2,433	3.7	23,737	7.3	16,033	4.6
TOTAL	266,680	100.0	283,082	100.0	60,049	100.0	66,085	100.0	326,729	100.0	349,167	100.0

[1]Crop farming and gardening
[2]Livestock & poultry raising, forestry & hunting
[3]Net share of crops, fruits, vegetables, livestock, poultry, etc.
[4]Cash receipts, gifts & other forms of assistance from abroad
[5]Cash receipts, gifts & other forms of assistance from domestic sources

Source: NSCB 1992

Appendix Table 3.8 Income level of households in the Leyte island group in 1985 and 1988

Income level (in pesos)	Leyte				Southern Leyte				Total			
	1985		1988		1985		1988		1985		1988	
	n	%	n	%	n	%	n	%	n	%	n	%
Below 10,000	96,696	36.3	49,007	17.3	19,166	31.9	9,409	14.2	115,862	35.5	58,416	16.7
10,000 - 19,999	114,634	43.0	134,039	47.4	23,237	38.7	30,556	46.2	137,871	42.2	164,595	47.1
20,000 - 29,999	29,025	10.9	55,476	19.6	9,290	15.5	13,505	20.4	38,315	11.7	68,981	19.8
30,000 - 39,999	11,769	4.4	21,878	7.7	2,629	4.4	7,970	12.1	14,398	4.4	29,848	8.6
40,000 & above	14,556	5.5	22,682	8.0	5,726	9.5	4,647	7.0	20,282	6.2	27,329	7.8
Total	266,680	100.0	283,082	100.0	60,048	100.0	66,087	100.0	326,728	100.0	349,169	100.0
Ave. per annum	18,508		25,255		18,720		28,310		18,547		25,833	
Food threshold	n.d.		n.d.		n.d.		n.d.		15,096		17,124	
Poverty threshold	n.d.		n.d.		n.d.		n.d.		19,704		22,908	

n.d. no data available

Source: NSCB 1992

3.5 Major Projects and Activities Involving Forest Lands

3.5.1 The National Livelihood Support Fund

Appendix Table 3.9 List of NLSF parcels and their respective area by land classification category

Parcel number*	No. of municipalities	Area of A&D lands (ha.)	Area of timberlands	Total area (ha.)
31	4	3,322	910	4,232
32	3	1,267	391	1,659
33	2	11,246	5,219	16,465
34	1	2,814	1,577	4,391
35	3	526	3,027	3,553
36	2	1,754	1,237	2,991
38	2	5	1,848	1,853
40	2	1,341	1,151	2,492
41	2	115	2	117
42A	2	685	7,421	8,106
42B	4	2,317	13,608	15,925
43A	2	1,442	2,308	3,750
43B	1	305	326	631
44	1	639	518	1,157
Total**	30	27,778	39,545	67,323

* Areas for Parcels 29, 30, 39, 45, 46 and 47 have not yet been determined.
** The total number of municipalities include those of the still unsurveyed parcels.

Source: Engineering Section, SSO, DAR Region VIII

3.5.2 The Integrated Social Forestry Project

Theoritically, a forest land cultivator or occupant could be awarded only one CSC. A review of the list of CSCs issued by the DENR, however, revealed that either some CSCs had been issued to persons with the same names or certain persons received more than one CSC. With the inability to verify whether similar names respresent the same person or not, and considering that other researchers (e.g. ESCASINAS & MANACPO 1993; TABADA et al. 1993; TABADA & ESCASINAS 1993) had reported cases wherein more than one CSC had been issued to the same person, the number of CSCs issued had been used in the analysis instead of the number of ISFP beneficiaries.

Appendix Table 3.10 Distribution of CSCs by size of parcel

Area covered by CSC	Leyte		Southern Leyte		Leyte mainland	
	n	%	n	%	n	%
7.01 - 8.00 ha.	4	0.2	-	-	4	0.1
6.01 - 7.00 ha.	37	1.7	7	0.7	44	1.4
5.01 - 6.00 ha.	38	1.7	9	0.9	47	1.5
4.01 - 5.00 ha.	173	7.9	41	4.0	214	6.6
3.01 - 4.00 ha.	202	9.2	42	4.0	244	7.6
2.01 - 3.00 ha.	364	16.6	113	10.9	477	14.8
1.01 - 2.00 ha.	711	32.5	310	29.8	1,021	31.6
0.01 - 1.00 ha.	657	30.0	517	49.8	1,174	36.4
Missing data	1	0.1	-	-	1	-
Total	2,187	100.0	1,039	100.0	3,226	100.0

As could be discerned in Appendix Table 3.11, a notable exclusion in the coverage of the ISFP being implemented by the DENR would be the forest lands in the Ormoc-Kananga and the Burauen-Jaro areas. As gathered, the ISFP in this area is being implemented by the PNOC which has assumed territorial jurisdication over lands reserved for geothermal energy exploration and development. The researcher had not been able to obtain a list of ISFP beneficiaries from the PNOC.

Appendix Table 3.11 Area and number of villages covered by the ISFP in the cities/municipalities with forest lands

Province	City/Municipality	No. of villages	Area covered (ha.)	No. of CSCs issued
Leyte	1. Abuyog	7	938	470
	2. Alangalang	1	39	13
	3. Albuera	6	421	298
	4. Babatngon	4	140	57
	5. Baybay	6	232	145
	6. Capoocan	5	493	199
	7. Inopacan	2	97	64
	8. Mahaplag	4	946	375
	9. Matag-ob	2	304	131
	10. Matalom	1	188	139
	11. Merida	1	16	13
	12. Palompon	2	124	71
	13. San Miguel	2	82	39
	14. Tacloban	3	388	171
	Sub-total	46	4,412*	2,187
Southern Leyte	15. Bontoc	4	98	55
	16. Libagon	1	26	32
	17. Maasin	11	568	420
	18. Macrohon	2	99	70
	19. Malitbog	7	267	230
	20. Saint Bernard	6	134	107
	21. Sogod	3	254	125
	Sub-total	34	1,446	1,039
	TOTAL	80	5,858	3,226

*Includes the area of 1 CSC whose location was not indicated.

APPENDIX 4

NOTES PERTAINING TO THE STUDY VILLAGES AND THE FOREST LAND CULTIVATORS

4.1 The Study Villages

4.1.1 Accessibility

Appendix Table 4.1 Indicators of accessibility of the study villages

Type of road going to the study village	Point of origin			
	Town center		Market center*	
	Distance (km.)	% of total distance	Distance (km.)	% of total distance
Concrete	5.21	46.39	11.94	50.49
All-weather dirt road	2.79	18.33	3.10	22.42
Dirt road difficult to pass during the rainy season	1.81	16.97	1.31	9.35
Dirt road passable only during the dry season	1.06	4.67	1.06	4.67
Foot trail	1.97	13.60	2.03	13.08
Total distance	12.84	100.00	19.44	100.00

*Market center refers to the place wherein village residents usually purchase consumer goods and other household needs.

4.1.2 Land Area and Land Use

Appendix Table 4.2 Information on the land area and land use of the study villages

Indicators of land use	n*	Min.	Max.	Mean	s.d.
Total land area (ha.)	12	152	1,447	665	377
Area of A&D lands (ha.)	14	0	1,124	323	305
% to total land area	12	0	98.60	49.61	34.00
Area of forest lands (ha.)	13	16	882	370	323
% to total land area	12	1.40	100.00	50.37	34.02
Area of cultivated lands (ha.)	14	90	1,447	563	404
% to total land area	11	87.03	100.00	98.65	3.88
% to forest land area	12	0	100.00	79.56	38.12

*n=no. of villages with available data

The attempt to determine the area planted to a particular crop in each of the study villages met the following problems: 1) When the data were based on the claims registered at the office of the municipal assessor, only one crop would usually be reported for each parcel. Parcels under various phases of shifting cultivation would simply be marked "suited for cultivation." 2) Results of panel interviews to come up with the needed area estimates were of limited applicability due to complicated crop combinations and sequences practiced by many farmers. In view of these difficulties, village informants were simply requested to enumerate the major crops in their respective villages. The results of this exercise are presented in Table 4.4.

4.1.3 Population

Appendix Table 4.3 Information on the population of the study villages

Variable	Year	Min.	Max.	Mean	s.d.
Population	1990	156	2,305	782	636.55
	1980	177	2,280	726	566.72
	1975	147	1,843	663	552.17
Average annual rate of population growth (%)	1981-90	-4.97	11.56	0.27	3.72
	1976-80	-1.57	16.64	2.89	4.73
	1976-90	-3.13	7.18	1.05	2.59
No. of households	1990	32	428	148	121.15
	1980	34	434	135	113.05
	1975	25	360	121	105.28
Household size	1990	4.88	6.47	5.35	0.37
	1980	4.45	6.63	5.48	0.56
	1975	4.76	6.07	5.51	0.36
Number of FLCs in 1993		0	184	47	47.35
% to number of households in 1990		0	216.47	49.35	55.42

Appendix Table 4.4 Comparison of population indicators between villages which had been affected and not affected by the insurgency conflict

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t-value	prob.
FLC to number of households (%)	*	Affected	10	7.04	216.47	68.17	62.28	-1.8995	0.0391
		Not affected	6	0	39.09	17.99	18.54		
Average annual population growth between census years	1980-90	Affected	10	-4.97	1.44	-1.04	2.40	1.9964	0.0329
		Not affected	6	-1.26	11.56	2.46	4.69		
	1975-80	Affected	8	-1.10	4.75	1.50	2.31	1.3867	0.0965
		Not affected	5	-1.57	16.64	5.11	6.92		
Average annual growth in number of households between census years	1980-90	Affected	10	-5.18	1.95	-0.72	2.54	1.8239	0.0448
		Not affected	6	-0.68	11.28	2.50	4.59		
	1975-80	Affected	8	-0.33	5.66	1.85	2.04	1.7537	0.0536
		Not affected	5	0	18.25	6.44	7.11		

*Data on the number of FLC were obtained in 1993 while the number of households were based on results of the 1990 census.

Appendix Table 4.5 Relationships between population and land area in the study villages

Indicators	Year	n	Min.	Max.	Mean	s.d.
Population density (persons per sq.km.)	1990	12	35	638	139	164
	1980	12	40	586	141	147
	1975	9	57	541	148	150
% change in population density between census years	1980-90	12	-39.94	37.12	-5.19	22.48
	1975-80	9	-5.37	28.23	14.01	11.88
	1975-90	9	38.32	29.64	-0.06	22.94
Per capita land area (ha. per person)	1990	12	0.16	2.84	1.26	0.76
	1980	12	0.17	2.50	1.12	0.64
	1975	9	0.18	1.75	1.00	0.45
% change in per capita land area between census years	1980-90	12	-27.07	66.50	11.55	28.76
	1975-80	9	-22.02	5.67	-11.41	9.59
	1975-90	9	-22.86	62.14	5.83	28.85
Per capita forest land area (ha. per person)	1990	13	0.01	2.16	0.62	0.57
	1980	13	0.01	2.37	0.61	0.63
	1975	10	0.01	0.93	0.40	0.32
% change in per capita forest land area between census years	1980-90	13	-27.07	66.50	9.64	28.38
	1975-80	10	-22.02	5.67	-9.86	10.28
	1975-90	10	-22.86	62.14	4.27	27.64
Per capita cultivated land area (ha. per person)	1990	14	0.04	2.48	1.07	0.75

Appendix Table 4.6 Comparison of the relationships between population and land area between villages affected by the insurgency conflict

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Population density (persons per sq.km.)	1990	Affected	8	35.15	119.10	77.89	32.08	2.0875	0.0317
		Not affected	4	71.89	637.50	260.86	256.68		
	1980	Affected	8	40.03	137.44	90.63	35.17	1.8514	0.0469
		Not affected	4	81.57	586.18	240.98	236.10		
	1975	Affected	6	57.00	111.87	94.31	20.97	1.6738	0.0695
		Not affected	3	67.74	541.45	255.05	251.92		
% change in population density between census years	1980-90	Affected	8	-39.94	12.50	-12.17	21.05	1.6325	0.0668
		Not affected	4	8.26	28.23	18.97	10.06		
	1975-80	Affected	6	-5.37	26.10	11.54	12.77	0.8714	0.2062
		Not affected	3	8.26	28.23	18.97	10.06		
	1975-90	Affected	6	-38.32	19.86	-9.01	22.32	1.9091	0.0489
		Not affected	3	6.12	29.64	17.83	11.76		

Appendix Table 4.6 (Continued...)

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Per capita land area (ha. per person)	1990	Affected	8	0.84	2.84	1.53	0.73	-2.0184	0.0356
		Not affected	4	0.16	1.39	0.70	0.52		
	1980	Affected	8	0.73	2.50	1.31	0.64	-1.5810	0.0725
		Not affected	4	0.17	1.23	0.73	0.49		
	1975	Affected	6	0.89	1.75	1.12	0.33	-1.1171	0.1504
		Not affected	3	0.18	1.48	0.77	0.65		
% change in per capita land area between census years	1980-90	Affected	8	-11.11	66.50	20.17	30.39	-1.5611	0.0748
		Not affected	4	-27.07	13.46	-5.69	16.84		
	1975-80	Affected	6	-20.70	5.67	-9.34	10.52	-0.9019	0.1985
		Not affected	3	-22.02	-7.63	-15.53	7.30		
	1975-90	Affected	6	-16.57	62.14	16.03	30.46	-1.6549	0.0710
		Not affected	3	-22.86	-5.77	-14.57	8.56		

Appendix Table 4.6 (Continued...)

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Per capita A&D land area (ha./person)	1990	Affected	9	0	2.18	0.79	0.70	-1.2588	0.1160
		Not affected	5	0.09	0.89	0.37	0.33		
	1980	Affected	9	0	1.35	0.64	0.49	-1.1472	0.1368
		Not affected	5	0.10	0.79	0.36	0.28		
	1975	Affected	7	0	1.36	0.73	0.54	-0.5117	0.3106
		Not affected	4	0.11	0.95	0.57	0.35		
% change in per capita A&D land area between census years	1980-90	Affected	8	-11.11	66.50	16.94	31.47	-1.4585	0.0863
		Not affected	5	-27.07	13.46	-5.18	14.63		
	1975-80	Affected	6	-20.70	5.67	-6.16	9.60	-2.0358	0.0381
		Not affected	4	-53.55	-7.63	-25.04	19.92		
	1975-90	Affected	6	-16.57	62.14	15.66	30.73	-2.2637	0.0267
		Not affected	4	-55.01	-5.77	-24.68	21.40		

Appendix Table 4.6 (Continued...)

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Per capita forest land area (ha. per person)	1990	Affected	9	0.05	2.16	0.76	0.61	-1.3607	0.1004
		Not affected	4	0.01	0.66	0.31	0.32		
	1980	Affected	9	0.03	2.37	0.73	0.69	-0.9946	0.1706
		Not affected	4	0.01	0.90	0.36	0.41		
	1975	Affected	7	0.04	0.93	0.49	0.32	-1.3006	0.1148
		Not affected	3	0.01	0.53	0.21	0.28		
% change in per capita forest land area between census years	1980-90	Affected	9	-13.31	66.50	16.45	30.54	-1.3401	0.1036
		Not affected	4	-27.07	13.46	-5.69	16.84		
	1975-80	Affected	7	-20.70	5.67	-7.43	10.86	-1.1647	0.1388
		Not affected	3	-22.02	-7.63	-15.53	7.30		
	1975-90	Affected	7	-16.57	62.14	12.34	29.47	-1.5069	0.0851
		Not affected	3	-22.86	-5.77	-14.57	8.56		
Per capita cultivated land area (ha. per person)	1990	Affected	9	0.04	2.48	1.32	0.77	-1.8502	0.0445
		Not affected	5	0.16	1.39	0.61	0.49		

Appendix Table 4.7 Relationships between the number of households and land area in the study villages

Indicators	Year	n	Min.	Max.	Mean	s.d.
Household density (households per sq.km.)	1990	12	6	122	26	31
	1980	12	6	103	25	26
	1975	9	11	93	26	26
% change in household density between census years	1980-90	12	-41.27	39.89	-1.09	24.57
	1975-80	9	-1.63	36.00	16.06	14.54
	1975-90	9	-40.32	30.28	5.21	26.94
Land area (ha.) per household	1990	12	0.82	15.84	6.96	4.54
	1980	12	0.97	16.55	6.51	4.24
(F=0.311; prob.=0.7349)	1975	9	1.07	9.45	5.59	2.51
% change in land area per household between census years	1980-90	12	-28.51	70.27	7.66	29.67
	1975-80	9	-26.47	1.65	-12.63	10.87
	1975-90	9	-23.24	67.57	2.31	32.52
Forest land area (ha.) per household	1990	13	0.04	13.98	3.49	3.61
	1980	13	0.04	15.73	3.61	4.14
(F=0.540; prob.=0.5879)	1975	10	0.05	4.96	2.22	1.76
% change in forest land area per household between census years	1980-90	13	-28.51	70.27	6.65	28.64
	1975-80	10	-26.47	1.65	-11.80	10.59
	1975-90	10	-23.24	67.57	1.12	30.89
Cultivated land area (ha.) per household	1990	14	0.23	14.71	5.88	4.43
Forest land area (ha.) per FLC	1990	12	1.20	28.57	8.78	7.48
Average cultivated forest land area (ha.) per FLC	1990	11	1.20	13.38	6.69	4.51

Appendix Table 4.8 Comparison of the relationships between number of households and land area between villages affected by the insurgency conflict

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Household density (households per sq.km.)	1990	Affected	8	6.31	22.51	14.22	6.25	2.1157	0.0302
		Not affected	4	14.75	121.71	49.62	48.96		
	1980	Affected	8	6.04	26.60	16.02	6.92	1.9446	0.0402
		Not affected	4	15.67	102.63	43.47	40.73		
	1975	Affected	6	10.58	20.20	16.93	3.42	1.6829	0.0681
		Not affected	3	11.52	93.42	44.60	43.16		
% change in household density between census years	1980-90	Affected	8	-41.27	21.32	-8.03	24.39	1.4532	0.0884
		Not affected	4	-5.88	39.89	12.80	20.96		
	1975-80	Affected	6	-1.63	31.71	11.13	13.10	1.5630	0.0810
		Not affected	3	9.86	36.00	25.92	14.06		
	1975-90	Affected	6	-40.32	22.22	-6.91	25.14	2.4198	0.0231
		Not affected	3	28.00	30.28	29.46	1.27		

Appendix Table 4.8 (Continued...)

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Land area (ha.) per household	1990	Affected	8	4.44	15.84	8.65	4.46	-2.0801	0.0321
		Not affected	4	0.82	6.78	3.59	2.51		
	1980	Affected	8	3.76	16.55	7.80	4.44	-1.5966	0.0707
		Not affected	4	0.97	6.38	3.92	2.56		
	1975	Affected	6	4.95	9.45	6.18	1.66	-1.0013	0.1750
		Not affected	3	1.07	8.68	4.41	3.89		
% change in land area per household between census years	1980-90	Affected	8	-17.58	70.27	16.06	32.13	-1.4551	0.0882
		Not affected	4	-28.51	6.25	-9.13	15.98		
	1975-80	Affected	6	-24.07	1.65	-9.01	10.28	-1.5269	0.0853
		Not affected	3	-26.47	-8.97	-19.88	9.51		
	1975-90	Affected	6	-18.18	67.57	14.84	33.56	-1.8739	0.0515
		Not affected	3	-23.24	-21.88	-22.75	0.76		

Appendix Table 4.8 (Continued...)

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
A&D land area (ha.) per household	1990	Affected	9	0	12.16	4.30	3.85	-1.3290	0.1043
		Not affected	5	0.47	4.34	1.87	1.63		
	1980	Affected	9	0	7.39	3.64	2.70	-1.3583	0.0997
		Not affected	5	0.56	4.09	1.85	1.48		
	1975	Affected	7	0	8.04	4.10	3.03	-0.5704	0.2912
		Not affected	4	0.61	5.56	3.12	2.03		
% change in the A&D land area per household between census years	1980-90	Affected	8	-17.58	70.27	11.25	33.11	-1.0724	0.1533
		Not affected	5	-28.51	7.04	-5.90	15.62		
	1975-80	Affected	6	-14.89	1.65	-6.34	7.20	-2.6128	0.0155
		Not affected	4	-56.58	-8.97	-29.05	19.93		
	1975-90	Affected	6	-18.57	67.57	12.33	35.70	-2.2268	0.0283
		Not affected	4	-53.52	-21.88	-30.44	15.40		

Appendix Table 4.8 (Continued...)

Indicators	Year	Insurgency	n	Min.	Max.	Mean	s.d.	t value	prob.
Forest land area (ha.) per household	1990	Affected	9	0.27	13.98	4.34	3.99	-1.2994	0.1102
		Not affected	4	0.04	3.54	1.59	1.68		
	1980	Affected	9	0.19	15.72	4.35	4.67	-0.9733	0.1757
		Not affected	4	0.04	4.96	1.93	2.25		
	1975	Affected	7	0.22	4.96	2.66	1.72	-1.2277	0.1272
		Not affected	3	0.05	3.12	1.21	1.67		
% change in forest land area per household between census years	1980-90	Affected	9	-17.58	70.27	13.66	30.90	-1.3720	0.0987
		Not affected	4	-28.51	6.25	-9.13	15.98		
	1975-80	Affected	7	-24.07	1.65	-8.33	9.55	-1.7535	0.0588
		Not affected	3	-26.47	-8.97	-19.88	9.51		
	1975-90	Affected	7	-18.18	67.57	11.35	31.99	-1.7836	0.0562
		Not affected	3	-23.24	-21.88	-22.75	0.76		
Cultivated land area (ha.) per household	1990	Affected	9	0.23	14.71	7.40	4.66	-1.3290	0.1043
		Not affected	5	0.82	6.78	3.13	2.40		
Forest land area (ha.) per FLC	1990	Affected	9	1.20	28.57	8.69	8.56	-0.4080	0.3455
		Not affected	4	0	13.36	6.77	5.46		
Cultivated forest land area (ha.) per FLC	1990	Affected	7	1.20	13.38	6.19	4.90	0.8850	0.2010
		Not affected	3	6.50	13.36	9.03	3.77		

Appendix Table 4.9 Descriptive statistics on the personal characteristics of the respondents

Characteristic	Class Interval	n	%
Gender	Male	23	74.19
	Female	8	25.81
Civil status	Single	1	3.23
	Married	25	80.65
	Widowed	5	16.13
Age (in years)	less than 30	1	3.23
	30 - 39	7	22.58
	40 - 49	8	25.81
	50 - 59	6	19.35
	60 - 69	9	29.03
	Minimum		16
	Maximum		69
	Mean		48.32
	s.d.		12.74
Educational attainment (in years of formal schooling)	None	5	16.13
	Elementary	20	64.52
	High school	5	16.13
	College	1	3.23
	Minimum		0
	Maximum		13
	Mean		3.81
	s.d.		3.23

Appendix Table 4.10 Descriptive statistics on the characteristics of the respondents' households

Variable	Class Interval	n	%
Size of family	3 - 4 members	5	16.13
	5 - 6 members	10	32.26
	7 - 8 members	5	16.13
	9 - 10 members	7	22.58
	11 - 12 members	4	12.90
	Minimum		3
	Maximum		11
	Mean		7.19
	s.d.		2.55
Average age of children (years)	less than 10	10	32.26
	10 - 19	9	29.03
	20 - 29	6	19.35
	30 - 39	6	19.35
	Minimum		2.00
	Maximum		37.50
	Mean		17.56
	s.d.		10.62
Type of household	Nuclear	17	54.84
	Extended	14	45.16

Appendix Table 4.10 (Continued...)

Variable	Class Interval	n	%
Household size	1 - 2 members	3	9.68
	3 - 4 members	8	25.81
	5 - 6 members	9	29.03
	7 - 8 members	9	29.03
	9 or more members	2	6.46
	Minimum		1
	Maximum		12
	Mean		5.48
	s.d.		2.36
Number of household members who help work in the farm	None	1	3.23
	1 - 2 members	13	41.94
	3 - 4 members	11	35.48
	5 - 6 members	4	12.90
	7 - 8 members	2	6.45
	Minimum		0
	Maximum		8
	Mean		3.23
	s.d.		1.75
Average educational attainment of the children	Not applicable	4	12.90
	Elementary	19	61.29
	High school	4	12.90
	College	4	12.90
	Minimum		2.83
	Maximum		12.00
	Mean		5.79
	s.d.		2.70

Appendix Table 4.11 Descriptive statistics pertaining to the forest parcels of the respondent-households

Variable	Class interval	n*	Min.	Max.	Mean	s.d.
Number of forest parcels		31	1	11	3.48	2.62
Aggregate size (ha.) of forest lands		30	0.19	16.00	3.96	3.50
Size (ha.) of forest land by tenurial status	"Fully owned"	7	0.25	4.50	2.27	1.80
	Claimed	8	0.45	4.00	1.95	1.28
	Family property	24	0.19	10.50	2.47	2.36
	Program recipient	3	0.25	0.36	0.29	0.06
	Private usufract	6	0.03	12.00	3.33	4.85
	Tenanted	4	0.68	4.65	2.03	1.81
Size (ha.) of forest land by dominant crop	Coconut	18	0.19	10.50	2.19	2.50
	Abaca	14	0.12	3.50	1.72	1.18
	Wetland rice	9	0.25	2.66	1.01	0.82
	Corn	3	0.03	1.80	0.68	0.98
	Others**	5	0.27	3.25	1.50	1.15
	Low grass fallow	4	0.25	3.50	1.72	1.42
	High grass fallow	2	0.20	1.00	0.60	0.57
	Forest fallow	11	0.12	13.75	2.62	4.11

* n=number of households

**Other dominant crops were citrus (n=1; 3.00 ha.), pineapple (n=1; 2.00 ha.), ginger (n=1; 1.00 ha.), chayote (n=1; 1.00 ha.), banana (n=1; 0.27 ha.), cacao (n=1; 0.25 ha.). The following crops were dominant but no data were available on the area of each parcel: sweet potato (n=2), taro (n=2) and green onions (n=1).

Appendix Table 4.12 Descriptive statistics pertaining to the farms of the respondent-households in A&D lands

Variable	Class interval	n*	Min.	Max.	Mean	s.d.
Number of parcels		15	1	4	1.80	1.08
Aggregate size (ha.) of parcels		13	0.50	5.00	1.86	1.42
Size (ha.) of landholding by tenurial status	Fully owned	3	0.25	5.00	2.00	2.61
	Family property	8	0.44	4.00	1.24	1.22
	Tenanted	7	0.06	3.25	1.19	1.10
Size (ha.) of landholding by dominant crop	Coconut	8	0.50	5.00	1.87	1.71
	Wetland rice	4	0.50	1.25	0.75	0.35
	Others**	4	0.06	2.00	1.21	0.59

* n=number of households
**These included corn (n=1; 2.00 ha.), abaca (n=1; 1.25 ha.), snap beans (n=1; 1.00 ha.) and pineapple (n=1; 0.06 ha.).

Appendix Table 4.13 Descriptive statistics pertaining to the sources of income and annual income of the respondent-households

Income source	Sub-category	n	Min.	Max.	Mean	s.d.
Animal production	Pigs	17	900	4,576	2,152	1,107
	Poultry	22	50	1,500	475	391
	Goat/Water buffalo	3	300	9,900	6,333	5,254
	Sub-total	25	60	12,980	2,641	3,238
Off-farm occupation	Wages	16	60	14,500	4,476	3,905
	Share	6	300	3,600	1,448	1,227
	Sub-total	19	60	14,500	4,226	3,788

Appendix Table 4.13 (Continued...)

Income source	Sub-category	n	Min.	Max.	Mean	s.d.
Farm production in forest lands	Coconut	19	180	9,885	2,138	2,517
	Abaca	12	15	4,320	1,224	1,412
	Wetland rice	8	702	13,075	5,504	3,916
	Corn	3	48	500	283	226
	Taro	7	150	1,800	658	606
	Sweet potato	3	105	5200	2,168	2,682
	Cassava	2	520	600	560	57
	Banana	5	120	1,300	660	506
	Cacao	2	60	375	218	222
	Fruits	5	68	660	302	246
	Flowers/vegetables	3	40	19,560	9,460	9,778
	Trees/bamboos	4	80	1,500	718	619
	Sub-total	26	290	22,258	5,727	5,296
Farm production in A&D lands	Coconut	9	62	12,770	2,750	3,947
	Abaca	3	540	1,500	955	493
	Wetland rice/corn	5	450	36,000	8,891	15,213
	Rootcrops	2	200	3,200	1,700	2,121
	Banana/cacao/fruits	5	30	2,620	1,215	1,252
	Vegetables	2	1,760	6,088	3,924	3,060
	Sub-total	12	346	36,062	7,450	9,690
Remittances		8	500	13,500	4,637	5,116
Total annual income		31	496	49,482	13,604	12,027

Appendix Table 4.14 Respondents' opinions regarding the benefits which various forest land uses could provide to their household

Forest land use	Benefit provided	n*	%**
Coconut production (including multi-storey cropping)	Cash income/easy to sell	4	12.90
	Short harvest cycle	3	9.68
	Long-term crop	2	6.45
	Easy to process	2	6.45
	Good growth/high production	2	6.45
	Food	1	3.23
	Typhoon resistance/minimal care	1	3.23
	Crop diversification	1	3.23
	Traditionally practiced	1	3.23
	Prevented forest regrowth	1	3.23
Grains and rootcrops production	Food	12	38.71
	Short harvest cycle	2	6.45
	Typhoon resistance/minimal care	2	6.45
	Traditionally practiced	1	3.23
Abaca production	Cash income/easy to sell	3	9.68
	Short harvest cycle	2	6.45
	Easy to process	2	6.45
	Typhoon resistance/minimal care	2	6.45
	Good growth/high production	2	6.45
	Long-term crop	1	3.23
Production of fruits and vegetables	Cash income/easy to sell	4	12.90
	Short harvest cycle	1	3.23
	Long-term crop	1	3.23
Reforestation and tree planting	Cash income/easy to sell	1	3.23
	Prevented erosion	1	3.23

* n=number of responses ** based on n=31

Appendix Table 4.15 Respondents' opinions regarding the sustainability of the various forest land uses which they identified as beneficial

Forest land use	Opinion	n*	%**
Coconut production (including multi-storey cropping) (n=18)	Non-sustainable	1	5.56
	Sustainable under certain conditions	8	44.44
	Sustainable	9	50.00
Grains and rootcrops production (n=17)	Non-sustainable	12	70.59
	Sustainable under certain conditions	3	17.65
	Sustainable	2	11.76
Abaca production (n=12)	Non-sustainable	3	25.00
	Sustainable under certain conditions	6	50.00
	Sustainable	3	25.00
Production of fruits and vegetables (n=6)	Non-sustainable	4	66.67
	Sustainable under certain conditions	0	0
	Sustainable	2	33.33
Reforestation and tree planting (n=2)	Non-sustainable	1	50.00
	Sustainable under certain conditions	0	0
	Sustainable	1	50.00

* n=number of responses

** based on n obtained for each forest land use

Appendix Table 4.16 Respondents' opinions regarding the beneficial aspects of various forms of fallow vegetation

Type of fallow	Perceived beneificial aspect	n*	%**
High forest fallow/ mature forest	Suitability to cultivation	10	32.26
	Availablity of wood, rattan or water	8	25.81
	Fertility of soil	3	9.68
Low forest fallow	Suitability to cultivation	17	54.84
	Availablity of wood or water	2	6.45
	Fertility of soil	7	22.58
High grass fallow (e.g. *S. spontaneum*)	Suitability to cultivation	16	51.61
	Suitability to tree planting	2	6.45
	Fertility of soil	1	3.23
Low grass fallow (e.g. *I. cylindrica*)	Suitability to cultivation	13	41.94
	Suitability to tree planting	1	3.23
	Source of roofing materials	4	12.90
	Suitability as pasture	1	3.23
Low grass fallow (e.g. *A. compressus*)	Suitability to cultivation	12	38.71
	Suitability to tree planting	1	3.23
	Minimal weeds	1	3.23
	Suitability as pasture	2	6.45

Appendix Table 4.17 Respondents' opinions regarding the non-beneficial aspects of various forms of fallow vegetation

Type of fallow	Perceived non-beneficial aspect	n*	%**
High forest fallow/ mature forest	Lack of access to forest products	4	12.90
	Absence of sources of livelihood	4	12.90
	Unfavorability to crop growth	2	6.45
Low forest fallow	Absence of sources of livelihood	2	6.45
	Unfavorability to crop growth	2	6.45
High grass fallow (e.g. *S. spontaneum*)	Absence of sources of livelihood	2	6.45
	Unfavorability to crop growth	7	22.58
Low grass fallow (e.g. *I. cylindrica*)	Absence of sources of livelihood	4	12.90
	Unfavorability to crop growth	5	16.13
Low grass fallow (e.g. *A. compressus*)	Unfavorability to crop growth	5	16.13

* n=number of responses
** based on n=31

Appendix Table 4.18 Area of forest farm parcels by tenurial arrangement

Tenurial arrangement	n	Min.	Max.	Mean	s.d.
"Fully owned"	66	0.02	3.25	1.06	0.80
Claimed	56	0.01	6.00	2.12	1.68
Family property	109	0.00	10.50	1.27	1.44
Program recipient	7	0.12	0.36	0.22	0.09
Private usufract	37	0.03	6.50	1.13	1.28
Tenanted	18	0.05	6.00	1.37	1.58
Total	293	0.00	10.50	1.35	1.40

Appendix Table 4.19 Area of forest farm parcels by dominant crop

Dominant crop	n	Min.	Max.	Mean	s.d.
Coconut	96	0.19	10.50	1.48	1.57
Abaca	65	0.01	6.00	1.30	1.20
Wetland rice	22	0.04	1.88	0.53	0.41
Corn	5	0.03	2.00	1.01	0.90
Sweet potato	4	0.10	1.00	0.56	0.51
Others*	13	0.00	3.50	1.04	1.20
Low grass fallow	11	0.01	3.50	1.05	1.16
High grass fallow	11	0.20	4.00	1.30	1.26
Low forest fallow	47	0.02	6.50	1.49	1.45
High forest fallow	19	0.25	6.00	2.11	1.84
Total	293	0.00	10.50	1.35	1.40

*These included cassava (n=1), taro (n=2), ginger (n=1), chayote (n=2), green onion (n=1), string beans (n=2), banana (n=2), pineapple (n=1), citrus (n=1), cacao (n=2) and tobacco (n=1)

Appendix Table 4.20 Cross-tabulation of observed frequencies between dominant crop or type of vegetation and tenurial arrangement prevailing in the forest parcel

Dominant crop/Type of vegetation	Tenurial arrangements					
	"Fully owned"	Claimed	Family property	ISFP/ Private usufruct	Tenanted	Total
Coconut	27	16	31	15	9	98
Abaca	17	17	26	5	0	65
Food crops	4	3	16	8	6	37
Fruits & vegetables	0	1	5	7	0	13
Grass fallow	13	16	25	11	3	68
Forest fallow	5	4	10	3	0	22
Total	66	57	113	49	18	303

Appendix Table 4.21 Area of forest farm parcels by dominant crop or type of vegetation existing at the time of initial cultivation

Crop/Type of vegetation	n	Min.	Max.	Mean	s.d.
Coconut	70	0.25	6.00	1.21	1.06
Abaca	65	0.01	6.50	1.08	1.12
Wetland rice	16	0.01	3.00	0.68	0.76
Others*	8	0.00	3.00	0.87	1.09
Grass fallow	20	0.03	2.00	0.47	0.57
Forest fallow	113	0.01	10.50	1.86	1.70
Total	293	0.00	10.50	1.35	1.40

*These included corn (n=1), upland rice (n=1), taro (n=1), chayote (n=2), citrus (n=1), and cacao (n=2)

Appendix Table 4.22 Frequency distribution of forest parcels according to the antecedent variables taken into consideration by the respondents in their selection as farm site*

Antecedent variables	Wet-land rice	Coco-nut	Abaca	Other crops	Grass fallow	Forest fallow	Total
Availability of parcel	13	56	51	4	9	38	171
Type of soil	0	5	7	0	3	20	35
Need for land	1	1	8	0	4	14	28
Previous use of land	0	1	0	1	2	24	28
Distance to settlement	0	4	5	4	1	8	22
For use in the future	1	3	3	0	0	10	17
Type of terrain	1	2	2	0	0	10	15
Emancipation	1	0	7	2	1	1	12
History of cultivation	0	7	4	0	0	0	11
Inaccessibility	0	0	0	0	0	5	5
Presence of water	1	2	0	1	0	1	5

*multiple responses

Appendix Table 4.23 Frequency distribution of forest parcels according to the processes involved in the selection of the farm site*

Processes involved	Wet-land rice	Coco-nut	Abaca	Other crops	Grass fallow	Forest fallow	Total
Inheritance	11	20	28	4	6	42	111
Purchase	2	22	27	2	1	12	66
Discussion with others	0	0	1	0	0	4	42
Private usufruct	0	0	1	0	0	6	7
Tenancy	3	11	2	0	0	2	25
Participation in the ISFP	0	17	5	2	4	12	40
Registration of claim	0	0	1	0	5	1	7

*multiple responses

Appendix Table 4.24 Cultivation systems into which parcels under grain cultivation were transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	2	5.7
	Rootcrops cultivation	16	45.7
Abaca-based farming system	Abaca monocrop	1	2.9
	Abaca-grain cultivation	3	8.6
	Abaca-rootcrops cultivation	1	2.9
Coconut-based farming system	Coconut monocrop	1	2.9
	Coconut-rootcrops cultivation	3	8.6
	Coconut-based multiple cropping	1	2.9
Vegetable production	Vegetable-abaca cropping	1	2.9
	Vegetable production	2	5.7
	Vegetable-grains production	1	2.9
Wetland rice		2	5.7
Grass fallow		1	2.9
Sub-total		35	100.0

*n=number of parcels

Appendix Table 4.25 Cultivation systems into which parcels under rootcrops cultivation were transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	6	13.6
	Rootcrops cultivation	1	2.3
	"Tree-crop" farming	2	4.6
	Forest fallow	6	13.6
Abaca-based farming system	Abaca monocrop	2	4.6
	Abaca-rootcrops cultivation	3	6.8
Coconut-based farming system	Coconut monocrop	2	4.6
	Coconut-grain cultivation	1	2.3
	Coconut-rootcrops cultivation	8	18.2
	Coconut-based multiple cropping	1	2.3
Abaca-coconut-tree crops cropping		2	4.6
Vegetable production		1	2.3
Wetland rice		2	4.6
Grass fallow		7	15.9
Total		44	100.0

*n=number of parcels

Appendix Table 4.26 Cultivation systems into which abaca plantations were transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	1	1.0
Abaca-based farming system	Abaca monocrop	20	21.0
	Abaca-grain cultivation	4	4.2
	Abaca-rootcrops cultivation	12	12.6
	Vegetables-abaca production	1	1.0
	Abaca-tree crops farming	9	9.5
	Abaca-forest fallowing	11	11.6
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	18	19.0
	Abaca-coconut-grain cropping	6	6.3
	Abaca-coconut-rootcrops croppping	5	5.3
	Abaca-coconut-tree crops cropping	6	6.3
	Abaca-coconut-forest fallowing	2	2.1
Total		95	100.0

*n=number of parcels

Appendix Table 4.27 Cultivation systems into which parcels abaca-grain cropping were transformed

Cultivation system	Sub-category	n*	%
Abaca-based farming system	Abaca-rootcrops cultivation	5	31.2
	Abaca-tree crops farming	3	18.8
	Abaca-forest fallowing	1	6.2
Abaca-coconut-based farming system	Abaca-coconut-grain cropping	4	25.0
	Abaca-coconut-rootcrops croppping	3	18.8
Total		16	100.0

*n=number of parcels

Appendix Table 4.28 Cultivation systems into which parcels under abaca-rootcrops cultivation were transformed

Cultivation system	Sub-category	n*	%
Abaca-based farming system	Abaca monocrop	3	12.5
	Abaca-grain cultivation	3	12.5
	Abaca-rootcrops cultivation	1	4.2
	Abaca-tree crops farming	2	8.3
	Abaca-forest fallowing	7	29.2
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	2	8.3
	Abaca-coconut-rootcrops croppping	6	25.0
Total		24	100.0

*n=number of parcels

Appendix Table 4.29 Cultivation systems into which coconut plantations were transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	2	1.9
	Forest fallow	1	1.0
Coconut-based farming system	Coconut monocrop	25	24.3
	Coconut-grain cultivation	6	5.8
	Coconut-rootcrops cultivation	7	6.8
	Coconut-based multiple cropping	10	9.7
	Coconut-forest fallowing	15	14.6
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	18	17.5
	Abaca-coconut-rootcrops croppping	6	5.8
	Abaca-coconut-tree crops cropping	5	4.8
	Abaca-coconut forest fallowing	1	1.0
Vegetable production	Vegetable production	2	1.9
	Vegetable-rootcrops production	1	1.0
Wetland rice		2	1.9
Grass fallow		1	1.0
Total		103	100.0

*n=number of parcels

Appendix Table 4.30 Cultivation systems into which parcels under coconut-grain cultivation would be transformed

Cultivation system	Sub-category	n*	%
Coconut-based farming system	Coconut monocrop	1	4.6
	Coconut-rootcrops cultivation	17	77.3
	Coconut-based multiple cropping	2	9.1
	Coconut-forest fallow	1	4.6
Grass fallow		1	4.6
Total		22	100.0

*n=number of parcels

Appendix Table 4.31 Cultivation systems into which parcels under coconut-rootcrops cultivation were transformed

Cultivation system	Sub-category	n*	%
Coconut-based farming system	Coconut monocrop	11	25.6
	Coconut-grain cultivation	9	20.9
	Coconut-based multiple cropping	12	27.9
	Coconut-forest fallow	5	11.6
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	1	2.3
	Abaca-coconut-rootcrops croppping	3	7.0
	Abaca-coconut-tree crops cropping	1	2.3
Grass fallow		1	2.3
Total		43	100.0

*n=number of parcels

Appendix Table 4.32 Cultivation systems into which parcels under coconut-based multiple cropping systems would be transformed

Cultivation system	Sub-category	n*	%
Coconut-based farming system	Coconut monocrop	2	12.5
	Coconut-grain cultivation	4	25.0
	Coconut-rootcrops cultivation	3	18.8
Abaca-coconut-tree crops cropping		4	25.0
Grass fallow		3	18.8
Total		16	100.0

*n=number of parcels

Appendix Table 4.33 Cultivation systems into which parcels under abaca-coconut mixed cropping would be transformed

Cultivation system	Sub-category	n*	%
Coconut-based farming system	Coconut monocrop	5	12.2
	Coconut-rootcrops cultivation	2	4.9
	Coconut-based multiple cropping	2	4.9
	Coconut-forest fallowing	1	2.4
Abaca-and-coconut-based farming system	Abaca-coconut-grain cropping	3	7.3
	Abaca-coconut-rootcrops croppping	6	14.6
	Abaca-coconut-tree crops cropping	10	24.4
	Abaca-coconut-forest fallow	10	24.4
Grass fallow		2	4.9
Total		41	100.0

*n=number of parcels

Appendix Table 4.34 Cultivation systems into which parcels under abaca-coconut-grains mixed cropping would be transformed

Cultivation system	Sub-category	n*	%
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	7	35.0
	Abaca-coconut-rootcrops croppping	11	55.0
	Abaca-coconut-forest fallowing	2	10.0
Total		20	100.0

*n=number of parcels

Appendix Table 4.35 Cultivation systems into which parcels under abaca-coconut-rootcrops mixed cropping would be transformed

Cultivation system	Sub-category	n*	%
Coconut-based farming system	Coconut monocrop	1	2.3
	Coconut-rootcrops cultivation	2	4.6
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	15	34.1
	Abaca-coconut-grain cropping	3	6.8
	Abaca-coconut-rootcrops croppping	1	2.3
	Abaca-coconut-tree crops cropping	11	25.0
	Abaca-coconut-forest fallowing	10	22.7
Grass fallow		1	2.3
Total		44	100.0

*n=number of parcels

Appendix Table 4.36 Cultivation systems into which parcels under abaca-coconut-tree crops mixed cropping would be transformed

Cultivation system	Sub-category	n*	%
Coconut-based farming system	Coconut monocrop	1	4.8
	Coconut-forest fallowing	1	4.8
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	9	42.9
	Abaca-coconut-grain cropping	1	4.8
	Abaca-coconut-rootcrops croppping	2	9.5
	Abaca-coconut-tree crops cropping	1	4.8
	Abaca-coconut-forest fallowing	6	28.6
Total		21	100.0

*n=number of parcels

Appendix Table 4.37 Cultivation systems into which parcels under abaca-coconut-forest fallowing would be transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	1	6.2
	Forest fallow	1	6.2
Abaca monocrop		1	6.2
Abaca-and-coconut-based farming system	Abaca-coconut cultivation	5	31.2
	Abaca-coconut-grain cropping	1	6.2
	Abaca-coconut-rootcrops croppping	2	12.5
	Abaca-coconut-tree crops cropping	3	18.8
Vegetable production		1	6.2
Grass fallow		1	6.2
Total		16	100.0

*n=number of parcels

Appendix Table 4.38 Cultivation systems into which parcels under vegetable production would be transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	1	4.0
	Rootcrops cultivation	3	12.0
	"Tree-crop" farming	2	8.0
	Forest fallow	4	16.0
Abaca-based farming system	Abaca-grain cultivation	2	8.0
	Abaca-rootcrops cultivation	3	12.0
	Abaca-tree crops farming	1	4.0
Abaca-coconut-rootcrops croppping		1	4.0
Vegetable production	Vegetable production	1	4.0
	Vegetable-grain production	3	12.0
	Vegetable-rootcrops production	1	4.0
Grassland		3	12.0
Total		25	100.0

*n=number of parcels

Appendix Table 4.39 Cultivation systems into which parcels under wetland rice cultivation would be transformed

Cultivation system	Sub-category		%
Shifting cultivation	Grain cultivation	2	7.1
	Forest fallow	1	3.6
Wetland rice		17	60.7
Grass fallow		8	28.6
Total		28	100.0

*n=number of parcels

Appendix Table 4.40 Cultivation systems into which parcels with grass fallow vegetation would be transformed

Cultivation system	Sub-category	n*	%
Shifting cultivation	Grain cultivation	6	18.2
	Rootcrops cultivation	11	33.3
Coconut-grain cultivation		1	3.0
Vegetable production	Vegetable production	1	3.0
	Vegetable-rootcrops production	2	6.1
Wetland rice		8	24.2
Grass fallow		4	12.1
Total		33	100.0

*n=number of parcels