

LAND COLONIZATION IN CENTRAL AMERICA

**Experiences in the Settlement of Humid Tropical Lands in
Panama, Costa Rica, Nicaragua, Honduras and Guatemala**

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**Results of Field Investigations, for the
CATIE-United Nations University Project
"Land Colonization in Central America"**

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PREFACE

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The word colonization in Central America generates a multitude of responses, ranging from pioneering derring-do and righteousness to environmentalist anxiety and dismay, depending on who perceives it and in what context.

Colonization has historical, political, economic, social and ecological implications. For the early Spanish colonizers, the area was there to be occupied, a feeling that is still prevalent among many people and particularly decision makers regardless of the agricultural marginality of the land involved. The rapid rate of occupation over the last 100 years has not yet created the awareness that land to be colonized is finite; many people continue to believe that "behind the mountain there is still lots of empty land".

Politically, it is an extremely useful and expedient too. The land is either unowned, or it is in the government's hands; giving it away to landless and poor farmers enhances the political aureola of the Government, as witnessed by the classical ceremony where a prominent Government official, often the president himself, or a military leader, hands over the newly acquired property titles to poor farmers - with cameras clicking and zooming in on the happy faces. To the large land-owners who possess the best land, it is an effective way to distract land hungry peasants from their and relieve - at least for the time being - what has become a most annoying pressure on their "sacred private property".

Opening new land is an apparently promising economic venture that lends itself to many financial schemes including loans by development banks or "soft" money from friendly countries or agencies. It also opens

possibilities for building roads, houses for the new settlers, and of course a whole array of land speculation possibilities.

The image of a land hungry peasant family moving into a new colonization area, with initial loans, a new house, educational and health services, is without discussion, a very socially satisfying scheme. Moreover, spontaneous colonization - as opposed to Government directed colonization schemes - is a very old tradition and socially accepted practice which has been documented over centuries.

The ecological implication is perhaps the least studied or understood. The capability of land to be managed on a sustainable basis to support a family is a little known concept. It is commonly heard in Spanish: "No hay tierra mala; lo que no hay es gente para trabajarla"; There is no bad land; all that is missing are people to work it.

Yet in most countries of Central America, almost all the land with adequate rainfall, moderate slopes - not to mention level land - and reasonable soils is already taken. What is left is land too steep, soils too poor in texture or in nutrients, and too moist because of excessive rain and/or inadequate drainage.

It is not by chance that most directed or spontaneous colonization efforts nowadays are found in the humid areas of Central America where conditions are usually marginal for sustainable agriculture. More than 50% of Costa Rica's present pasture lands have recently been qualified by the national Planning Board as "mistakes in the conversion of forest to pastures" which should revert to pastures. However, this sort of realization has not stopped the countries from continuing the opening of new land, usually primary forests, at an alarming rate.

This is not to say that there is no role for colonization but rather that the present attitude to it must change. Some areas with slopes or high rainfall may be farmed but not with traditional techniques imported from other ecological areas, with more level land, better soils, or drier or cooler conditions or a combination of any of these factors. Colonization must become a carefully thought-out process and appropriate farming systems must be devised, understood, applied, evaluated and continuously improved,

Agroforestry, in which the United National University is deeply involved, may be a proper tool in some cases. In others, imaginative land use techniques must be devised. Traditional technical knowledge can be a

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most interesting guide to "new" or improved techniques.

It is time that decision makers and planners who have the fundamental power over land use make a careful assessment of present colonization schemes and hopefully learn from past mistakes as well as from success stories. The present contribution by Dr. Jeffrey Jones, a staff member at CATIE, is an attempt in this direction. It fits well with UNU's interest in land use, in the food production-energy nexus and in devising better guidelines for sustainable land use, under satisfactory ecological and socio-economic conditions for the farmers. This indeed is a long-term, fundamental objective of UNU.

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Chapter 1

Introduction

1.1 Objectives and Dangers of Colonization in the Humid Tropics.

There are many motivations for the colonization of tropical lands, political, economic, and speculative. The most important is probably the simple perception that there is land available for the taking, with adequate rainfall and reasonably good soils. This perception is widely held, but often erroneous, and dangerously so; the numerous failures of colonization projects, the abandonment of lands and proposed activities, or the continued poverty of the new colonists testify to unexpected problems.

Although at one time in the history of the Central American Region colonization presented no major conflicts due to the abundance of forested land, this is no longer the case. The process of colonization is increasingly directed toward public lands which have been, or should be, set aside for environmental reasons. The protection of water supplies, the control of erosion, the maintenance of forest reserves and the conservation of natural resources are needs which are coming into conflict with farmers' needs for new agricultural lands. The conflict of public welfare and individual welfare is repeated in innumerable ways through the process of colonization; the value of farmers' welfare and the value of agricultural production must be balanced with the welfare of urban dwellers needing fresh water and protection from floods; the value of short term economic production must be balanced with the value of longer term income generation from forest resources; the international importance of natural scenic and genetic resources must be balanced with the immediate needs of local populations.

Colonization reflects many of the resource and public interest questions which have come to take on global importance in recent years. The investigation of these problems constitutes one localized step in the resolution of the larger questions of conservation and the environment which face the entire world.

1.1.1 The Political and Ecological Context of Colonization

The process of colonization tries to alleviate a major social problem, landlessness. The acquisition of "working capital" in the form of land provides an opportunity to earn a living or even become rich for disadvantaged individuals. Although colonization is designed to solve certain social problems, it also threatens to create environmental problems. Humid tropical areas have not been occupied precisely because they are difficult to manage on a sustained basis. In very humid environments the loss of soil fertility and increasing erosion combine to reduce productivity and raise costs of farming, so a colonization project can be a short-term success and a long-term economic and ecological disaster.

The use of tropical colonization as a substitute for land reform has been explicitly discussed, with the general conclusion that it is not advisable to do land reform through colonization (Domike 1970). The colonization of poor agricultural lands only condemns colonists to a downward spiral of subsistence agriculture with constantly rising costs. Nevertheless, this solution has been seized by virtually all countries with tropical regions as a short term "least cost" solution to the political problem of satisfying both landless farmers and large land-holders. In nearly all Central America, tropical colonization is managed through the national land reform agency, and farmers relocated on tropical lands are those from areas with land reform pressure. To the credit of the personnel of these agencies, many (and possibly the majority) recognize the dangers in the use of colonization to relieve pressure for land reform. Areas with land reform problems will continue to generate landless farmers and newly colonized areas will recreate the conditions of land concentration which were the initial cause of the land reform problem. Thus, colonization of humid lands does not solve land reform problems.

It should be emphasized that the use of what are now termed "fragile"

lands for agricultural purposes is possible on a sustained basis. Indigenous populations occupied these areas quite successfully (Brush 1981 gives an example for the Andes, Nations and Nigh 1980 for southern Mexico, and Conklin 1955 for the Philippines), but the pressures of increased population, and the attempt to introduce new crops and intensified production methods either ignore more appropriate traditional strategies, or simply push these past their capacities. Even with crops suited to humid tropical environments, care must be taken to maintain a balance between productivity and sustainability. A negative example is the use of persistent chemicals in banana plantation fungicides to control the "Sigatoka" disease in many sites in Central America.

It is possible to dwell on environmental problems of the use of humid tropical lands, and overlook some of the positive examples and possibilities for the use of these areas. Cacao and coffee have been very successful, both environmentally and economically in some Central American countries (although it can be noted that there are disturbing trends toward the over-intensification of coffee production through the removal of shade trees and heavy applications of fertilizers and herbicides to increase profitability). And on a much larger scale, the potential for forestry in humid tropical areas has yet to be completely realized. The high temperatures and rainfall favor the rapid development of many valuable forest species, giving a clear competitive advantage over northern latitudes where tree growth is generally slower. A few examples of successful forestry activities have been noted, but it is technically possible for a far greater development. In general, it is clear is that permanent woody crops are most appropriate for humid areas (IUCN 1975, 1976). Any production strategy which requires disturbing precious topsoil, and exposing it to more intensive sunlight and erosion action, as in the case of monocropping of cereals, is highly unlikely to be sustainable over long periods of time (except in the case of wetland rice). Nevertheless, there are a sufficient number of permanent crops of potential and actual commercial value which are alternatives to annual cropping in these areas.

1.1.2 Ecological Regions of Central America

The Central American Isthmus is divided into six countries, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama[1]. Its total population is more than 22 million in 1984, on a land area of some 516,000 km. sq.

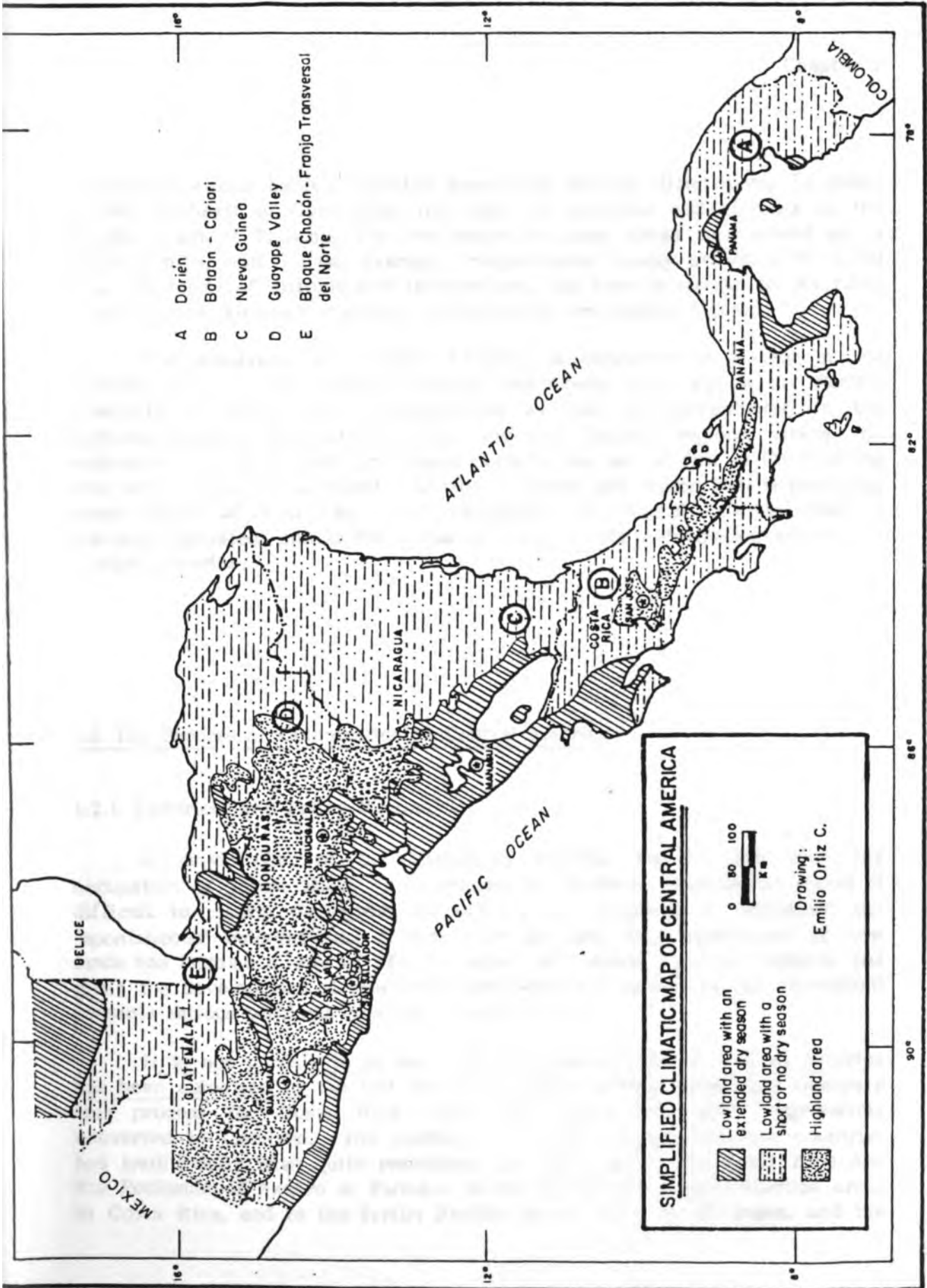
The area can be divided into three simple climatic zones (see map)[2]. The most extensive climate area is in the Atlantic lowlands of the Isthmus, covered with remnants of dense broadleaf forest, and in some areas open pine savannah. In general, precipitation ranges from 2,000 to 6,000 mm, with a short or no dry season (Dulin 1984). The area is low, generally below 600 m elevation with average annual temperatures greater than 20 C.

A second climatic zone appears in the central mountain range which runs through most of the Isthmus, and is characterized in general by a relatively heavy rainfall, but with lower temperatures than in the lowlands areas. Two major highland areas can be identified. A northern highland area stretches from Mexico, through Guatemala, El Salvador and Honduras, and ends in Northern Nicaragua, and a southern highlands area runs from the north of Costa Rica to central Panama. Generally speaking, the northern highlands are drier than comparable areas in the south and have a longer dry season. They are characterized by pine forests alternated with smaller areas of broadleaf forest, while the southern highlands have only broadleaf forests.

A third zone, with a relatively extended dry season, is found in the Pacific lowlands of the Isthmus, from the north of Costa Rica to the




1. El Salvador was not considered in this study because virtually no tropical forest areas remain for colonization. What land reform is taking place concerns the conversion of large farms to peasant owned farms, and as such is not the subject matter for this investigation.

2. Holdridge 1979 distinguishes more than a dozen life zones in Central America, but a differentiation to this level is not necessary for the present discussion.



- A Darién
- B Balaón - Cariari
- C Nueva Guinea
- D Guayape Valley
- E Bloque Chacón - Franja Transversal del Norte

SIMPLIFIED CLIMATIC MAP OF CENTRAL AMERICA

-  Lowland area with an extended dry season
-  Lowland area with a short or no dry season
-  Highland area

0 50 100
km

Drawing:
Emilio Ortiz C.

Guatemala-Mexico border. Smaller areas with similar climates can be found in the northeast of Guatemala, the north of Honduras and in parts of the Pacific coast of Panama. The dry season in these areas may extend up to eight months, with annual average precipitations usually around 1,000-1,500 mm. In terms of altitude and temperature, this zone is similar to the rainy Atlantic zone, although maximum temperatures are usually higher.

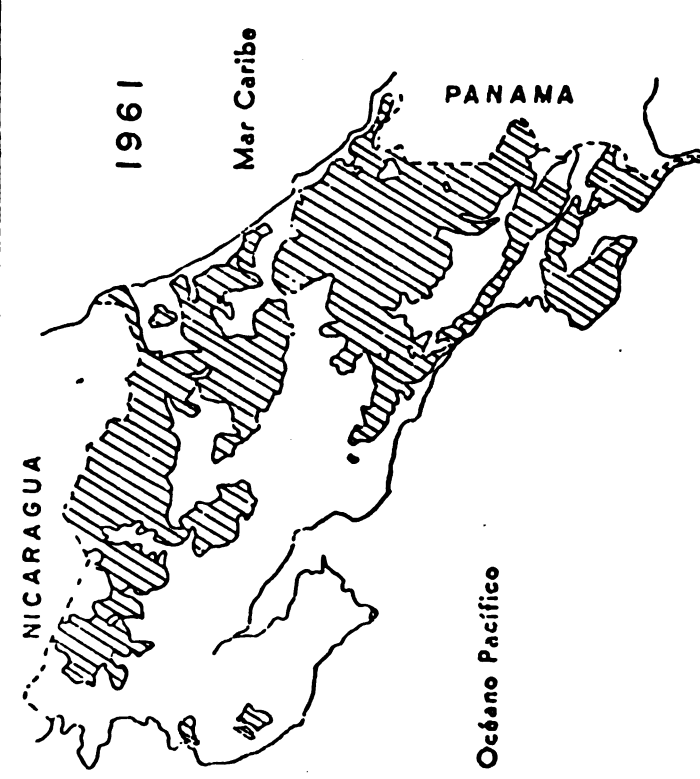
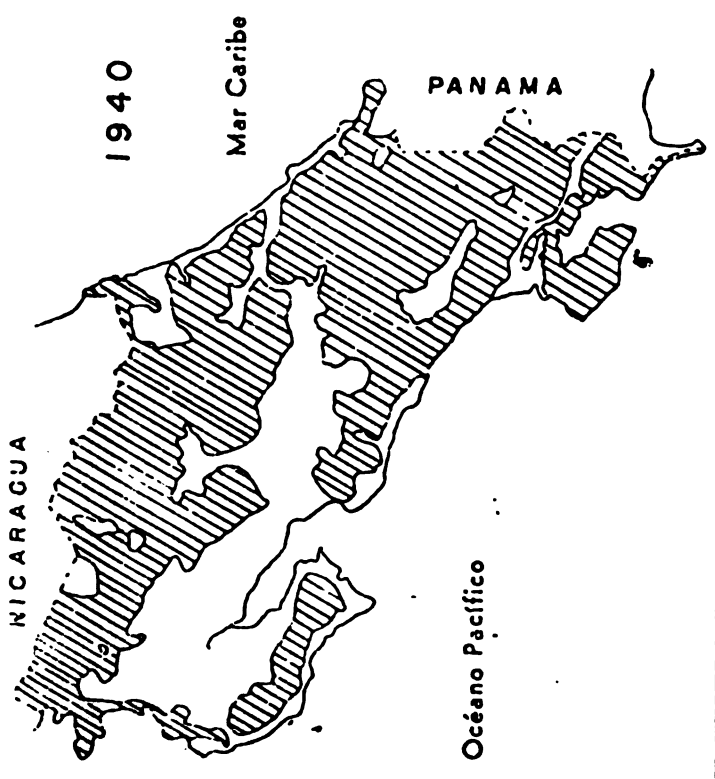
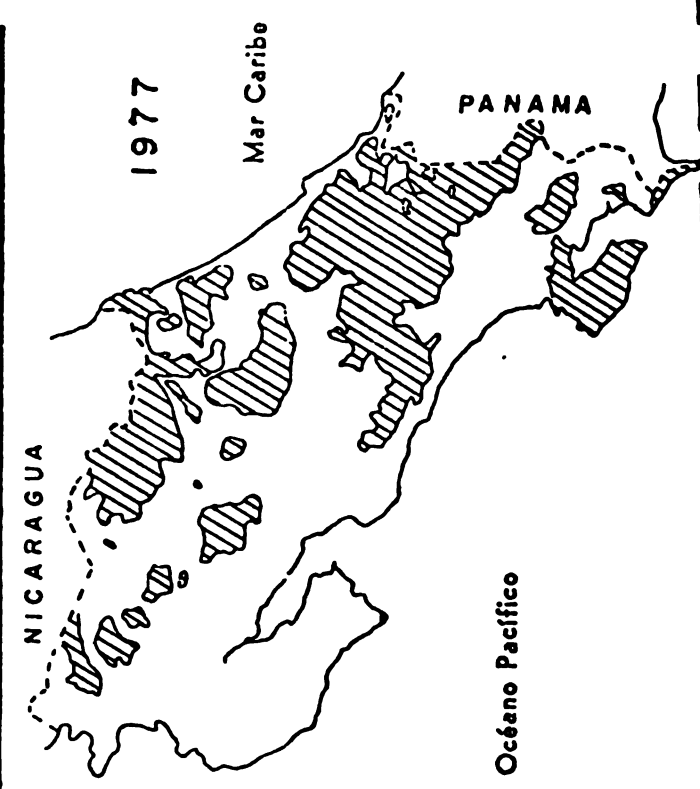
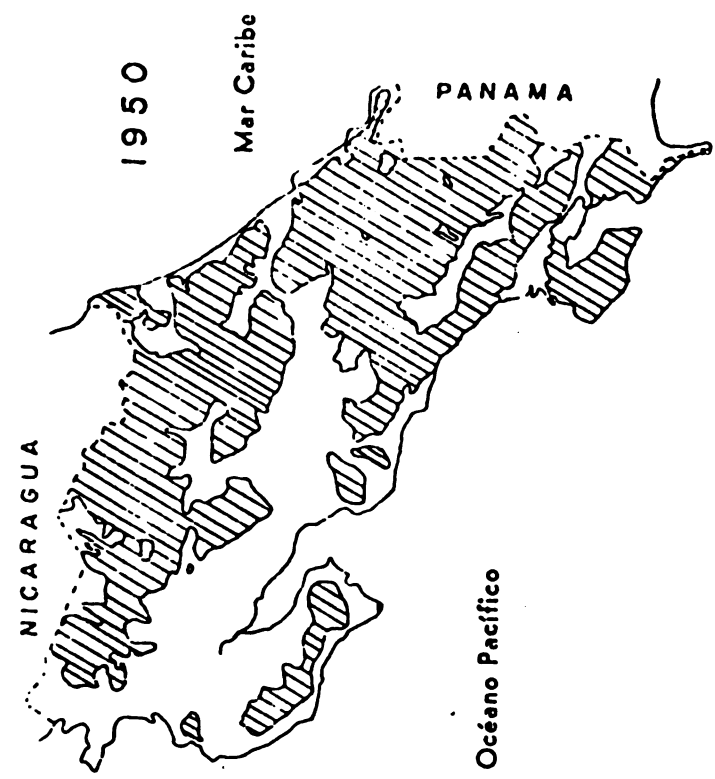
The population of Central America is concentrated mainly in the highland areas of Guatemala, Honduras and Costa Rica, and in the Pacific Lowlands of all countries. Agriculture as well is concentrated in the highland regions, and in the relatively dry Pacific regions, where the existence of even a short dry season permits the use of fire in the clearing and maintenance of farmland. Except in ports and major banana-producing areas (which in most cases are contiguous), the humid Atlantic coast is sparsely populated, and is the focus of most of the colonization activity in Central America.

1.2 The Process of Colonization in Central America

1.2.1 Historical and Policy Factors

A major part of the history of Central America has been the occupation of forest lands. This process of continual colonization makes it difficult to clearly distinguish the often cited categories of "directed" and "spontaneous" colonization. It may even be said that colonization of new lands has become a way of life, an aspect of Central American culture, and given the development of new social and economic conditions this "tradition" presents serious problems (see esp. Heckadon 1981).

It is not unrealistic to say that the greater part of Central America has been colonized in the last 50 years. Maps 2 to 5 graphically illustrate this process for Costa Rica, where the forest has been progressively converted to farmland. The economic focus of Central American countries has traditionally been quite restricted, for example, to the Canal Zone and the Peninsula of Azuero in Panama, to the coffee and dairy production areas in Costa Rica, and to the fertile Pacific coastal plain in Nicaragua, and the



Costa Rica - Deforestation from 1940 to 1977.
Deforested areas in white.

northern valleys of Honduras. This situation has given rise to generalized policy orientation favoring colonization of forest areas. Costa Rica's first president, Juan Mora Fernandez, outlined this policy orientation in a 1828 message to the Assembly of that country, which included awards of land and monetary compensation for individuals who colonized or who established transitable roads into forest areas (Gomez 1973). The development of the market for bananas encouraged a limited occupation of the best alluvial soils in low lying tropical forest lands during the early part of the twentieth century, but the linkage of these enclaves to the national economies was weak[3]. Not until the 1930's and 1940's did these areas experience a large scale colonization by independent farmers, when the appearance of uncontrollable diseases lead to the abandonment of many banana plantations (See for example Stouse's discussion of the occupation of abandoned banana lands in Costa Rica, 1965).

Sandner documents the process of colonization in detail for Costa Rica, differentiating six forms of colonization, which vary from scattered individual efforts at colonization to large scale, government or privately organized projects for occupying new lands (1962;1-7). Unfortunately, it is quite difficult to differentiate these categories on the ground, which in fact is a reflection of the diversity of the process, and the lack of a clear differentiation in the methods and inspirations between different instances of colonization. Planned colonizations inevitably have their spontaneous adherents, while spontaneous activities will also include self-organized groups, or pockets of "planning" by specific agencies.

In general, the process of colonization in all Central America, has been a spontaneous process where farmers inform themselves of available lands and occupy these lands through their own initiative with the passive support of the government. As implied in the address of Costa Rica's President Mora Fernandez, the development of access roads have been the key to the occupation of new areas. As transportation improved to permit access to markets for the sale of agricultural products, and the provision of basic products such as clothes and tools, forest areas have come under cultivation.

3. Population pressure and land hunger have also lead to a more intensive use of marginal highland areas (CSUCA 1978), but these will not be considered for this study.

Major colonization "projects" for tropical forest areas have been rare; many "colonizations" have in fact been the appropriation of farm lands for small farmers (Minkel 1967 presents a number of examples, and Salazar 1962 presents some specific cases from Costa Rica). The abandonment of areas affected by the Panama disease and Black Sigatoka gave rise to colonization efforts in the Valle de Aguan in Honduras (Nelson 1977), and the Caribbean coastal plain in Costa Rica (*ibid.*). The expropriation of German farms during WWII provided land for resettlement in the Pacific coastal areas of Guatemala and in the northern tropical areas of the country. More recently the process of land invasion and expropriation is common in much of Central America (Downing 1965). These sorts of activities generally do not affect tropical forest areas, since they mainly consist in the repartition of established farms among other owners.

A list of major colonization projects designed to occupy tropical forest lands is short. The Rio Guayape project in East Central Honduras from its conception was to include more than 78,000 ha. The Rigoberto Cabezas project in Eastern Nicaragua was designed to include more than 1,000,000 ha. Guatemala's Franja Transversal del Norte has been a major area for colonization; the first designated projects were for a total of 50,000 ha. but the area ultimately considered for colonization is over 880,000 ha. The area of colonization is much larger still if the Peten is considered, since this is Guatemala's largest department, and borders the FTN. In Panama, the Province of Darien has been the focus of colonization of interest, especially since the extension of the Pan-American highway. Costa Rica's northern lowland plain has been colonized with government support, and in some restricted areas under government supervision, but for the most part colonizers have been individually motivated and financed.

A crucial question in colonization is the kind of control exercised by government agencies within colonization areas. A broad range of authority is necessary to confront the different situations faced in the process of colonization. A major pressure in colonization areas is the tendency to establish large farms, generally by wealthy individuals for the purpose of cattle ranching. It has been well documented that this pattern of land use causes both social and ecological problems, in spite of the income it generates (Parsons 1976). The decision to permit or prohibit this sort of activity implies decisions on an economic, political and ecological level, and it is often the case that agencies operating in colonization areas do not have sufficient jurisdictional authority to make these decisions. Similarly,

questions of types of land use, the establishment of protected areas, or the establishment of agricultural research and development initiatives may require a much broader authority than colonization agencies possess, even though these are necessary to define the most appropriate land use and management practices, both economically and ecologically.

1.2.2 Technical and Ecological Aspects of Humid Tropical Land Colonization

Tropical deforestation and soil erosion are the most obvious ecological impacts and problems of colonization. While these are very important problems, they are really the tip of the iceberg with respect to ecological and technical problems of these areas. The climate and soils of these areas present difficulties even in areas where erosion can be controlled.

The maintenance of soil fertility and physical quality is closely tied to the presence of organic material in the soil under humid tropical conditions. Decomposing organic material releases nutrients for use by living plants over a long period of time, and is an important component of "natural" soil fertility. This material also releases a broader range of nutrients than do chemical fertilizers, so they may help to substitute for the application of minor elements, and reduce the need for the application of major elements, such as nitrogen, phosphorous and potassium. Land under forest cover maintains its fertility through a complex cycle of rapid decomposition and efficient root mat collection, which ~~recycles~~ recycles nutrients between soil and plants. In humid tropical environments, high temperatures and frequent rains speed the decomposition process, so the maintenance of soil quality is extremely difficult. When the forest overstory which created and maintained the soil is removed, all the processes of degradation such as leaching and precipitation, and ultimately depletion of nutrients, compaction and erosion take place (Sanchez 1981).

A more subtle problem of tropical soils is that of chemical composition. Two problems which are of major importance are soil acidity and aluminum content. These two factors impede the availability of nutrients to plants, and actually make the soil toxic to many plants. While these are not insuperable problems, their prevalence in tropical soils means that the appropriate techniques for achieving maximum productivity in tropical soils will be significantly different from those of other soils

(Sanchez *ibid*).

Tropical colonization now tends to occur in areas where the problems mentioned above are most serious. The last few acts in the pageant of humid tropical land colonization are now being played out in the areas of the highest rainfall and the most difficult soil conditions precisely because it has not been known how to make them sufficiently productive.

1.2.3 Population density.

Central American countries display a range of population densities, as well as distinctive colonization situations (Table 1). El Salvador has by far the highest population density, and colonization has ceased because almost all forest lands have been occupied. Only 5% of the land surface remains in forest, and this is limited to steep slopes or mangrove swamps. Guatemala and Costa Rica have the next highest population densities, and in both countries the areas still available for colonization are becoming increasingly limited. Honduras, Panama and Nicaragua have the lowest densities, and are the countries for which large scale colonization are seen by decision makers as physically possible.

Population density is not the only factor which contributes to the colonization of tropical lands. The development, or the expansion of cash crops such as cattle or cotton is a major motor of colonization. The appearance of cash crops with international markets raises the value of land used for semi-commercial agriculture (subsistence agriculture), displacing small farmers. While some of these farmers are incorporated into the work forces for the new cash crop activities, many are not, or by preference they set out to find new land to farm. Subsistence farming is a refuge for independent individuals in unpredictable economies, and a way to avoid the abuses of individual rights or worth which are generally found in highly competitive, and largely uncontrolled market places for wage labor. The appearance of large scale commercial coffee plantations in the Guatemalan highlands has been a driving force for colonization since the 1940's (Carter 1969). More recently, the development of the market for cotton in Nicaragua and Honduras has been cited as the cause for migrations to forested areas (CSUCA 1978). And at the present time, beef production has become the major force for displacing farmers to new tropical lands (Heckadon 1981,

DeWalt 1982, Partridge 1984, Parsons 1976, NAS 1980).

1.2.4 Incursions by farmers on forest resources.

The effect of colonization on tropical forests is a question of major importance. While it is clear that farmers are occupying forest land, it is valuable to statistically break down the process of occupation. Three major categories of forest can be recognized; 1) virgin forest, 2) exploited forests (high graded) and 3) remnant forests or low density forests integrated into agricultural landscapes.

Table 2 presents a breakdown following FAO (1981) of forest cover in Central America. The categories of **Open forest**, **Disturbed forest** and **Brush** are remnant forests. **Open forests** are generally grazing lands with occasional trees; **Disturbed forests** and **Brush** are different types of secondary growth, which either may be incorporated into a long or short fallow systems (although in some cases this category overlaps with "brushy" agricultural crops such as coffee). **Dense forests with access** are those which have been high graded and which now have at least moderately serviceable logging roads (evidenced by the ability to take out lumber). **Unfarmed dense forests** are the remaining virgin forests of the area. **Protected dense forest** is land which is legally preserved, either for logging operations, parks, Indian reserves, watershed management, etc. The estimate of how disturbed these areas are depends on how optimistic one is with regard to the efficacy of forestry protection efforts. There are many known cases of incursions on forestry reserves, but there is no data as to how extensive these incursions are.

Forest lands constitute 51% of the total land area of Central America, according to the calculations of FAO. One quarter of this land are remnant forest integrated into farmlands in some form. Nearly one third is still in virgin forest, and nearly another third is exploited forest, presumably with road access for colonists. The remaining 14% of protected land is of indeterminate status, although some part of it is now being deforested for agricultural purposes.

Colonization is currently taking place in lands categorized as **Dense forest with access**. These are areas which are accessible for colonization, and will have begun to establish some basic services for the lumbering

operations which are probably continuing in most cases. **Unfarmed dense forests** tend to be in inaccessible areas which are not congenial to any kind of human activity due to their isolation or topographical characteristics. **Protected dense forest** areas and remnant forest areas are legally unavailable for colonization, since they are either on private farms or part of national parks, forest reserves, etc. These lands are not uncontested; land invasions are constantly occurring on both private and public lands, although the affected area is probably much smaller than the unprotected forest lands. This study then will primarily consider some 5.6 million hectares of **Dense forest land with access**, which is approximately one third of the forested area of Central America, and one sixth of the total land area of the Isthmus.

1.3 Field Work for the Present Study

1.3.1 Plan for Investigation

In the initial stages of the research project two foci of interest were selected, the concentration of land in colonization areas and the evidence for environmental damage to these areas. These two factors were chosen because they were thought to represent, on the one hand, how successful (or unsuccessful) the process of colonization had been in achieving the social aims of colonization (i.e. the provision of work to a maximum number of farmers), and on the other, whether these colonization activities had been damaging to the relatively delicate environments of the humid tropical areas. In the course of the investigation, these criteria were adjusted to more adequately use available data to answer the underlying questions.

It was originally intended that land concentration was to be measured using agricultural census data, since these were generally broken down into farms of different size classes for fairly small geographical units. Most importantly, several of the Central American countries were in the process of doing new agricultural censuses at the time of the investigation. Unfortunately, there have been delays in the analysis and publication of census data, so for the most part these were not available (except for the

Table 1
Land Area, Population and Dense Forest Cover in Central American Countries

Country	Area (Sq. km.)	Populat. (1,000)	Density (Sq. km/ inhab.)	Date	Dense Forest 1980 (1,000 has.)	% forest
Costa Rica	50,899	2,111	24.11	1978	1,638	3.18
El Salvador	20,865	4,255	4.90	1977	141	0.66
Guatemala	108,888	6,621	16.45	1978	4,442	4.08
Honduras	112,087	2,831	39.59	1976	3,797	3.39
Nicaragua	148,005	2,395	61.80	1978	4,496	2.62
Panama	75,648	1,826	41.43	1978	4,165	5.40
	516,392	20,039	25.77		18,679	3.44

Table 2
Forest cover in Central America - FAO 1981
In '000s of Ha.

Country	Dense Forest			Open Forest	Disturbed	Brush	Total
	Unfarmed	Protected	W/access				
Costa Rica	548	320	770	160	120	120	2,038
El Salvador	116	0	25	0	22	293	456
Guatemala	2,220	400	1,822	100	360	1,505	6,407
Honduras	873	759	2,165	200	680	1,220	5,897
Panama	2,125	1,222	818	0	124	0	4,289
Totals	5,882	2,701	5,600	460	1,306	3,138	19,087
Percent	31	14	29	2	7	16	100
As percent of C.Am. land area	16	7	15	1	4	8	51

The FAO equivalents of the column labels are: Unfarmed = NHCfluv + NHCflm, Protected = NHCf2, W/access = NHCfluc, Open Forest = NHC/NHO, Disturbed = NHCa, Brush = nH.

10 year old censuses cited in Budowski, Briscoe and Jones (1984)). Nevertheless, it was possible to gather information on policies regarding land concentration in the colonization areas, and the perceptions of government agents and private individuals of these areas. It may well be that the form in which land concentration was evaluated was in fact the most appropriate, since land in the new colonization areas tends to be untitled, and very inaccurately recorded for government purposes. Certain clear tendencies did emerge from the data collected in spite of its lack of a strict numerical basis.

A set of criteria for identifying environmental damage in the form of erosion and decreases in soil fertility were established. These criteria were judged necessary to determine if in fact environmental damage was occurring. In the field, the observation of environmental damage and derivative problems was so widespread that no special criteria were necessary for detecting it. Erosion and decreases in soil fertility were nearly universally reported. Soil management problems were observed in most of the colonization areas.

Given that the existence of environmental damage was not a variable whose existence had to be demonstrated, more attention was directed toward attempts to ameliorate these problems. Special attention was given to proposed programs, or programs in the process of implementation, which attempted to resolve problems associated with the agricultural use of humid tropical areas. The brief periods for collection of information in each country could not be expected to generate definitive evaluations of the programs observed, but they did serve to identify a series of problems and solutions which seem to be important in all colonization areas.

The objective of the research undertaken was to define areas where technological improvements could be made either in the development of agricultural or land management strategies or in the implementation of the same. The problems of humid tropical colonization are known in a general sense, but it was hoped that this investigation would provide specific recommendations as to how to direct agricultural investigations toward problems which would have most potential impact in colonization areas. Another objective was to consider the process of project implementation in humid tropical areas to identify the impacts of these activities on environmental and social questions.

1.3.2 Country Visits and Report Preparation

The present study was carried out between June and December of 1984. Field visits of 2 weeks (10 working days) were scheduled to each of the study countries, although the actual length of the field investigation varied with the specific conditions in each country. Country visits were divided between the identification of, and visits to national and international institutions which were active in the process of colonization in each country. During the first week, a field site was selected to be visited during the second part of the country visit. Field sites were selected to be representative of the colonization process in the countries, and on the basis of the availability of information. Field visits were generally scheduled to permit one week for the analysis of collected information and the formulation of a preliminary report at the home base in CATIE, Turrialba, Costa Rica. Field visits were carried out from July through October.

Reports were circulated to their respective countries in draft form. This was done for the dual purpose of giving ministry official feedback on the progress and conclusions of the colonization research project, and to solicit their comments and corrections on the information presented. Since a great deal of the information was collected in interview situations, errors of fact and interpretation were much more possible than would be the case with the analysis of carefully written and corrected source materials.

In the course of the investigation, a great number of individuals helped in the definition of project areas, the collection of information in the field, the analysis of information collected, and the revision of report drafts. It implies a certain injustice to single out any individuals, since so many gave so much time and attention. Lists of individuals contacted in each country are included as an appendix. In CATIE as well there were a great number of individuals who assisted in various ways. Craig MacFarland and Jim Barborak were especially helpful in the initial definition of investigation areas, and the establishment of contacts within the countries who would have access to information and personal knowledge which would be helpful. Gerardo Budowski counseled all phases of the research, and reviewed completed manuscripts. Buford Briscoe dedicated a great deal of time to both technical aspects of the investigation and general support of project activities. None of these people have been able to keep me from committing numerous errors of judgement and interpretation, for which they

should not be held responsible, but their support is greatly appreciated for what errors they were able to correct.

Chapter 2

Colonization in Costa Rica

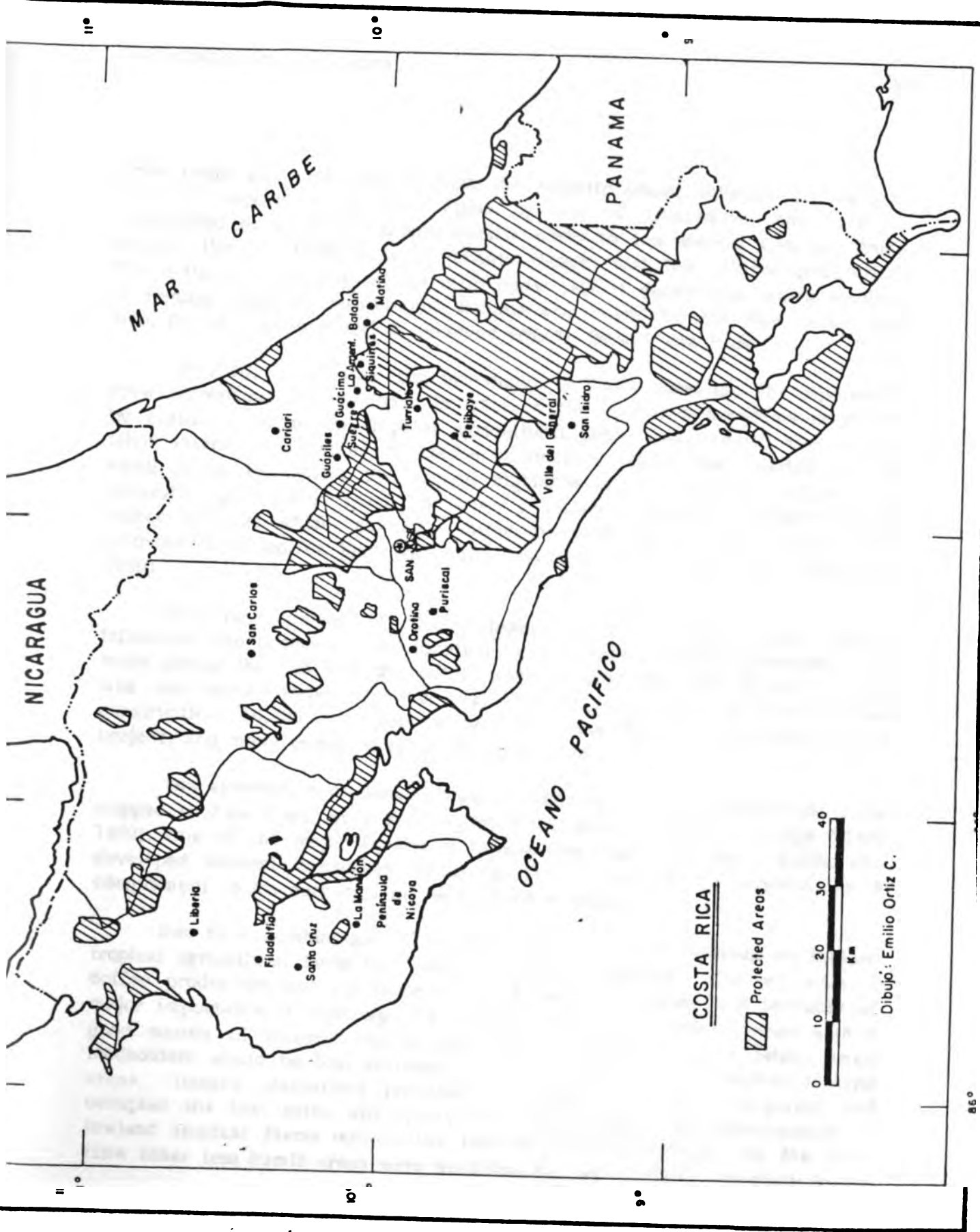
2.1 Historical Perspective on Costa Rican Land Colonization

2.1.1 Economic Importance of Tropical Lowlands

The tropical lowlands of Costa Rica have been of economic importance to the country since the XVI century, although the area has not been heavily populated due to a combination of factors, including health, defense and climatic preferences. During the colonial period, the production of cacao was established as an activity of major economic importance, and this importance has been maintained until the present. In the XIX century banana production was added as a new focus of economic interest in the lowlands. A persistent factor in national interest in the tropical lowlands has been the desire to improve communications and transport, especially for exporting products from the Meseta Central through the Caribbean; transport between the Meseta and the Pacific Coast was well established in the colonial period, but access to the Atlantic Coast has been a constant problem due to the heavy rains which hindered road construction and maintenance.

Cacao had been cultivated by pre-colombian inhabitants of Costa Rica, but in the colonial period this cultivation was taken over by Europeans and descendants of African slaves in the coastal area near present day Limon. Records from 1682 indicate that in the valleys of Matina and Suerre there were 102,200 cacao trees, in 55 haciendas. An analysis of rental records between 1650 and 1790 shows 192 renters, only 9 of which were European, the rest of whom were black or mulatto (Monge Alfaro 1980).

During the colonial period the Cacao production areas were dangerous not only for health reasons, but due to regular attacks by Indians and pirates. This area had been officially ignored by the colonial government,



Dibujo: Emilio Ortiz C.

since trade was prohibited through the Atlantic coast; colonial law required that all imports come from Spain by way of Guatemala, and then be transported overland or through Pacific ports to the Meseta Central. Trade thrived through Atlantic ports despite danger and the official prohibition. The official neglect of the Atlantic coast left it defenseless which resulted in regular raids by pirates and Indians who would harvest ripe cacao, and who, for at least one period, received tribute from Costa Rica.

In 1804, coffee was first introduced to Costa Rica, and its importance grew throughout the century. In spite of the economic expansion promoted by coffee, pressure on tropical agricultural lands was reduced due to the labor intensive character of coffee production, which was carried out on small farms throughout the central highlands of the country. While it is generally agreed that there has been a tendency toward concentration of coffee holdings which may have begun as early as the past century, the distribution of coffee land was quite equitable as late as 1935 (Churnside 1980).

The development of the railroad to the Atlantic coast heavily influenced the process of colonization of that area. Several attempts were made during the XIX century, but it was not until 1890 that Minor C. Keith was successful (Seligson 1980; 52). As a by-product of the railroad construction, 10,000 Jamaicans arrived in Costa Rica as laborers for the project, and many remained after its completion.

The exportation of banana began in 1880, when 360 banana stalks were shipped to New York. By 1884 this figure had risen to 420,000 (Monge Alfaro 1980). One of the major figures in banana production was Minor Keith, who developed several companies, including the United Fruit Company, as a complement to his activities in the railroad business.

Due to a combination of factors, there was little pressure on lowland tropical agricultural lands until well into the XX century. The requisites of coffee production and its distribution among small farms was probably of major importance in reducing the tendency for out-migration, since with a good source of income and a guaranteed demand for their labor, small landholders would be less motivated to test their luck in tropical lowland areas. Banana plantations provided a ready source of employment and occupied the best soils, which may also have reduced the development of lowland tropical farms outside the banana production areas. At the same time other less humid areas were available for colonization, especially in the

areas of Guanacaste and San Isidro del General.

Nevertheless, colonization did occur on a reduced scale throughout Costa Rican history. To the southwest of the Meseta Central cantonal administrative centers were legally recognized in Puriscal, in 1868, and in Orotina, in 1908. The dry coastal lowlands of Guanacaste saw the establishment of Liberia (1770), Santa Cruz (1821), and Filadelfia (1839), as well as La Mansion (1890) in the foothills of the southern Nicoya Peninsula. The highlands of Tilaran were colonized from 1818 onward, first by large "hacendados", and later by small farmers (Sandner 1961). The area of Sarapiquí was a source of lumber throughout the XIX century, and attempts at colonization had been begun in the San Carlos area as early as 1850. The rhythm of colonization speeded up in the 1930's.

2.1.2 Colonization of the 1930's

The Depression and the arrival of the Panama Disease in the banana plantations gave a new impetus to land colonization in Costa Rica. Before 1930, the majority of the country was very sparsely populated outside the Meseta Central, with the population of the country concentrated in coffee and secondarily banana production areas to meet the growing demand for these products. Earlier colonizations had moved at a leisurely pace, concentrating on the most desirable areas of new colonization zones. Although "cantones" had been established in the Nicoya Peninsula, the highlands of Guanacaste were still largely uninhabited. Likewise, the Valle del General was sparsely populated as were the Northern Plain and the Atlantic Coastal area. In the 1930's major colonization movements were directed toward the border areas of Costa Rica, opening roads and farmland where previously there had only been forest, and filling in forest areas which remained between previously established population centers.

The reduced demand for coffee and banana due to the depression had a profound effect on the Costa Rican economy. During the rise in importance of coffee, Costa Rica went from self-sufficiency in basic grains to being a net importer (Seligson 1980); flour was brought from Chile and California to make up the deficit. As the economic opportunities from export agriculture diminished in the 1930's, the natural increase in population could no longer be absorbed into cash-crop production, and jobless young

farmers began pushing toward the frontier regions. This motivation toward land colonization was accentuated by the Panama Disease which destroyed many banana plantations. While the conversion of banana plantations to farmland (Stouse 1965) may have ameliorated the demand for new forest land conversions, the reduction of the work source in banana industry left in place a transportation infrastructure which facilitated access to new lands.

Sandner (1961) documents the process of colonization in Costa Rica during the XX century. The major colonization area was the Valle Del General, south-east of San Jose, but there were numerous others, such as the Peninsula of Nicoya, the Central Pacific Coastal areas and the Sarapiquí-San Carlos areas. By mid-century these colonization areas had largely been occupied. Once access roads and basic services were established populations grew rapidly. By the second half of the century, the colonization of tropical forest areas had largely lost its characteristic "frontier" quality as the forest came to be restricted to pockets between agricultural areas.

The era of colonization between 1930 and 1960 followed and reinforced Costa Rican perceptions regarding forests and land use. Historically, forests have been regarded in much the same way as had been the North American "frontier", as a source of new wealth, employment and an opportunity for land hungry farmers. The experience of the XX century colonization bore out this perception to some extent; areas such as Nicoya and the Valle del General contained some good agricultural lands whose use had been limited by lack of transportation and lack of initiative. Nevertheless, the best soils were quickly occupied, and more recent colonization has had to concentrate on less appropriate land in more difficult conditions.

2.1.3 Recent Colonization in Costa Rica

Major colonization efforts are now restricted to the Northern Atlantic Plain, an area which extends west from the Caribbean coast to the chain of volcanoes which divide it from the drier Pacific lowlands, and from the foot of the Meseta Central north to the Nicaraguan border. Unoccupied forested areas still exist in the mountains of the Cordillera de Talamanca in the southern part of the country, but these areas have recently been designated Indian Reservations and National Parks and new colonists are being

excluded.

The climate of the Northern Atlantic Plain for the most part is humid tropical forest (Holdridge 1979). Annual rainfall is variable, but most areas receive 2,000 to 3,000 mm, with a "dry" season of three months from January to March which in some years is marked only by a decrease in precipitation. Rainfall peaks occur in June, and October-November. Most of the area lies below 100 m. altitude.

While soils of the area suffer from the problems characteristic of high rainfall areas, there are areas of relatively good soils made up of volcanic alluvium.

A number of directed colonization efforts have been carried out in the area. Most notable are the Rio Frio-San Carlos area, and Cariari. In the Rio Frio area, a number of colonization projects have been organized within areas of spontaneous colonization, making the differentiation of "directed" and "undirected" activities and results difficult. CATIE has been working in the Rio Frio area within the framework of an agreement with ITCO (now ADI) (Villegas 1980). Cariari is one small colony located near Guapiles, formed in the 1960's, adjacent to the spontaneous colonization area of Guacimo, and the banana plantations of the "Linea Vieja", some of which have been converted to small farms. Both Cariari and Rio Frio have been successful in the establishment of small farms, and the permanent settlement of migrant families. Formal technical improvement programs especially directed toward these colonies have undoubtedly had important impacts (Villegas op. cit., Jones 1983). Both areas are now experiencing a development of urban centers, population increase and dramatic increases in land values. Cariari colony is potentially one of great interest, since its design incorporated a plan for forest exploitation by the farmers (McKenzie 1972). No further work has been done with regard to the forestry activities in this colony.

To the east of Cariari lies the area of Bataan. This settlement was initiated on abandoned banana plantation lands nearly at sea level (10 m.) surrounded by forests and squatter settlements. It has been an area of Cacao production for several centuries (it lies 6 km. from the town of Matina, mentioned above), and lies close to the main highway which connects the port of Limon with the Meseta Central. The nearest town is Siquirres, and Bataan itself is "urban" in a loose sense, with several blocks of businesses and dwellings bordering the railroad tracks. It has not achieved

the urban growth of Guapiles, possibly due to the close proximity of the major urban center of Limon (less than 1 hour by asphalted road) and Siquirres (less than 1/2 hour). While it seems anomolous that an area along a major road is a "colonization" zone, this may be explained by the early establishment of large landholdings associated with the railroad and banana industry. As other areas have been saturated with colonists, farmers have begun to challenge the large landholders.

Bataan is still an important area for production of Cacao, and there are several banana cooperatives in the area. A new crop is mechanized rice in flat humid lands. A government program supports prices, but producers of the area have now reached their collective quota.

2.2 Current Management of Tropical Forest Areas in Costa Rica

In recent years, Costa Rica has made important strides to protect its remaining forest resources. National and international organizations have joined forces for an extensive campaign to establish biological reserves and national parks in areas of exceptional beauty and biological interest under the direction of the National Park Service (NPS). The National Forestry Directorate (NFD) has been charged with the management of all remaining forests in the countries, and has established a series of Forest Reserves and Protection Zones where deforestation has potentially damaging impacts on downstream populations or facilities. Another large block of forest land has been incorporated into Indian Reservations, under the management of the National Commission for Indian Affairs (NCIA). These efforts have been surprisingly successful, and nearly 20% of the total land area of Costa Rica is incorporated into some kind of land protection plan (See Table 1). To a large extent, the process of land colonization has been centralized under the Agrarian Development Institute (ADI); while the primary concern of the ADI has been land reform in areas of established farms, it is also the institution which processes demands for new land from forests.

Table 3 - Costa Rica - Protected areas, types of management and managing agencies

Management Class	Agency	#	Area (has.)
Forest Reserves	NFD	12	408,351
Protection Zones	NFD	13	60,671
Wildlife Preserves	NFD	5	15,483
Indian Reserves	ADI	13	276,379
Biological Reserves	NPS	9	21,688
National Parks	NPS	14	393,850
National Monument	NPS	1	218
Recreational Areas	NPS	5	659

TOTALS		72	1,177,299

NFD = National Forestry Directorate.
 ADI = Agrarian Development Institute
 NPS = National Park Service

----- Source: Morales 1984. See Appendix A for more detailed breakdown of protected areas.

2.2.1 The National Park Service

The National Park Service has been quite successful in protecting forest areas, and preventing forest destruction for agricultural or other purposes. Their policy is to resist all incursions on park land. When parks are formed, they try [1] to buy legally established farms which remain within the park boundaries. Squatters are informed that they are on park land and discouraged by park guards. Only one area under Park Service authority has problems with squatters (Biological Reserve R. B. Hitoy), and this problem arose during the prolonged process of acquisition of the land, when neither the former owners nor the Park Service had legal authority over the land.

One example of the Park Service's success can be seen in the Corcovado Park, in the Peninsula of Osa. Corcovado shares a long boundary with the Golfo Dulce Forest Reserve, managed by the NFD. The Golfo Dulce Reserve has been invaded by squatters, who have been encouraged by the gold mining activities in the Reserve. No method for controlling this invasion has been found, and the NFD was well disposed to a plan to manage the Reserve jointly with the ADI in order to stabilize the population through formal land titling and try to bring them into a legal framework for controlling forest cutting. This plan has not yet been financed, and there has been no improvement in the condition of the reserve. Corcovado Park, on the other hand, does not have any invasion problem (as of June 1984), and employs 20 park guards to control the entry of squatters. The only farmers who remain within the park boundaries are those who had legal title to their land before the establishment of the park.

Another example of NPS success in avoiding forest destruction can be seen in the Altos de Coton, on the Panama border. This has been the site of a major conflict between peasant squatters and national officials, and the area in question abuts lands administered by ADI, and NFD. According to NPS officials, the activities of some 6 guards in the Las Tablas Protection Zone (jointly administered by NFD and NPS, managed by NPS) has been sufficient to avoid the inclusion of more than a small part the Park lands in the conflict.

1. Usually successfully. ADI financed the purchase of lands when the parks were first established, since ADI was relatively well funded at that time.

In at least one instance, NPS relinquished control over parts of a Biological Reserve which were not appropriate for inclusion under their administration. The Reserve in question is Carrara, which in the beginning included some areas of abandoned pasture and an isolated watershed protection area. Organized squatters invaded part of the reserve, and were ejected, but they brought pressure to bear through the actions of local political officials, so the NPS acceded to the separation of some abandoned pastures, which according to an NPS official were not really appropriate for inclusion in the reserve. Part of the separated lands became farms in part, and the rest became the Cerro Turrubares Protection Zone. The NPS strategy of releasing lands which they are not prepared to manage may be important in their success in protecting the areas they can manage.

2.2.2 National Commission for Indian Affairs

Indian reservations occupy more than 276,000 ha. in Costa Rica. These lands are generally forested, and NCIA officials report that these lands are not being deforested. The Indian populations do not practice extensive agriculture or commercial logging. Furthermore, the Indians assist in keeping squatters out of the reservations, either by advising them that they are on reservation land, or by informing the appropriate authorities. The exceptional cases of Indians who consistently alienate reservation lands through attempted "sales" (Indians have no legal right to sell land of reservations) are controlled through "Development Committees" composed of local Indians which may order their exclusion from the Reservation.

2.2.3 The National Forestry Directorate

The largest category of protected lands in Costa Rica are Forest Reserves, under the administration of the National Forestry Directorate. The NFD also jointly administers Protection Zones with the NPS. The management of Forest Reserves and Protection Zones falls under the direction of the Reforestation Program of the NFD. Each Forest Reserve and Protection Zone has its own operative plan, which is to serve as a basis for a more detailed management plan. To date, only La Carpintera (a

Protection Zone) has a management plan. The plan for the largest Forest Reserve, Rio Macho, is being written up as a thesis project by a CATIE student. In principle, none of these lands are available for colonization, but there has been a constant pressure on NFD to release lands. Some Reserves have been colonized by squatters, and the Golfo Dulce and Los Angeles reserves were mentioned as having especially severe problems. Los Angeles Reserve was established after the town of Santo Tomas had been established within its limits, creating a situation of constant pressure by farmers. The NFD strategy for this situation is one of legalizing farmers within the reserve, by giving land titles to clearly establish which lands are occupied and which not, in order to prevent further squatting. Farm lands within the reserve will be zoned as to appropriate land use, and the NFD's power to authorize land titling will be used as an enforcement tool.

The National Forestry Directorate has not been as successful as the NPS in controlling access to protected areas, possibly due to the ambiguity of their mandate in the management of forest areas. The head of the department of reforestation for the NFD reports that the objective in managing Forest Reserves is to incorporate them into the national economy. While this orientation is appropriate for a governmental agency, it surely gives rise to a need for many decisions as to whether an immediate economic contribution is more desirable than a more valuable future or long-term contribution. The existence of these alternatives may hamper decision making, and thus cause an ineffective protection of forest areas. The case of the Taque-Taque colonization illustrates this point.

Taque-Taque is located near the town of Pejibaye, in Canton Jimenez, Cartago. It is an innovative plan for colonization involving forest reserve lands initiated in 1977, and is jointly administered by the NFD and the ADI. The "colony" is a mountain top located near the town of Pejibaye, which itself is located in an agrarian reform colony established in 1963 in a banana production area. Pejibaye is located in a small valley, and the establishment of new colonies is required by the growing population of the area. Both the NFD and ADI see this pressure as an indication of the success of the Pejibaye project (another colony, El Humo, was established by the ADI in the same area in 1974).

The innovative aspect of the Taque-Taque colonization is that it is a first attempt by the NFD to manage the occupation of forest areas for agricultural purposes. The NFD had managed the colonization of the Chambacu area near Ciudad Quesada, but the land had already been

deforested at the time the project began. Taque-Taque abuts the Rio Macho Forest Reserve (91,992 ha.), and comprises an abandoned farm which straddles the border of the reserve. Part of the 340 ha. colony has been carved out of the Forest Reserve, and temporarily loaned to farmers for 5 year renewable loan periods.

Some parts of the Taque-Taque area are too steep to be safely cultivated, and the objective of the management project is for the NFD to analyze land use potential, and recommend appropriate uses through the activity of the the national level Agroforestry Program. The basis for activity to date has been in large part a student thesis, in which land in the area was stratified by appropriate land use. These recommendations are being reviewed by NFD personnel for incorporation into the final package of recommendations to farmers. Following the land use recommendations in the thesis, land in Taque-Taque has been stratified into "protected", "restricted" and "unrestricted" use categories. These strata correspond to absolute protection (no agriculture), agroforestry (especially macadamia), and general agricultural use (annual crops or pastures).

The activity by the NFD in Taque-Taque is still restricted to investigation, and no recommendations to farmers or attempts at control have yet been made. Some agricultural activity is being introduced into the area, but the main activity seems to be extraction of fuelwood for the coffee processing plant in Pejibaye.

NFD officials are doubtful of their ability to enforce their technical recommendations, despite their seemingly powerful weapon of last resort, the revocation of the temporary permission to use the land. The Taque-Taque colonization project was a response to pressure from the local community to provide new lands for younger farmers. The NFD acceded to this pressure in permitting the land from the Forest Reserve to be considered for colonization, and a recurrent theme of government officials in this study has been the inability of government agencies to resist the demands of local political pressure groups.

2.2.4 The Agrarian Development Institute

The Agrarian Development Institute is the largest scale land manager in Costa Rica. In 1984, ADI reports that it has settled 40,326 farmers on

793,940 ha. of land in the last 23 years (ITCO, the predecessor of ADI, was formed in 1961) (Barahona 1980; 255). ADI is the agency responsible for the management of nearly all colonization, both on forested lands and on established farms, and is called upon in cases of invasion of Forest Reserves or Indian Reservations.

ADI is primarily concerned with settling farmers on land; environmental concerns may be recognized and acted upon at a personal level, but are not generally included in policy decisions. For questions of forest use, the general ADI policy is to look to the NFD to supply whatever guidelines are necessary, while the ADI tends to the problems involved in establishing farmers on land. In some cases, for example the 12,800 Ha. Barbilla Protection Zone, the administration of the area is jointly assumed (in this case by ADI, NFD and NPS), with the understanding that each agency will carry out its function within the designated area. Another attempt at collaboration was the previously mentioned plan for the Golfo Dulce Forest Reserve, where ADI and NFD were to collaborate in the management of the area to control deforestation by colonist-farmers through the formalization of farm titles and the application of legal controls. In such a plan, forest exploitation is integrated into the process of colonization in a more rational fashion, as had been done in the Cariari colony near Guapiles (McKenzie 1972). Provisions are made so farmers realize benefits from the forest which will capitalize the farms and demonstrate the economic potential of forest management. Such a project requires good controls over forest cutting and lumber marketing, and neither NFD nor ADI have resources available for these activities.

The policy of ADI is to precede the establishment of new colonies with a set of socio-economic studies which analyze the capacity and appropriateness of proposed farmers, and land use capacity of the invaded farm, as a basis for recommending the the inclusion of the most appropriate farmers, and for purchasing of the land. These same studies later serve for making recommendations to farmers as to how to manage their farms. For example, when visited in 1984, the Neguev Colony had complete soil maps of the area, and had zoned the colony into sectors corresponding to most appropriate crops. Training and extension efforts were directed toward the recommended activities for each zone.

Farmers are admitted to the colony on the basis of several criteria which seem to be fairly clearly directed toward the exclusion of "land speculators" in agrarian reform colonies. The requirements for colonists are;

1. They must not possess other lands.
2. They must have a family.
3. They must show that agriculture is the basis for their livelihood.
4. They must demonstrate basic agricultural knowledge.
5. They must agree to work the farm themselves.
6. They must not have received (and sold) land from ADI (or ITCO, its predecessor).

The completion of background studies by ADI is an ideal not always achieved, as will be discussed in the case study which follows.

No provision is made for the enforcement of land-use recommendations. Farmers are left to accept or reject these on the basis of their own judgement, although it is assumed that most will follow the technical recommendations. In much of the tropical lowland colonization region discussed here, inappropriate land-use does not present much erosion danger, since the land is relatively flat. Nevertheless, even in more difficult areas, erosion control is the province of the NFD, and is not included in ADI work plans.

Within ADI colonies, forest management is controlled by the NFD in a fashion similar to areas which have no ADI colonists. Farmers are required to request permits for forest cutting from NFD, and are subject to all normal regulations. ADI intervenes only to help the farmer establish that he is the legal owner of the land, which is a prerequisite for lumbering or land clearing permits. In Neguev Colony one agronomist is assigned the task of overseeing forestry questions, but he is strictly an advisor to the NFD inspector, and makes recommendations as to appropriate action, but cannot give out permits. The one restriction ADI places on forest harvesting is that all proceeds must be reinvested in the farm; prior to the recommendation of allowing a cutting permit, farmers must present an "Investment Plan" (Plan de Inversion) which details the use to which income will be put. Frequent purchases are fencing materials and fumigation equipment, but once the permit is authorized ADI recognizes that many farmers do not follow the investment plan. -

NFD policy with regard to forest cutting permits is to avoid exploitative or dangerous deforestation, and to authorize cutting when no environmental or legal problems are present. In practice, this means that steep slopes and stream courses cannot be deforested. NFD will also authorize selective cutting in forest areas on farms, while prohibiting complete deforestation. These restrictions are enforced indirectly; NFD permits are required for the transport of logs on major highways, without which they can be detained. Truckers prefer not to purchase logs without having this paperwork in order, so the NFD policy does in fact control commercial logging. Small scale cutting for on farm use is permitted with NFD authorization, but in practice is largely uncontrolled, and clearing is often carried out without permission when there is no intention of selling wood.

Logistical and other problems often impede the complete implementation of the ADI management strategy, and in the case study to follow these problems will be described.

2.3 Case Study; Bataan Regional Office of ADI

ADI is the focus of much controversy and conflict. It has been accused of serving landed interests as a ready and well-paying buyer for unwanted farmlands (Salazar 1962, Hill 1964) on the one hand, and on the other hand has been accused of fomenting laziness among peasants and forest destruction by legalizing a process of land clearance, pasture establishment and land speculation by itinerant laborers (Costa Rica 1982). Obviously, there is a certain truth to the accusations, since land owners insist on being well paid for expropriated land, and the agency is under political pressure from organized peasant groups to acquire more land. These accusations and pressures have been answered by policy changes in ADI, and while they are not always directly related to deforestation and land use, they exercise a pervasive influence on agency decision making, and constitute part of the problem encountered for the design of environmentally appropriate colonization strategies.

For administrative purposes, ADI management of colonization is

Table 4 - Land Use in Limon Province - Costa Rica

Type of Administration	Area	Total	Inhabs.
National Parks			
Tortuguero	18,946		
Cahuita	1,068		
Chirripo	43,700		
Braulio Carrillo	31,401		
La Amistad	190,403		
Reserva Biologica			
Hitoy	9,044		
		294,562	
Reservas Forestales			
Zona Protectora Barbilla	12,830		
Matina	400		
Volcanica Central	72,895		
		86,125	
Reservas Indigenas			
Tayni Estrella	13,616		
Talamanca	62,129		
Chirripo	82,105		
Telire	9,187		
Sibuju Norte	2,195		
Cocles	5,538		
Chase	190		
Barbilla Dantes	2,450		
		177,410	
TOTAL		558,097	
Agrarian Reform - Number of beneficiaries and farm area (excludes Indian Reservations)			
	92,234		3,153
Total Agricultural Sector for Limon			
	Ha. in forest	Ha. in farms	# farms
	95,663	124,690	5,290

Sources: Morales 1984, Costa Rica 1973, Appendix A, Appendix D.

decentralized in 20 regional centers to manage some 300 individual colonization areas. These colonies include 40,326 farm families, on an extension of 793,940 has., approximately 15% of the territorial extent of the country (See Appendix C). Each regional office administers a set of colonies with varying conditions. One example of the complexity of the administrative problem can be seen by comparing the lists of colonies held by the Main Office and the Regional Office for Bataan; both recognized the existence of 21 colonies, but there is a difference of approximately 15,000 ha. in the estimates of area administered, and only a 50% overlap in the colony names (compare Appendix C and Appendix D). Apparently, colonies are created, legalized or administratively divided frequently, and this dynamism and problems of communication are reflected in the differences between the two lists (regional office technicians made a xerox of the author's copy of the central office list of colonies).

Table 2 presents an overall view of land use in Limon Province. The majority of all land is protected, and a large part of the area in farms is incorporated in ADI programs. It should be noted that Limon has experienced a great deal of economic growth in the past 10 years, so the 1973 Census data are likely to be quite different from the current figures (the 1984 Census was carried out in June 1984 and is still in the process of analysis). In any case, it is clear that ADI colonies form a significant portion of the farms and farming population of the province.

In his analysis of colonization of Latin America, Nelson (1977) discusses Bataan colony, but his brief summary hardly does justice to the situation. He concluded that the colony was a failure because 1) problems of cooperative organization, 2) there were squatters within the colony, 3) a lack of interest on the part of settlers in agricultural activities, and 4) lower than expected yields made the colony a failure. Viewed at the present time, his observations oversimplify a complex situation and misrepresent the problems of colonization in the region.

The colony of Bataan was created from an abandoned banana plantation, and as such was not the subject of the present investigation. It is one (or four depending on whether the administrative list of the main office or the regional office is used) of 21 colonies administered by the Bataan ADI office. While it is the largest of the colonies, it represents only part of the colonized area of the region. The four divisions recognized by the regional office in 1984 are; the original colony of 10,500 ha., an additional 2700 ha. of parcels established by ADI, another 7000 ha. of

parcels assimilated into the colony, and 800 ha. of banana cooperatives.

Steps have obviously been taken to incorporate new squatters into the colony, evidenced by the near doubling of the size of the colony over a period of approximately 10 years. The addition of new farmers to the colony (there are now 1500, as opposed to 600 proposed at the time of Nelson's study) seems to indicate that the problems of low crop yields have not limited growth. A national support program for rice production has been very well received by farmers of the region, who are now producing their full quota of rice. The banana cooperatives have been so successful that an ADI official estimated the members' individual incomes to have been in excess of \$20,000 for some years, and manual labor is now carried out by contracted, non-member laborers. ADI officials see their main problems as the excessive demand for land by peasants, the agency's financial limitations which restrict their level of activity, and the creation of a new elite in the area composed of members of the banana cooperatives.

With hindsight, it is clear that Nelson drew erroneous conclusions and made inaccurate predictions regarding the colony. But it is likely that the discrepancies between Nelson's predictions and the actual state of Bataan colony is a result of changing conditions and policy corrections made as the colony developed.

2.3.1 Neguev Colony and La Argentina

The two colonies in forest areas selected for this study are Neguev and La Argentina (also called Made), of 5,340 and 1300 ha. respectively. Both colonies are at approximately 100 m above sea level, with the majority of La Argentina above this altitude, and the majority of Neguev below it. These colonies are administered by the Pocora Regional Office of ADI, but this office is at present (August 1984) incorporated into the Bataan office. These colonies were visited at the recommendation of Bataan administrators since they had a more complete forest cover when the colonies were initiated, and as such more clearly fit into the framework of the present investigation.

Neguev colony has a favorable financial situation, due to the initiation of an AID funded program to reinforce land titling and colonization. Neguev colony has a staff of 5 technicians, and a fleet of new jeeps to administer

the 5,340 ha. of the project, while the Bataan Regional office has a staff of 6, 1 jeep (which must be push started) and one motorcycle to administer a much larger area. Neguev, then, does not suffer as acutely the financial limitations which affect Bataan.

La Argentina and Neguev share similar environmental problems and a similar history. The greater part of the land in both colonies is unsuitable for most kinds of agriculture. They are acid clay soils which are generally thought to be suitable only for pasture. Small sections, especially alluvial soil areas, have better agricultural potential, but these lands do not constitute more than 20% of the total land area. Both farms were formed on the basis of land invasions by organized peasant groups, and were forced on ADI without allowing for a complete background analysis.

A number of farmers were interviewed in each of these colonies for their views on the problems of establishing their farms. Several generalizations can be made with regard to the farmers interviewed. First, many are recent immigrants from areas with different ecological conditions, such as the much drier Puriscal area, or from Turrialba, a higher area with fewer months of rainfall and better soils. The initial ADI report on the population found 115 farmers on the land, and only 56 from nearby areas (IDA 1980). These farmers do not have special insights into the problems of managing their new lands, and generally admitted to being at a loss as to how to best use them. Sowing of pasture was the one universal solution to their problems, since most affirmed that soils were too poor to support any other crops. Nevertheless, farmers did not seem to have a realistic view of their income possibilities from animal production. Since the majority of the farms are smaller than 20 ha. the only alternative for deriving a viable income from animal production would be through dairy production. Farmers interviewed had made no special provisions to orient their work toward dairy production.

Tree farming is not considered a viable land use alternative by the colonists. For a farmer, income from trees is usually a one-time affair, where he sells the rights to trees on his land, and the lumber contractor takes charge of cutting. The returns to the farmer for this sort of extraction are low but acceptable because they require no input from the farmer. In La Argentina a small saw mill was established, but prices for processing logs were so high that farmers only considered using the mill's services for home construction, as an alternative to buying wood. It seems clear that the (lack of) organization of the lumber industry in the area is a

major disincentive to further forestry activities. Farmers do not have especially profitable experiences in wood processing, and apparently as a result, it never occurs to them to enter the business again.

Both Neguev and La Argentina were private farms prior to their invasions. Both had significant forest areas, but in the case of Neguev, the owner had sown several hectares of laurel (Cordia alliodora) and laurel muneco Terminalia ivorensis in the central area of the farm. The plantations seemed to have suffered high mortality, and only patches of plantation remain. The remaining trees are at least 5 years old (the colony was established five years ago, and one farmer's wife assured us that there had been no planting in the interim), and had reached a height of nearly 10 meters. The farmers who had acquired the land on which the trees stood could not be located, but there was no evidence of any special efforts taken with regard to the plantations, and no further sowing of trees had taken place. Pastures had been planted among the trees, but the two local ADI employees interviewed (including the forestry inspector) were unaware of the plantations, until they were pointed out to them.

It is significant that forestry activities were not contemplated in the ADI management plan for farms in the area. "Protection Zones" had been established in swampy and uncultivable areas, but no plans for reforestation had been suggested.

Both Neguev and La Argentina had been major centers of peasant political activities. When La Argentina was first invaded, peasants organized in rejecting ADI support, and the farm was "abandoned" by ADI, leaving it in hands of the peasant group. One reason that the Pocora "office" of ADI is now located in Bataan is that it had formerly been located on a farm adjacent to La Argentina, and had to be abandoned due to the political opposition. The office facilities have now deteriorated to the point of being unserviceable. Apparently the more inaccessible parts of the farm had been used for weapons training by militant groups at one time, but after police action this activity ended. The most significant result of the political activity in La Argentina was that the recommendations of the socio-economic evaluations of potential settlers could never be implemented. Of the 115 families identified in the ADI Settler Selection Study, only 89 were recommended as settlers. Twenty six were excluded for a variety of reasons, including possession of other lands, previous land adjudications to the farmer by ADI; indications that the farm would not be a major source of income, or the "colonist" being a single, legal minor (possibly family to local

farmers or other settlers in La Argentina). These recommendations were never carried out, and the farm was never formally adjudicated, so that in June of 1984 there was no legal title for any of the existing parcels, and presumably the original 115 colonists had disposed of the land as they pleased. Many land transactions had taken place since the original study on the basis of "letters of sale" (cartas de venta), but the ADI land adjudicator insisted that these papers had no legal merit. Survey teams for ADI were in the process of making new a socio-economic study and remeasuring parcels, so titles could be formalized.

While the case of La Argentina is exceptional in the militance of its occupiers, in many senses it represents the norm in land colonization. A farm is invaded by peasants who have identified it as "abandoned" (or minimally managed); the organized peasant group succeeds in bringing political pressure to bear on ADI so they cannot carry out their preliminary evaluations or make decisions on the basis of information collected. ADI "inherits" to purchase the farm and has no option to refuse conditions suggested by the land owner, or those imposed by the invading group.

The cases of La Argentina and Neguev illustrate the problems of land acquisition by ADI. Land of questionable value is acquired, and distributed among peasants with no basis in technical criteria. The result is the establishment of colonies on poor farmland, on farms too small to offer reasonable incomes given the poor land quality. Even the farmers recognized the limitations of their land, and have little hope of becoming self sufficient, much less, well-off. From their perspective the land in all likelihood is a good investment (ADI officials estimate that the majority of the original families have changed since the first invasion of 1979, and the current occupants have paid for the land), since it will appreciate and generate some income in the meantime. Nevertheless, it is doubtful that these farms will contribute to a vigorous development of agriculture without the development of improved land utilization strategies.

2.3.2 Economic and Political Aspects of Tropical Land Colonization in Costa Rica

No discussion of land colonization in Costa Rica can be complete without at least mentioning the economic and political context of land

invasions. These are delicate and explosive issues which have come to be incorporated into the deforestation process and which influence the process of land development and use even more than technical considerations. During the week of 16 July 1984, the regional office of ADI in Bataan was invaded twice by militant squatters, and on one occasion the personnel encountered in the office were held hostage for a period of 20 hours in an effort to reinforce squatter demands. The background to this invasion is presented here because it helps illustrate the problems faced by ADI.

As mentioned, one of the major concerns of ADI in adjudicating farmland is to avoid providing land to peasant land "speculators" who have no intention of farming. In some notorious cases, farms have been invaded by peasants, and adjudicated by ADI only to have the farmland resold to the original owner within a period of a few years. More common is the rapid turn-over of peasants in recently established colonies, where original invaders quickly "sell" their land to other peasants. While there obviously are conditions under which farmers may want or need to sell recently acquired land, ADI officials identify certain individuals as "professionals" who earn a living by participating in invasions and selling adjudicated lands. Condition 6 of the ADI settler evaluation criteria (page 30) is included to exclude these professionals from new colonies. This question is prominent in the following discussion.

The immediate motivation for the take-over of the ADI offices in Bataan was a demand for expropriation of a farm called "La Margarita". (This is not the same Margarita referred to in Appendix D.) La Margarita is a cacao farm located on the railway between Bataan and Limon. Its area is 360 ha. and its owner, the Costa Rica Cocoa Company, was reported to be asking 40 million colones (approximately 1 million US\$) for the farm. A group of 50 squatters invaded the farm, but were removed by the local police, and some were taken to court. Nevertheless, the squatters invaded the lands again, since according to the squatters the farm had been abandoned prior to their invasion. This may be true, since in the past few years the presence of Monilia fungus has greatly reduced cacao production in the area, and many cacao plantations have ceased to be worked. In the meantime, CATIE technicians working at "La Lola" experiment station near Bataan have discovered methods for controlling Monilia which appear to be economically feasible. Where a few years ago cacao was being abandoned or destroyed, plantations are now being renewed or newly planted. ADI finds itself in the position of buying a fairly small farm, which the owners probably now want to retain, at a price which would be quite high for

abandoned lands.

An added dilemma for ADI is the make-up of the new colonists. Most are thought to be professional land occupiers. This impression gains some support from the location of the farm on the railway, where lands will be especially valuable and will appreciate rapidly. In a chance interview with a squatter from a politically associated invasion (the two invasion groups had joined forces to pressure for the adjudication of "their" lands, and had jointly invaded the IDA offices that week), the squatter recognized that 80% of the invaders of "La Margarita" were "comerciantes" (merchants, in his words).

Political pressure is increased in these invasions by the participation of leftist political parties. In the Selection study for La Argentina (IDA 1980), it was recognized that the Popular Vanguard Party (PVP) provided advice and support for the invading group. The PVP is a coalition of leftist parties which have traditionally been involved with political activity in labor unions of the banana areas. Many invasions are organized through banana workers unions, where members organize to take over farms, and the PVP has come to be present in other invasions as an organizational or legal advisor. In the case of La Margarita, a second gathering at the ADI office in Bataan two days after the takeover (ADI officials took the precaution of not allowing more than one of the demonstrators in the office at one time) was joined by directors of peasant unions from all over Limon province.

The takeover of the ADI office took place during a week marked by nationwide labor problems. Newspapers were full of articles discussing the coalition of political interests which were attempting to manipulate these labor problems for their own ends. After leaving the ADI offices following the second incident, organizers of the group openly discussed the possibility of coordinating their demands with those of the workers in other parts of the country to deal a "massive blow" (golpe masivo) to the government.

While the takeover of ADI offices has been an exceptional occurrence in the past, the invasion of lands has not. In a progress report from 15 June 1984, the Bataan Regional office reported that there had been 30 invasions in the past 2 years. Twenty of these were new invasions, and 10 were continuing cases, which had not been formally adjudicated for a variety of reasons.

The problems associated with the farm "La Margarita" illustrate the problems of ADI in managing colonization on a technical basis. The interests of landless farmers have been tied to political and commercial interests

which are contrary to ADI policies. Pressure groups are trying to force the ADI into making decisions on a political basis, in order to avoid the application of technical criteria which may recommend the refusal an adjudication request. At the same time, ADI may find itself subject to pressure from the government to make decisions which are based more on the current political conditions in the country than on the technical merits of a colonization program.

2.4 Conclusions and Recommendations

Several general conclusions emerge from this analysis of colonization in tropical forest areas.

1. National agencies faced with colonization questions do not have technical information available to them which could guide them in making more efficient use of humid tropical lands, such as studies of land use potential.
2. There is a shortage of production recommendations which are feasible for small farmers. Productive activities which would be especially appropriate for the humid areas, typically forestry, do not have a structure of financial and technical support which would encourage farmers to enter into innovative production strategies.
3. In the cases where this information is available, there is a lack of incentive for farmers to use it.
4. Financial support is generally lacking for the implementation of activities which may help to ameliorate environmental problems.
5. There is no national environmental conscience capable of resisting local pressures for forest destruction.
6. ADI is being forced into the position of regularizing ex post facto the illegal seizure of lands, both by poor peasants and by "professional squatters" and land speculators.

2.4.1 Agrarian Reform Problems in Tropical Colonization

The Agrarian Development Institute is constantly faced with problems which involve forestry questions, but they have not been able to implement effective programs which address these problems. ADI programs do not generally have a forestry component built into them, and in fact forestry and environmental problems are generally ignored for want of appropriate planning and implementation mechanisms. As one clear example, the production of laurel (Cordia alliodora) in agroforestry combinations has been an important source of income for farmers in Limon in recent years where Monilia has reduced cacao income; combined with cacao, or with pastures, laurel provides a method of making multiple use of lands with appropriate local species, but also helps to stabilize land and reduce problems of nutrient leaching and erosion (Rosero and Gewald 1979). Nevertheless, there is no clearly defined laurel component in either pasture or cacao production programs in Neguev, and technicians were not even sensitized enough to the potential of the species to realize that the existing plantations could provide experimental data which might support further use of laurel.

Notably absent were plans for financing forestry activities of farmers. ADI in fact had unconsciously adopted a purely exploitive view of forest resources. In an area with soil problems as serious as those of Neguev, forestry may well be one of the better economic alternatives for land use. In any case, farms are clearly lacking in income sources, and more attention could be paid to the enriching of forest which by law must remain on the farm.

A major problem in the control of the colonization of tropical lands is ADI's general reactive strategy. It seems that all colonization areas are selected by the invading peasants rather than the colonization agency. Once installed, the removal of the peasants is more costly (both politically and financially) than a more forward looking strategy which provides colonization areas which have been selected on the basis of technical evaluations. It is quite likely that this problem is one of financing, where ADI already has its budget committed to prior purchases, and has no remaining funds to dedicate to further purchases, except where they are forced by unavoidable political pressures. In any case, it is likely that in environmental and financial terms

it would be less costly to try to direct colonization to more appropriate areas, and that immediate investments in ADI would be beneficial over the longer term.

2.4.2 Needs for Tropical Forestry Management

Within the NFD, the Forestry Reserve and Protection Zone programs need to be strengthened. Increased staffing of forest guards has been demonstrated by the NPS to be effective, and this presumably would have the same effect in NFD areas.

NFD needs to dramatically increase its capacity to produce management plans for protected areas. The most detailed plans now available generally come from student theses, but are sporadic in their development and slow in being produced. Either NFD planning capacity must be increased, or CATIE activities must be reoriented to provide a more complete coverage of forest areas with management plans.

Another need is to strengthen extension type activities through the provision of technical support and credit, especially in the management of natural on-farm forests. The development of enrichment programs, or management and exploitation plans would be a positive step in generating farmer interest in forestry.

2.4.3 Necessary Investigations

In all cases of humid forest land occupation, there seems to be a clear lack of forestry implementation plans. Even in areas where forestry is obviously necessary, technicians are not making recommendations as to how to increase productivity of natural forest or how to best manage small scale forestry or agroforestry activities. Investigation must be implemented to provide answers to technical questions, and more effort must be directed toward communicating available information and the adaptation of forestry technologies to existing socio-economic conditions so they can readily be used by farmers.

It would be extremely useful to plant more agroforestry experiments in areas where they may be useful to farmers. The experiments can serve as demonstration plots, and a sensitive collection of local perceptions of the experiments can provide insights into technical improvements which will make adoption more likely.

More attention must be paid to soils. Although the problems of soils in high rainfall areas are generally known there is insufficient information on alternative land uses, or strategies for ameliorating known problems. Special attention must be paid not only to the discovery of alternative land uses, but to management strategies which generate income on small farms. Eighty five percent of all farms in Costa Rica are smaller than 50 hectares, many of which are in areas of poor soils affected by high rainfall. Techniques for environmental management on these farms has a great potential impact both in terms of numbers and in terms of impact on the larger environment.

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Appendix A

Breakdown of Forest Administration Areas in Costa Rica

Management category and Name	Extension (Hectares)	Management category and Name	Extension (Hectares)
<u>FOREST RESERVES</u>		<u>PROTECTION ZONES</u>	
Matina	400	Caragres	4,000
Grecia	2,000	Escazu	7,000
San Ramon	7,800	Cerros de la Carpinteria	2,000
Juan Castro Blanco	13,700	Rio Grande	1,500
Cordillera Volcanica Central	72,300	Atenas	700
Taboga	297	Rio tiribi	650
Arenal	18,325	Las Tablas	19,602
Rio Macho	91,922	Barbilla	12,830
Los Santos	62,000	Cabecar	
Golfo Dulce	70,000	La Selva	10,204
Cordillera Volcanica de		Quitirrisi	40
Guanacaste	39,537	El Rodeo	2,085
Manglares	30,000	Cerro Turrubares	
<u>WILDLIFE REFUGES</u>		<u>RECREATIONAL AREAS</u>	
Curu	75	Santa Ana	48
Rafael Lucas Rodriguez Caballero	7,523	Ricardo Jimenez Oreamuno	58
Tapanti	5,000	Cariari	13
Isla Bolanos	100	Laguna de Frayjanes	13
Cano Negro	9,969	Simon Bolivar (Biological Park)	3

<u>INDIAN RESERVATIONS</u>		<u>NATIONAL PARKS</u>	
Cocles	5,538	Volcan Irazu	2,309
Chirripo	75,824	Volcan Poas	5,317
Tayni	22,803	Cahuita	1,067
Talamanca	62,253	Santa Rosa	21,913
Guatuso	2,744	Manuel Antonio	682
Guaymi Coto Brus	7,500	Rincon de la Vieja	14,083
Guaymi Abrojos Moctezuma	1,480	Barra Honda	2,295
Boruca-Terraba	31,981	Chirripo	50,150
Ujarras-Salitre-Cabagra	56,561	Corcovado	41,788
Quitirrisi	1,710	Tortuguero	18,946
Zapaton		Braulio Carrillo	31,401
		Palo Verde	9,460
		Isla del Coco	2,400
		Talamanca (La Amistad)	192,000
<hr/>			
<u>NATIONAL MONUMENT</u>			
Guayabo	218		
<hr/>			
<u>BIOLOGICAL RESERVES</u>		<u>TOTAL AREAS</u>	
Cabo Blanco	1,172	Forest Reserves	408,281
Islas Negrillos y Guayabo	143	Wildlife Refuges	22,667
Isla Pajaros	4	Indian Reservations	268,394
Isla del Cano	200	National Monument	218
Carara	5,500	Biological Reserves	21,678
Hitoy	9,144	Protection Zones	60,611
Monteverde	4,500	Recreational Areas	135
La Selva (Research Station)	880	National Parks	393,811
Las Cruces (Research Station)	135		
		TOTAL	1,175,795

Source: Morales 1984.

Appendix B

Persons Contacted during Investigation in Costa Rica

Name	Title	Agency
Sr. Miguel Bolanos	Land Adjuster; Bataan	ADI
Sr. Jose Cerdas	Acting Administrator; Neguev Colony	ADI
Sr. Malaquias Castillo	Training Coordinator; Neguev	ADI
Sr. Rogelio Nickolson Chana	Forest Inspector, Neguev	ADI
Orlando Castro	Regional Head; Bataan	ADI
Mario Zamora	Asistente; Bataan	ADI
Jose Gomez Sanchez	Forest Inspector; Siquirres	NFD
Esau Chavez	Head; Land Tenure Section	NPS
Sr. Danilo Ruis	Acting Chief; Statistics and Computing	RN
Sr. Juan Araque	Sub-Director	RN
Sr. Victor Rojas	Forestry Inspector; Turrialba	NFD
Sr. Marco Vinicio Araya	Head; Reforestation Department	NFD
Sr. Carlos Saenz Herrera	Sub-Director	ADI
Srta. Higinia Rodriguez	Forester; National Agroforestry Project	NFD
Sr. Tirso Maldonado	Student; Watershed Management	CATIE
Sr. Oscar Lucke	Watershed Management Specialist	CATIE
Mr. James Barborak	Park Management Specialist	CATIE
Sr. Hjalmar Morales	Park Management Researcher	CATIE
Sr. Walter Robinson	Advisor to Executive Director	ADI
Sr. Luis Diego Gomez	Director; National Herbarium	NM
Ing. Hector Martinez	Resident; CATIE-ROCAP Fuelwood Project; Guatemala	CATIE
Mr. Ulf Rasmusson	Volunteer; Rainforest Group; Stockholm; Sweden (Nicaragua)	IRENA
Mr. Paul Dulin	Coordinator; Choluteca Watershed Advisory Project (Honduras)	CHEMONICS
Sr. Guillermo Fuentes	Animal Production Specialist (Cariari)	CATIE
Sr. Jorge Arturo Calvo	Regional Director; Turrialba	ADI
Sr. Jorge Gamboa Quiros	Agronomist	NCAI
Sr. Luis Alberto Tenorio Alfaro	Office Staff	NCAI

Abbreviations:

ADI - Agrarian Development Institute
 NM - National Museum
 RN - Registro Nacional
 IRENA - Instituto Nicaraguense
 de Recursos Naturales
 NPS - National Park Service

NFD - National Forestry Directorate
CHEMONICS - Consulting Agency
NCAI - National Commission for
for Indian Affairs

Appendix C

IDA Colonies as of June 1984

	Pop.	Area (ha)	Estab.	Provincia	Canton	Distrito
Oficina Regional de Coto Sur						
Coto Sur	1700	27,000	1975	Puntarenas	Corredores	La Cuesta
La Plancha	208	2,207	1975	Puntarenas	Corredores	La Cuesta
Caimito	8	390	1975	Puntarenas	Corredores	La Cuesta
Cenizo	38	300	1975	Puntarenas	Corredores	La Cuesta
Bambito	41	297	1975	Puntarenas	Corredores	La Cuesta
Caucho	8	300	1975	Puntarenas	Corredores	La Cuesta
Tamarindo	32	315	1975	Puntarenas	Corredores	La Cuesta
Mango	34	278	1975	Puntarenas	Corredores	La Cuesta
Laurel	17	324	1975	Puntarenas	Corredores	La Cuesta
La Vaca			1974	Puntarenas	Corredores	La Cuesta
Sabalo y Conte	231	6,825	1974	Puntarenas	Corredores	La Cuesta
Pueblo Nuevo y Bella Luz	505	5,111	1974	Puntarenas	Corredores	La Cuesta
La Bota	15	201	1974	Puntarenas	Corredores	La Cuesta
Tinamaste	21	429	1975	Puntarenas	Corredores	La Cuesta
San Juan	146	3,137	1975	Puntarenas	Corredores	La Cuesta
El Control	40	517	1971	Puntarenas	Corredores	La Cuesta
Jobo y Peral	59	491	1971	Puntarenas	Corredores	La Cuesta
Roble y Naranja	92	796	1975	Puntarenas	Corredores	La Cuesta
Coopevaquita	22	400	1975	Puntarenas	Corredores	La Cuesta
Nubia y Vaquita	58	863	1975	Puntarenas	Corredores	La Cuesta
La Libertad	36	110	1975	Puntarenas	Corredores	La Cuesta
El Barrido	12	109	1975	Puntarenas	Corredores	La Cuesta
Coopetrabatur	74	519	1975	Puntarenas	Corredores	La Cuesta
Agroindustrial 1	187	2,281	1975	Puntarenas	Corredores	La Cuesta
Agroindustrial 2	175	3,468	1975	Puntarenas	Corredores	La Cuesta
Beto Vargas	17	437	1975	Puntarenas	Corredores	La Cuesta
Abrojos-Montezuma	450	1,480	1981	Puntarenas	Corredores	La Cuesta
Conte Burica	1075	11,910	1982	Puntarenas	Corredores	La Cuesta
Enrique Carr Jimenez		182	1983	Puntarenas	Corredores	La Cuesta
Israel Borbon Marin		475	1983	Puntarenas	Corredores	La Cuesta
Oficina Regional de Osa						
Canasa	43	1,038	1976	Puntarenas	Osa	Sierpe
Marcos Cordero	100	1,557	1980	Puntarenas	Osa	Sierpe
Arturo Aguilar	80	1,264	1980	Puntarenas	Osa	Sierpe
Osa Forestal	448	4,000	1979	Puntarenas	Osa	Sierpe
Coronado (Carlos Olarte)	10	101	1979	Puntarenas	Osa	Sierpe
Denis Aguilar Mora		500	1979	Puntarenas	Osa	Pto. Cortes

	Pop.	Area (ha)	Estab.	Provincia	Canton	Distrito
Eliecer Aguilar Mora		500	1979	Puntarenas	Osa Draque	Sierpe
ML. Villalobos Arguedas Manteca		600	1979	Puntarenas	Osa Draque	Sierpe
Rafael Marino Cabezas Sandy		300	1979	Puntarenas	Osa Draque	Sierpe
M'de Jesus Gonzalez Gonzalez			1979	Puntarenas	Osa Draque	Sierpe
Sergio Segura Luna		700	1979	Puntarenas	Osa Draque	Sierpe
Jose ML. Jimenez Rodriguez		100	1979	Puntarenas	Osa Draque	Sierpe
Batista Salazar y Alvaro Alfaro		200	1979	Puntarenas	Osa Draque	Sierpe
Levi Jimenez Mora y Hnos.		600	1979	Puntarenas	Osa Draque	Sierpe

Oficina Regional de Rio Claro o Piedras Blancas

La Gamba (Rio Bonito)	77	1,091	1980	Puntarenas	Golfito	Villa Bricena,Uayc
Jalaca y Guanacaste	106	2,650	1979	Puntarenas	Osa Palmar	Sierpe
Alianza Giltablada	59	871	1974	Puntarenas	Osa Palmar	Palmar
Esperanza de Rio Claro	29	95	1972	Puntarenas	Golfito	Uaycara
Puerto Cortez 1 y 2	254	1,957	1963	Puntarenas	Golfito	Pto. Cortes
Carlos Luis Alfaro	23	186	1981	Puntarenas	Golfito	Uaycara
Gil Martinez	31	292	1978	Puntarenas	Aguirre	Uaycara
Jose J. Carrillo Soto		278	1978	Puntarenas	Golfito	Km. 1
Agropecuaria la Cuesta		237	1978	Puntarenas	Golfito	Rio Claro
La Quigra		629	1983	Puntarenas	Golfito	Rio Claro
Agricola Rio Terraba	58	1,091	1983	Puntarenas	Golfito	Rio Claro
Alajuela y Limon Agustin Va	80		1979	Puntarenas	Osa Piedras	Palmar
Jose J. Carrillo Soto		278	1983	Puntarenas	Golfito	Palmar
Sucesion Macaya Lahmani		179	1983	Puntarenas	Golfito	Coto Colorado
Carlos Ramos y Augusto Corrales		217	1983	Puntarenas	Osa	Coto Colorado

Oficina Regional de Coto Brus

Oropeza	35	396	1979	Puntarenas	Coto Brus	Agua Buena
Coto Brus	140	10,699	1963	Puntarenas	Coto Brus	San Vito
Paso Danta	21	97	1973	Puntarenas	Coto Brus	San Vito
Lus Wachong Lee	275	3,005	1973	Puntarenas	Coto Brus	Sabalito
Copal		283	1977	Puntarenas	Coto Brus	Sabalito
Amalia Hernandez	20	400	1970	Puntarenas	Coto Brus	Sabalito
Salvador Marfil	71	365	1970	Puntarenas	Coto Brus	Sabalito
Siete Colinas		1,654	1977	Puntarenas	Coto Brus	Sabalito
Guaimi Coto Brus	950	7,500	1981	Puntarenas	Coto Brus	Sabalito

Oficina Regional de San Isidro

Utrapez	15	185	1977	Puntarenas	Buenos Aires	Volcan
Colinas (La Lucha)	33	1,192	1973	Puntarenas	Buenos Aires	Potrero Gd.
Silencio	53	597	1972	Puntarenas	Aguirre	Savegre
Cerritos	24	284	1972	Puntarenas	Aguirre	Quepos
Convento	34	448	1980	San Jose	P. Zeledon	San Pedro
La Esperanza (Hnos. Guido)	33	444	1979	San Jose	P. Zeledon	San Pedro
Mario Ruiz	17	110	1980	San Jose	P. Zeledon	San Pedro
Rodrigo Ruiz	11	70	1981	San Jose	P. Zeledon	San Pedro
Matilde Maradiaga	20	250	1979	Puntarenas	Buenos Aires	P. Grande
Todney Wead (Bioley)	15	140	1980	Puntarenas	Buenos Aires	P. Grande
Blanca Murillo (Candelaria)	11	115	1980	Puntarenas	Buenos Aires	Central
Coopecortes (Gil Martinez)	31	292	1978	Puntarenas	Osa-Aguirre	Coretz
El Trebol	33	658	1977	Puntarenas	Buenos Aires	P. Grande
Gromaco (Colorado)	160	3,150	1980	Puntarenas	Buenos Aires	P. Grande
Colepato	14	419	1965	Puntarenas	Coto Brus	P. Grande
Miravalles	19	155	1964	San Jose	P. Zeledon	San Isidro

	Pop.	Area (ha)	Estab.	Provincia	Canton	Distrito
Liberacion	20	80	1975	San Jose	P. Zeledon	San Isidro
Bahia	52	788	1977	San Jose	Dota	San Isidro
Coronado	13	105	1977	San Jose	Dota	San Isidro
Rancho Quemado	11	79	1977'	San Jose	Dota	San Isidro
Rey Curre	12	282	1977	San Jose	Dota	San Isidro
Copey	12	89	1977	San Jose	Dota	Santa Maria
Portalon y El Paso	95	1,384	1977	San Jose	Dota	Santa Maria
Boruca	1,130		1957	Puntarenas	Buenos Aires	Boruca
Curre	870	31,973	1957	Puntarenas	Buenos Aires	Boruca
Terraba	300		1657	Puntarenas	Buenos Aires	Boruca
Salitre	1,000	11,700	1957	Puntarenas	Buenos Aires	Salitre
Cabagra	1,400	27,860	1957	Puntarenas	Buenos Aires	Cabagra
Ujarraz	900	19,040	1957	Puntarenas	Buenos Aires	Ujarraz
Alcoa	170	3,258	1977	San Jose	P. Zeledon	
Finca 1	43		1977	San Jose	P. Zeledon	
Fincas 2 y 3	25		1977	San Jose	P. Zeledon	
Finca 4	21		1977	San Jose	P. Zeledon	
Finca 6	78		1977	San Jose	P. Zeledon	Cajon

Oficina Regional de Turrialba

Guayabo	65	748	1964	Cartago	Turrialba	Sta Teresita
Pejibaye	78	1,217	1963	Cartago	Jimenez	Pejibaye
Las Virtudes	21	342	1965	Cartago	Turrialba	Sta. Cruz
Buenos Aires	27	73	1971	Cartago	Alvarado	Pacayas
Las Vueltas	105	840	1973	Cartago	Jimenez	Tucurrique
Santa Teresita	14	94	1976	Cartago	Jimenez	Sta. Teresita
El Humo	39	156	1974	Cartago	Jimenez	Pejibaye
Altos de Tucurrique	10	109	1977	Cartago	Jimenez	Tucurrique
Taque-Taque	22	160	1977	Cartago	Jimenez	Tucurrique
La Fuente	51	390	1978	Cartago	Turrialba	Sta. Teresita
Cafe y Azucar	46	384	1980	Cartago	Jimenez	Tucurrique
La Flora y El Oso	24	171	1979	Cartago	Jimenez	Tucurrique
San Cayetano	12	200	1979	Cartago	Oreamuno	
Urasca	25	167	1980	Cartago	Jimenez	Tucurrique
Cimarron	43	50	1980	Cartago	Turrialba	
Cinchona	32	139	1980	Cartago	Turrialba	Sta. Cruz
Hernan Vargas	18	146	1980	Cartago	Turrialba	Tuis
Blanco y Negro	19	160	1980	Cartago	Turrialba	Sta. Cruz
Chitaria		526	1969	Cartago	Turrialba	
Tuis y Platanillo	580	1,925	1970	Cartago	Turrialba	Tuis
Parruas	41	116	1971	Cartago	Paraiso	Central
Rosemount	46	361	1976	Cartago	Jimenez	Juan Vinas
Santa Clara			1977	Cartago	El Guarco	Tejar
Los Comunes	18	31	1977	Cartago	Central	Llano Grande
El Descanso	52	168	1978	Cartago	Alvarado	Cervantes
Birris	24	155	1979	Cartago	Alvarado	Cervantes
Mata de Mora	12	21	1978	Cartago	Oreamuno	San Rafael
Pasqui	9	64	1978	Cartago	Oreamuno	San Rafael
Los Meneses	40	120	1978	Cartago	Oreamuno	San Rafael
Gaby	15	69	1979	Cartago	Oreamuno	San Rafael
La Ensenanza		115	1979	Cartago	Oreamuno	Capellades
Alvaro Munoz Soto		59	1983	Cartago	Turrialba	La Suiza
La Estrella (Platica SA)		341	1984	Cartago	Guarco	San Isidro

Oficina Regional de Cariari

Cariari	370	8,292	1966	Limon	Pococi	Cariari
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	Pop.	Area (ha)	Estab.	Provincia	Canton	Distrito
El Ceibo	38	707	1979	Limon	Pococi	Colorado
Don Carlos	44	808	1979	Limon	Pococi	La Rita
La Teresa	16	807	1979	Limon	Pococi	La Rita
Senegal (tounnon)	30	418	1979	Limon	Pococi	Jimenez
Tierras de Rio Frio	33	595	1980	Limon	Pococi	La Rita
La Pavona	27	858	1979	Limon	Pococi	Colorado
Hamburgo	38	213	1978	Limon	Pococi	
Astua Pirie	450	26,400	1967	Limon	Pococi	Cariari
Las Vegas de Tortuguero Guz	22	353	1983	Limon	Pococi	Tortuguero
Arturo Navas		243	1981	Limon	Pococi	Cariari
Llano Bonito	36	400		Limon	Pococi	
San Jorge y La Fortuna	42	650		Limon	Pococi	
El Indio (034)		4,240	1983	Limon	Pococi	Guapiles
Paula Bonilla Molina	23	228	1982	Limon	Pococi	Filadelfia S
La Pavona (Carlos German)		2,064	1983	Limon	Pococi	

Oficina Regional de Bataan

Bataan	287	12,573	1965	Limon	Matina	Bataan
La Peligrosa	12	396	1977	Limon	Matina	Bataan
Coopecocho (La Flor)	5	347	1978	Limon	Matina	Carrandi
Wachope	22	1,000	1977	Limon	Limon	Limon
Golden Grow	18	341	1977	Limon	Siquirres	Cairo
von Storren	28	294	1980	Limon	Matina	Bataan
Desarrollo forestal	64	5,565	1977	Limon	Matina	Bataan
La Maravilla	25	383	1978	Limon	Matina	Bataan
Las Nubes	27	502	1976	Limon	Limon	Limon
Fuscaldo	14	217	1979	Limon	Matina	Bataan
Dorayi	45	335	1980	Limon	Siquirres	Siquirres
Julius Calabria	111	8,000	1979	Limon	Limon	Limon
Estrella del Caribe	289	1,000	1979	Limon	Talamanca	Cahuita
Finca IICA	38	50	1978	Limon	Matina	
Pattoni (Rio Blanco)	91	1,327	1977	Limon	Limon	Limon
Roma y Palacios	82	1,062		Limon		
Ambade	9	91	1978	Limon	Siquirres	Siquirres
Indianas	82	685		Limon	Siquirres	Siquirres
CIA Bananera (Meryland)		2,095	1983	Limon		2
Chirripo	2,900	82,105	1982	Limon	Cartag	Matina-Turrialba
Compton Bennett						

Oficina Regional de Sixaola

País	221	1,000		Limon	Talamanca	Bibri
Julio Robelo	26	264	1979	Limon	Talamanca	Bratzi
Agrotalamanca	51	510	1979	Limon	Talamanca	Sixaola
Fincas Sixaola		3,658		Limon	Talamanca	Sixaola
Reserva Indigena Cabecar-Br6	200	62,561	1982	Limon	Talamanca	
Reserva Indigena Telire	310	9,187	1976	Limon	Talamanca	
Reserva Indigena Estrella o	870	13,616	1981	Limon	Talamanca	

Oficina Regional de Pocora

Florida	170	1,780	1978	Limon	Siquirres	Florida
Made (Arnoldo Acosta)	115	863	1980	Limon	Guacimo	Pocora
Tierra Grande	132	393	1980	Limon	Siquirres	Germania
Walter Sutherland	20	200	1980	Limon	Siquirres	Pacuarito

Oficina Regional de Rio Frio

Finca	Area (ha)	Estab.	Provincia	Canton		
La Rambla	60	1976	Heredia	Sarapiquí	Horquetas	
Horquetas	109	1976	Heredia,	Sarapiquí	Horquetas	
Sector Norte 1 y 2	117	1976	Heredia	Sarapiquí	Horquetas	
Finca Agua	39	1976	Heredia	Sarapiquí	Horquetas	
Finca Otoyá	23	1977	Heredia	Sarapiquí	Horquetas	
Gonzalez Vega	27	1976	Heredia	Sarapiquí	Horquetas	
Rio Sucio	50	1976	Heredia	Sarapiquí	Horquetas	
Finaven	20	1978	Heredia	Sarapiquí	Pto. Viejo	
Jormo S.A.	48	1977	Heredia	Sarapiquí	Pto. Viejo	
Charpentier Hnos.	75	1976	Heredia	Sarapiquí	Horquetas	
Saborio Etienne	42	1,271	1973	Heredia	Sarapiquí	
Coopenazareth y Cima	31	387		Heredia	Sarapiquí	Horquetas
Antigo o Huetares	48	489	1980	Heredia	Sarapiquí	Horquetas
Granjas Tropicales	50	714	1979	Heredia	Sarapiquí	Pto. Viejo
Gonzalez Flores	200	8,158	1975	Heredia	Sarapiquí	Horquetas
Cubujuquí	133	8,232	1965	Heredia	Sarapiquí	
Accion Nacional de Trabajo	317	5,215	1966	Heredia	Sarapiquí	
Randall Ferris Iglesias		117	1983	Heredia	Sarapiquí	
Inversiones el Alto		347		Heredia	Sarapiquí	
Minor Chavex Arguedas		98		Heredia	Sarapiquí	
Porfirio Rodriguez A.		246		Heredia	Sarapiquí	
Santos Lopez Ugalde		297		Heredia	Sarapiquí	
Asdrubal y Miguel Leon H.				Heredia	Sarapiquí	
La Suerte (Octavio Beech)	9	207	1979	Heredia	Sarapiquí	La Virgen
Najes S.A.	33	1,200	1976	Heredia	Sarapiquí	La Virgen
Agropecuaria Apacunca		256	1983	Heredia	Sarapiquí	La Virgen
Compania Bananera de Costa Rica		206	1983	Heredia	Sarapiquí	La Virgen
Anabelle Quesada		85	1983	Heredia	Sarapiquí	La Virgen
El Toro	20	2,274	1978	Heredia	Sarapiquí	Pto. Viejo
Cinchona	46	303	1966	Heredia	Sarapiquí	
Estela quesada		214		Heredia	Sarapiquí	Pto. Viejo
Garrido y Llovera		772	1982	Heredia	Sarapiquí	Pto. Viejo
La Chiripa S.A.		594	1983	Heredia	Sarapiquí	Pto. Viejo
Finca El Agua S.A.		1,292		Heredia	Sarapiquí	Pto. Viejo
Cay Rica S.A.		730	1984	Heredia	Sarapiquí	Pto. Viejo

Oficina Regional de La Fortuna

Zonafluca	103	1,225	1975	Alajuela	San Carlos	Fortuna
Los Criques	84	1,111	1975	Alajuela	San Ramon	Angeles
Coopezamora	22	325	1973	Alajuela	San Ramon	Angeles
Trinidad	240	2,549	1968	Alajuela	San Ramon	P. Blancas
La Vega (Climaco)	29	254	1981	Alajuela	San Carlos	Fortuna
La Lucha (Sta. Clara)	94	707	1980	Alajuela	San Carlos	Florencia
San Lorenzo (Rodrigo Castro)	8	64	1979	Alajuela	San Ramon	Angeles
Agutla	4	68	1974	Alajuela	San Carlos	Monterrey
La Bruja	23	137		Alajuela		
Chachagua	13	103		Alajuela	San Ramon	P. Blancas
Zeta - Trece	63	414		Alajuela	San Carlos	Fortuna
Daube Abelino Zamora Murillo		212	1984	Alajuela	San Ramon	P. Blancas

Oficina Regional de Pital

Thesalia	74	633	1969	Alajuela	San Carlos	C. Quesada
Isabel	22	317	1976	Alajuela	San Carlos	Pital

	Pop.		Area (ha)	Estab.	Provincia	Canton	Distrito
Hernan Avendano (Garabito)	44		369	1979	Alajuela	San Carlos	Aguas Zarcas
La Trinchera	46		508		Alajuela	San Carlos	
Manuel E. Viquez (Chaparron)	20		229	1980	Alajuela	San Carlos	Pital
La Fama	20		237		Alajuela	San Carlos	
Curena	80		5,626	1978	Alajuela	San Carlos	
La Gloria (Yucasa)	77		1,067		Alajuela	San Carlos	

Oficina Regional Chambacu

Heriberto Madrigal (3 Y 3)	31		531	1980	Alajuela	San Carlos	Cutris
Inversiones Don gilberto	29		299	1980	Alajuela	Los Chiles	Cano Negro
Francisco Rodriguez	4		198	1978	Alajuela	Los Chiles	El Amparo
Sebastian Rocha (El Retiro)	21		200	1978	Alajuela	Los Chiles	El Amparo
San Jorge	46		569	1976	Alajuela	San Carlos	Cutris
Clodoveo	20		488		Alajuela		
Botijo	64		2,557		Alajuela		
Sabogal	59		1,954		Alajuela		
Terranova	24		599		Alajuela		
Chambacu	2,400		135,202	1967	Alajuela	San Carlos	Cutris
Victor Julio Morales Blanco			189	1983	Alajuela	San Carlos	Pocosol
Juan R. Soto Castro			33	1983	Alajuela	San Carlos	Pocosol
Juan R. Morales Salas			66	1983	Alajuela	San Carlos	Pocosol
Ganadera Quesada Rojas			236		Alajuela	San Carlos	Pocosol
Albergonca			524	1984	Alajuela	San Carlos	Monterrey
Miguel Hidalgo Rojas			179	1984	Alajuela	San Carlos	Cutris
Grace Rodriguez Quesada			161	1984	Alajuela	San Carlos	Cutris
Inmobiliaria La Lidia S.A. y el Pequeno Agricultor			296	1984	Alajuela	San Carlos	Cutris
"			101	1984	Alajuela	San Carlos	Cutris
"			49	1984	Alajuela	San Carlos	Cutris
"			41	1984	Alajuela	San Carlos	Cutris
"			177	1984	Alajuela	San Carlos	Cutris
"			666	1984	Alajuela	San Carlos	Cutris
Almacenes y Bodegas					Alajuela	San Carlos	Cutris

Oficina Regional de Guatuso

Epifanio Chavarria (Las Let)	17		282	1979	Alajuela	Guatuso	Buena Vista
El Charco	5		584		Alajuela	Guatuso	Buena Vista
Thiales	48		588	1976	Alajuela	Guatuso	Buena Vista
Purdue (Catira)	104		4,308	1983	Alajuela	Guatuso	Buena Vista
Buena Vista	20		293	1978	Alajuela	Guatuso	Buena Vista
Reserva Indigena Guatuso	270		2,994	1978	Alajuela	Guatuso	Buena Vista
Cristobal Chaverri			1,583	1983	Alajuela	Guatuso	Buena Vista
Oscar Artavia Conejo			105	1983	Alajuela	Guatuso	Buena Vista
"			215	1983	Alajuela	Guatuso	Buena Vista
"			126	1983	Alajuela	Guatuso	Buena Vista

Oficina Regional de Coyolar

Paso Agres	43	608	1970	San Jose	Turrubares	S.J. de Mata
Gamalotillo	30	433	1979	San Jose	Puriscal	Merc. Sur
Ananias Chavarria	80	1,000	1980	San Jose	Puriscal	Merc. Sur
Curu	17	406	1979	Puntarenas	Central	Paquera
Tambor	19	307	1976	Puntarenas	Central	Cobano
Mal Pais	81	1,608		Puntarenas		
Coopecoyolar	60	1,051	1977	Alajuela-PtaOrotina		
Coopebarro	38	1,960	1977	San Jose	Turrubares	

	Pop.		Area (ha)	Estab.	Provincia	Canton	Dist
Coopecuarros	25	633	1977	Puntarenas	Central		
Salinas	52	1,412	1977	Puntarenas	Esparza		
La Bola	18	340	1977	San Jose	Turrubares		
Bijagual	24	400	1977	San Jose	turrubares		
Lagunillas	120	1,125	1977	Alajuela	Orotina		
Zapaton	830	2,000	1979	San Jose	Puriscal		
Quitirrisi	780	963	1979	San Jose	Mora		
El Baron		622	1984	Puntarenas	Esparza		
Finca Jenkins		290	1984	Alajuela	Atenas		

Oficina Regional de Canas

San Luis	62	1,157	1970	Guanacaste	Canas	Canas	
Corobici (Montezuma)	64	993	1979	Guanacaste	Canas	Canas	
Quebrada Azul	50	352	1975	Guanacaste	Tilaran	Sta. Rosa	
Paso Hondo	42	892		Guanacaste	Canas		
Llanos del Cortes	179	18,330	1975	Guanacaste	Bagaces	Bagaces	
San Ramon	39	280	1975	Guanacaste	Bagaces	Bagaces	
Coopellanos del Cortes	25		1975	Guanacaste	Bagaces	Bagaces	
Tamarindo	111	1,238	1979	Guanacaste	Bagaces	Bagaces	
Almoca (La Guaría)		158	1980	Guanacaste	Canas	Canas	
Miravalles de Bagaces		12,912	1966	Guanacaste	Bagaces		
Agropecuaria Rio Piedras S.A.		413	1984	Guanacaste	Bagaces	Canas	
Agropecuaria de Tamarindo S.A.		321	1984	Guanacaste	Bagaces	Canas	
Falconiana		290	1984	Guanacaste	Bagaces	Canas	

Oficina Regional de Liberia

San Dimas	34	1,026	1964	Guanacaste	La Cruz	La Cruz	
Las Lilas	14	435	1963	Guanacaste	Liberia	Canas Dulces	
Curubande	23	220		Guanacaste	Liberia		
Hacienda Sta. Marta		846	1978	Guanacaste	Liberia		
Eida Fonseca	5	82	1980	Guanacaste	Liberia	Canas Dulces	
Lomas del Valle	2	49	1980	Guanacaste	Liberia	Mayorga	
Cerritos (La Fe)	21	406	1980	Guanacaste	Liberia	Mayorga	
Juan Sta. Maria	68	3,500	1980	Guanacaste	Liberia		
Parcelacion	44	895	1980	Guanacaste	La Cruz		
Coopejusa	27	1,370	1980	Guanacaste	La Cruz		
Quebrada Grande	5	88	1979	Guanacaste	Liberia		
Canas Dulces	7	233	1979	Guanacaste	Liberia		
Agricola Dos Quebradas	20	193	1979	Guanacaste	Carrillo	Sardinal	
Colonia la Libertad	50	1,822	1966	Guanacaste	Upala	Aguas Claras	
Gil Tablada (El Jobo)	20	537		Guanacaste	La Cruz		
Alberto Chamorro		227	1984	Guanacaste	La Cruz	Aguas Claras	

Oficina Regional de Upala

Vicente Rodriguez	12	173	1976	Alajuela	Upala		
Las Armenias	21	1,708	1978	Alajuela	Upala	Aguas Claras	
Llano Azul	114	1,563	1979	Alajuela	Upala	Upala	
Los Ingenieros	22	208	1981	Alajuela	Upala	Upala	
La Jabalina	13	649	1979	Alajuela	Upala	Dos Rios	
Alvaro Masis	3	45	1978	Alajuela	Upala	Upala	
El Retiro (Sebastian Rocha)	21	200	1978	Alajuela	Los Chiles	El Amparo	
Nelly Quesada Alvarez		688	1978	Alajuela	Upala		
Jose Alvarez Q.		237	1979	Alajuela	Upala		
Adolfo Rodriguez	12	102	1983	Alajuela	Upala	Upala	

	Pop.		Area (ha)	Estab.	Provincia	Canton	Dist:
Almacenes y Bodegas S.A.	47	1983	Alajuela	Upala			
Almacenes y Bodegas S.A.	92		Alajuela	Upala			
Almacenes y Bodegas S.A.	118		Alajuela	Upala			
Almacenes y Bodegas S.A.	59		Alajuela	Upala			
Almacenes y Bodegas S.A.	39		Alajuela	Upala			
Almacenes y Bodegas S.A.	26		Alajuela	Upala			
Eladio Cordero Mejias	208	1983	Alajuela	Upala		Aguas Claras	
Dagin S.A.	291	1983	Alajuela	Upala			
Kamaesa S.A.	229	1983	Alajuela	Upala			
Kamaesa S.A.	207	1983	Alajuela	Upala			

Oficina Regional de Santa Cruz

Cooperio Canas	45	309	1971	Guanacaste	Carrillo	Belen	
Coopebernabela	32	242	1975	Guanacaste	Santa Cruz	Santa Cruz	
Coopespavelar	31	203	1977	Guanacaste	Santa Cruz	Diria	
Nyala	17	172	1980	Guanacaste	Nicoya	Nicoya	
Casitas	30	520	1978	Guanacaste	Nicoya		
Matambu	25	420	1976	Guanacaste	Nicoya		
Nosara	11	159		Guanacaste			
Magro	10	34	1979	Guanacaste	Santa Cruz	Diria	
San Juanillo	320	9,541	1968	Guanacaste	Santa Cruz	Cuajiniquil	
Corralillo	60	280	1966	Guanacaste	Filadelfia		
Santa Cecilia		954		Guanacaste	Santa Cruz	Paquera	
Reserva Indigena Matambu	900	1,710	1980	Guanacaste	Nicoya	Hojancha	
Copebelen	27	258	1976	Guanacaste	Carrillo	Belen	
La Esperanza	45	912	1964	Guanacaste	Carrillo	Filadelfia	
Coopesardinal	21	177	1978	Guanacaste	Carrillo		
Hermanos Viales (San Juan)		475	1978	Guanacaste	Nicoya		
Hacienda Filadelfia	116	1,217	1982	Guanacaste	Carrillo	Filadelfia	
Rio Palmas	24	250	1982	Guanacaste	Carrillo	Filadelfia	
Empresa Juvenil	20	100	1982	Guanacaste	Carrillo	Filadelfia	
Santa Ana	21	100	1982	Guanacaste	Carrillo	Filadelfia	
Avate	32	270	1982	Guanacaste	Carrillo	Filadelfia	
La Cascada (Auristela)	20	192		Guanacaste	Carrillo	Filadelfia	
Olman y Raul Briceno Cabalceta		495	1984	Guanacaste	Sta. Cruz		
Familia Gutierrez Matarrita				Guanacaste	Sta. Cruz		

Appendix D

Bataan Regional Office; List of ADI Colonies Under Their Jurisdiction

No.	Asentamiento	Localizacion	Area	Benefi- ciarios	Parcelas	Entrega
1.0	Colonia Bataan	Bataan-Matina	10,572	750	799	1964
1.1	Parcelacion Dirigida	Bataan-Matina	2,796	309	329	1964
1.2	Parcelacion Asimilada	Bataan-Matina	6,985	450	479	1964
1.3	Sector Cooperativo	Bataan-Matina	791	120		1984
2.0	San Jose (Von Storren)	Estrada-Matina	30	26	29	1980
3.0	Maravilla	Venecia-Matina	313	29	31	1978
4.0	La Flor (Coopecho)	Larga Distancia	324	21	22	1979
5.0	Peligrosa	San Miguel	380	33	34	1977
6.0	Fuscaldo	Sahara-Matina	217	16	16	1979
7.0	Wachope	Sta. Rosa-Limon	1,000	38	45	1978
8.0	Las Nubes	La Estrella-Limon	550	37	37	1975
9.0	Desarrollo Forestal	Pacuarito-Siquirres	6,157	85	77	1977
10.0	Florida	Siquirres	2,992	250	250	1978
11.0	Argentina (Made)	Pocora-Guacimo	1,343	113	113	
12.0	tierra Grande	Pocora-Guacimo	3,298	140	132	1980
13.0	Delicias	Parsmina-Guacimo	314	49	49	1984
14.0	Dorayi	Carmen-Siquirres	450	50	50	1980
15.0	Pais S.A.	Sixaola-Talamanca	4,190			1979
15.1	Margarita	Margarita Sixaola	1,700	130	127	1979
15.2	Otros sectores	Varios Sixaola	2,410	170		1984
16.0	Julio Cesar Calabria	Cahuita-Talamanca	3,003	200		1984

Source: Castro, R. (No title). Bataan Regional Office Document.

Chapter 3

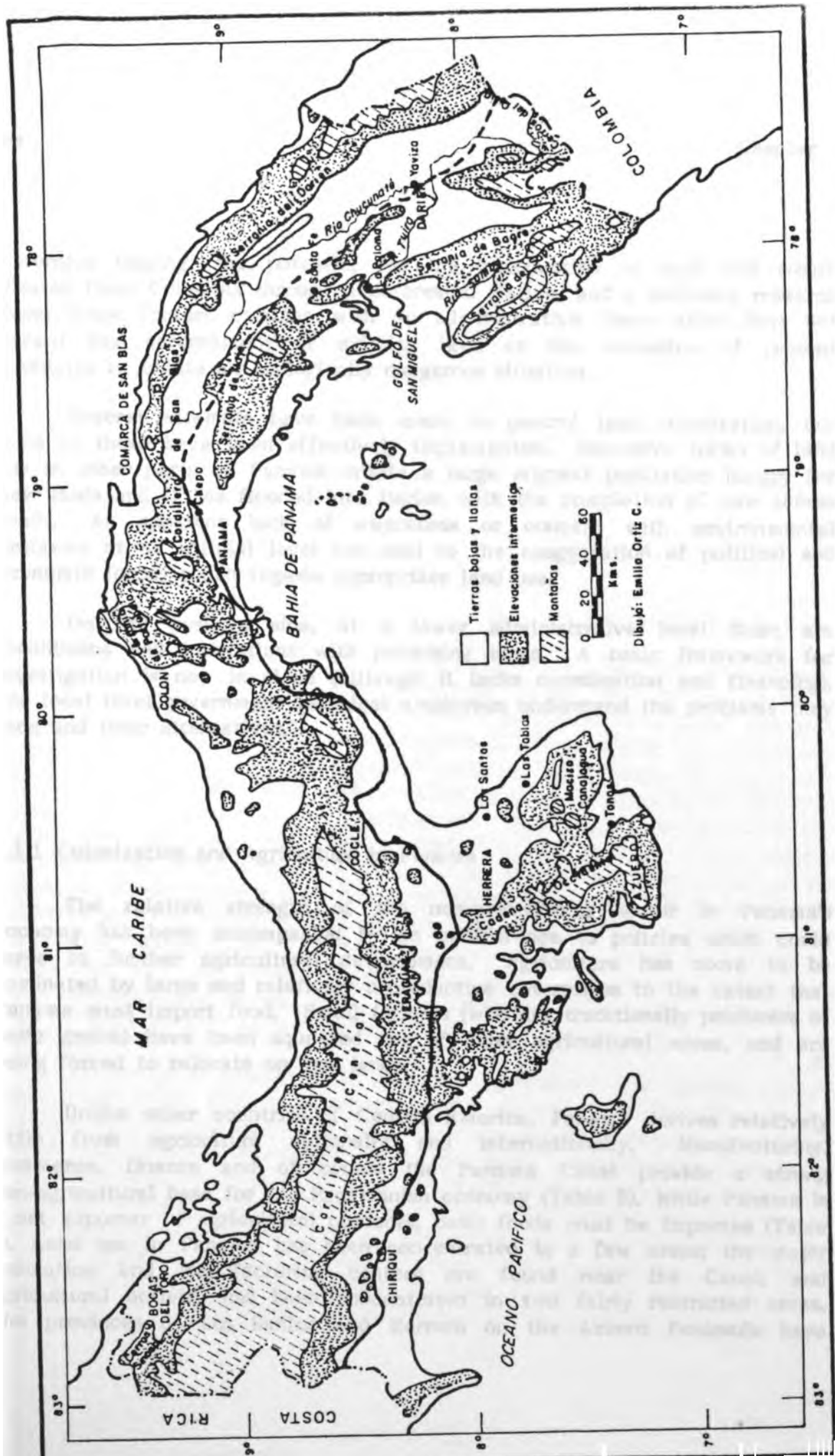
Colonization in Panama

3.1 Introduction and Summary

Although Panama is one of the most developed countries of Central America, it faces grave ecological threats to its economic base. It has avoided the more typical "banana republic" dependency on agricultural exports through the income and employment generated by the Canal, and through an economic diversification into manufacturing and banking activities. This development unfortunately has been accompanied by the underdevelopment of the agricultural sector in which destructive, land extensive agricultural techniques are still used by the majority of Panamanian farmers.

Panama is at the point of being overtaken by the underdevelopment of its agriculture. Historically, the existence of employment alternatives reduced the pressure on Panamanian agricultural lands, so the use of land extensive production techniques presented no problems. In fact they may have been seen as positive in some sectors since they allowed for a massive conversion of "unproductive" forest to agricultural, and more specifically, ranching activities. Nevertheless, as the agricultural population has increased, these extensive techniques created land shortage and land use conflict. The agricultural use of the Panama Canal watershed threatens not only the use of the Canal, but the hydroelectric capacity to supply major cities (Wadsworth 1982). Darien Province contains the largest remaining forest area in Panama, and provides a large proportion of national wood production as well as new agricultural lands. As land in other areas of the country has been occupied, Panamanians look more to the Darien for their agricultural future.

Unfortunately, the colonization of Panama's Darien contains all the elements of an ecological disaster. Deficient soils, uncontrolled land use,



extensive logging, the potential for the introduction of hoof and mouth disease from Colombia through a deforested Darien, and a deficient research base; these factors combine with an administrative chaos which does not permit the enforcement of existing laws or the execution of present mandates to create an ecologically dangerous situation.

Several attempts have been made to control land colonization, but none of these have been effectively implemented. Extensive forms of land use in other parts of Panama create a large migrant population hungry for new lands and it has flooded into Darien with the completion of new access roads. An apparent lack of awareness or concern with environmental problems at an official level has led to the exaggeration of political and economic forces which impede appropriate land use.

On the positive side, at a lower administrative level there are technicians and institutions with promising ideas. A basic framework for investigation is now in place (although it lacks coordination and financing), and local level government technical employees understand the problems they face and their alternatives.

3.1.1 Colonization and Agriculture in Panama

The relative strength of the non-agricultural sector in Panama's economy has been accompanied by an indifference to policies which could serve to further agricultural development. Agriculture has come to be dominated by large and relatively unproductive enterprises to the extent that Panama must import food. Small farmers (who are traditionally producers of basic grains) have been squeezed out of older agricultural areas, and are being forced to relocate on new lands.

Unlike other countries of Central America, Panama derives relatively little from agriculture nationally and internationally. Manufacturing, commerce, finance and of course the Panama Canal provide a strong non-agricultural base for the Panamanian economy (Table 5). While Panama is a net exporter of agricultural products, basic foods must be imported (Table 6). Land use in Panama has been concentrated in a few areas; the major population and manufacturing centers are found near the Canal, and agricultural activity has been concentrated in two fairly restricted areas. The provinces of Los Santos and Herrera on the Azuero Peninsula have

traditionally been the heartland of Panamanian small farm agriculture and areas of small farm economies bordered by cattle "haciendas" in the neighboring provinces of Veraguas and Cocolé (Jaen Suarez 1978), while the more humid provinces of Chiriquí and Bocas del Toro have been utilized for large scale banana production for export.

The recent process of agricultural "development" in Panama has been characterized by the formation of large cattle ranching operations and the displacement of small farmers (Gudeman 1978, Heckadon 1984, McKay and Heckadon 1980). While there is some question as to the date when land concentration began in Azuero the process has become more accentuated in recent years. Even the relatively recently colonized lands of Tonosí have been quickly transformed from a lush tropical forest area cited, to contain some of the most fertile lands of Panama, to a pastureland (Heckadon 1983).

One of the most destructive outcomes of the land concentration process in Azuero has been the formation of an unstable population of landless farmers. These farmers have been forced to search for new lands in the highlands of Veraguas, the provinces of Colon, Cocolé and Panama, and since the opening of the Interamerican Highway past Chepo, the province of Darién. Part of the technological tool kit of these farmers is the ability to rapidly deforest land and sow it to pasture. Their destructive slash and burn agricultural techniques have been rewarded in the past by cattle ranchers willing to buy infertile pasture land. As an unfortunate side effect of this situation, these farmers have not developed agricultural techniques for soil conservation, nor improved management techniques for humid conditions, nor have they experimented with new crops which might serve to extend the productive life of recently deforested lands. Independent studies of deforestation problems (eg. Joly 1983, Heckadon 1981) have confirmed the role of these farmers in the creation of land use problems.

As part of a campaign to strengthen agriculture, the Agrarian Reform agency has made efforts to transform the structure of production in the countryside. The initial focus of activities was the formation of communally owned agricultural enterprises, although more recently the communal enterprises have been de-emphasized. In practice, the reform activities have seemingly followed a line of least resistance, with outright expropriations of farms making up a relatively small proportion of farms affected, and the majority of lands coming from tax payment expropriations (See Table 7), or in the relatively unpopulated Darién. Between March 1973 and August 1975, 80% of all land acquired was in the Darién, including 88,000 ha. associated

Table 5
Gross Domestic Product; Panama, 1974

Activity	% GDP
Manufacturing and Industry	16.5
Agriculture, forestry and fisheries	15.5
Commerce	14.3
Public and Private Services	13.4
Transport, storage and communications	8.0
Housing	7.5
Construction	7.0
Services in Canal Zone	5.8
Banking and Financing	5.3
Others	6.6
TOTAL	99.9

Source: Delgado et. al., 1976.

Table 6
Imports and Exports of Agricultural Goods; Panama 1974.

Imports	Value (\$) (000,000)	% Total Imports
Food Products	55.10	7
Corn	3.82	1
Beans	2.32	\$1
Onion	0.50	\$1
Rice	0.10	\$1
Potatoes	0.03	\$1
Cereales	0.02	\$1
TOTAL	61.89	
Exports	Value (\$) (000,000)	% Total Exports
Banana	49.50	24
Shrimp	15.10	7
Sugar	8.80	4
Animal Products (1973)	2.31	1
TOTAL	75.71	

Source: Delgado et. al., 1976.

with the Bayano Reservoir Project. Of 350,000 ha. of land acquired before 1972, less than one third is class IV or better, which suggests that these were lands which were not strongly contested (Shearer and Tejada 1978).

The most recent colonization of Darien is in fact a "recolonization". The 1,291 farms reported in the 1970 census represent a decrease from the 2,044 reported in 1960. The decline in farms was accompanied by a decrease in the total area in farms from 35,754 to 27,544 (Panama-OEA 1978). Forestry and plantain production had been major income generators in previous years and the current status of the area as a whole has been described as one of "decadence" rather than "underdevelopment". Nevertheless, it should be clear that many areas are being opened up for colonization for the first time. The previous development of Darien had been completely based on water transport, with most of the major settlements located around the Gulf of San Miguel, or on major waterways. One of the major problems foreseen in the Integrated Development Project for Darien (Panama-OEA 1978) was the dislocation of population in urban centers which declined in importance as a result of the decreased importance of water transport. Another problem of the more recent development is that the newly colonized lands are less appropriate for agriculture than those already cultivated, so there would be more danger of the creation of a deforestation cycle motivated by soil exhaustion and the successive deforestation of new lands.

The Darien "Gap" Highway is the last link in the all weather road connecting North and South America (USDT 1976). While in 1984 this road is still not complete, its progress has opened up major new expanses of land by providing improved road transport to and from the capital. Previous to the construction of the road, all communication between the population centers of Darien and Panama was by boat or plane. Agricultural marketing was virtually impossible. The opening of the new portions of the road has provided an opportunity for development of the area which is accompanied by serious problems.

3.1.2 General Description of Darien Province

The Province of Darien covers 1,680,300 ha., making up 22.2% of the total territory of Panama. The major life zone for the area is Tropical Wet

Forest (Holdridge 1979). Rainfall averages between 1400 and 2500 mm annually, and a three month dry season extends from January to March (Panama-OEA 1978). The driest areas of Darien are the coastal areas around the Gulf of San Miguel and the low lying valleys of Rivers Chucunaque and Tuira. Recent data indicates that the strip of Tropical Dry Forest on the coast near Sambu extends as far as La Palma, and a large area should be considered Tropical Dry Forest transition to Humid Forest. Only 6% of the land was found to be suitable for intensive agriculture (See Table 8), while the majority of all land is unsuitable for any non-forestry activity. In 1971 and 1972, five million board-feet of lumber were extracted annually, constituting 21% and 26% of the national lumber production in the respective years. RENARE officials now report that Darien's contribution to total national lumber production may be as high as 80%.

3.1.2.1 Ethnic Groups in the Darien

The occupants of the Darien can be divided into four general ethnic groups, "Darienitas", "Colombianos", "Indigenas" and "Colonos". "Darienitas" are non-Indian people born in Darien. "Colombianos" are non-nationalized Colombian blacks. "Indigenas" are Indians of either Kuna or Embera descent. "Colonos" are the immigrants from the provinces of Los Santos, Herrera, Chiriqui, etc. (also known as "Interioranos") who come in search of new agricultural lands (Heckadon and McKay 1982). In 1972 the Darienitas were the largest population group (See Table 8), but recent migrations of colonos are likely to have made migrants the major population group.

The economic activities of the Indigenas and of many of the Colombianos and Darienitas are quite similar. Swidden agriculture is practiced on a very small scale in forest clearings. An important part of the diet and income comes from hunting and fishing, and no cattle are kept. Settlements border water courses.

Another production pattern is commercial plantain production. In the Darien National Park plantations border rivers, and may extend as much as 1 km. from the bank. These are maintained by Indigenas, but the production of plantain is generalized in Darien.

Colombianos are characterized by people of Darien as loggers. Their major economic activity is tree cutting, either as day laborers, small scale

Table 7
Sources of land for Agrarian Reform before 1972

Source	% Total
Expropriation for taxes	59
Expropriation	21
Purchase	14
Donation	5
Other	1

Source: Shearer and Tejada 1978.

Table 8
Land Use Potential in Area and as Percentage

Aptitude	Area (Ha.)	%
Intensive Agriculture	106.7	6.35
Pasture, permanent crops or forest	441.9	26.30
Forestry	575.8	34.27
Protection or reserve	512.8	30.52
Rivers	43.1	2.57
TOTALS	1680.3	100.00

Source: Panama-OEA 1977.

Table 9
Ethnic Groups in Darien 1972

Ethnic Group	% Darien Population
Darientas	52.00
Indigenas	24.00
Colombianos	17.50
Colonos	6.50
TOTAL	100.00

Source: Heckadon et.al. 1982.

land clearing contractors, or as regular employees of lumbering concessions.

The practice of combined farming and ranching is associated with the Colonos, the recent migrants from other parts of Panama. The activities of these farmers have been discussed extensively in other publications (Heckadon and McKay 1982, Heckadon 1981), and they most significantly include the use of slash and burn agriculture as a process for clearing land for pastures. While the most notorious source for migrants is Los Santos, the first colonos in Darien were Chiricanos (from Chiriqui Province) as are many of the more recent colonists.

The colonos have also become associated with commerce. They run stores and restaurants, and act as middlemen in the commercialization of agricultural products and lumber.

3.1.2.2 The Process of Deforestation in Darien

The two major motives for deforestation in Darien are logging and farming.

Large scale lumbering is carried out within a framework of "concessions" granted by RENARE, which authorize the exploitation of 5000 hectare areas for a period of 2 years. Concessions are now quite distant from the highway, in areas which are thought to be generally uninhabited.

During a visit to Darien in July of 1984, a constant movement of lumber out of Darien was noted on the highway, mostly in the form of whole tree trunks. A visual inspection of passing trucks and lumber patios found 100% of the lumber to be "espinoso" or "cedro espinoso" (Bombacopsis quinatum) trunks of diameters in excess of .7 m and up to 2 m. No explanation was encountered for the predominance of Bombacopsis observed.

Small scale logging is carried out by individual farmers. A few trees are cut on the farm, and cut into "tablones" measuring from 12 x 12 cm to 40 x 40 cm, and 3 to 6 m long. These tablones are dragged to the roadside to be sold to middlemen. A few mahogany tablones were seen.

Intermediate scale logging is carried out on farms distant from the highway, where transport is extremely difficult. Log extraction in this case

is carried out by small operators who use their own agricultural tractors to bring wood to the roadside. The cost of transport in this case is so high that it is only profitable for tractor owners to operate in this fashion.

Small and intermediate scale lumbering is an integral part of the colonization process. Lumber is extracted in the process of clearing the farm, or to generate income. Most colonists seem to be poor, so short term income and capitalization needs can only be financed through wood sales.

3.1.2.3 Problems of Colonists in Darien

A series of open ended interviews were carried out with colonists of Darien to determine their perceptions of the problems and possibilities of agriculture in Darien.

A major problem perceived by colonists is their lack of knowledge of viable farming alternatives to apply in the area. For most farmers, cattle raising has been an important source of income in other areas, but in Darien the program for control of hoof and mouth disease restricts marketing possibilities [1]. Nevertheless, all farms include an extension of pasture far in excess of their current needs. Farmers are clearly relying on their traditional agriculture strategies even though they are inappropriate to the current situation, because they have not discovered more promising alternatives.

The quality of the soil is a major limiting factor in Darien agriculture. Some farmers report that good yields can only be expected for one, or possibly 2 years. Such a rate of exhaustion would lead to an accelerated rate of conversion of farmland to pasture, and forest to

1. COPFA is a longstanding government activity which is supported by other Central American countries and the United States to contain the spread of hoof and mouth disease. COPFA restricts the movement of live animals from Darien to other parts of the country, although it does permit animals to be extracted for slaughter. This restriction reduces marketing possibilities since a major marketing alternative in cattle production is the sale of immature animals for fattening in other regions.

farmland.

Potable water presents a major problem in Darien. In the eastern part of Darien, water has a high mineral content. In the western part along the highway water shortage is a limiting factor. While the normal dry season in Darien lasts 3 months, in 1981-1982 it extended to nearly 7 months, and the colonists blocked the main highway to pressure the national guard to bring in drinking water, a practice which has been continued every year (Waterman 1984). Some areas, such as the higher parts of Nicanor, experience permanent water problems, and farmers along the highway plan to rely on piped public water sources. An especially doubtful element in their expectations is that the Filo de Tallo Biosphere Reserve will be the source of this water; the current deforestation of the Biosphere Reserve is not presently being controlled with obvious effects on this crucial water supply. Significantly, one farm visit carried out in Darien was in the company of the director of the Agrarian Reform office and the Corregidor (judge) of La Palma, to view the arbitration in a farm boundary dispute which centered around access to a dry season water source.

Finally, agricultural marketing for all products remains a problem and disincentive for increased production. Local problems of transporting products to the main road, inadequate storage and monopsonistic middlemen are major problems of the marketing "system" cited by farmers.

3.2 Institutional Aspects of Colonization in Darien

3.2.1 Integrated Development Plans for Colonization

The land occupation following the opening of the Interamerican Highway into Darien was accompanied by the development of technical and organization plans for the amelioration of land use problems in the newly colonized areas. These arrangements have had very little effect on the process of colonization to date.

The most significant attempt at planning for the colonization of the Darien was the integrated development plan produced through the OAS (Panama-OEA 1977, later published as Panama 1978). This study found only 6% of the land in Darien to be suitable for intensive agriculture and another 26% which could be used under careful management (Table 9). A plan was outlined for settling farmers on the most appropriate lands, according to categories of potential land use. The Ministry of Planning and Political Economy is now in charge of executing this plan. Nevertheless, a trip to the offices of the Ministry and repeated phone calls only succeeded in identifying one individual who could give me information regarding the execution of the plan; on the one occasion this individual could be located in his office, he was too busy to allow an interview. No evidence or knowledge of the execution of this plan was found either in the field or in other government agencies.

The creation of a "Department of Colonization" in RENARE was recommended in FAO's report on forestry development in Darien (FAO 1980). The objective of this department was to coordinate colonization activities of the different institutions which had an impact on the colonization of forest lands. The Department was in fact created (named "Oficina de Ordenacion Territorial del Darien"), and two individuals were named to head the office in Darien. Nevertheless, in July 1984 the Sub-Director of RENARE had only a vague knowledge of the Department, and was not aware that it had been attached to RENARE. No formal reports could be located. The former assistant director for the office in Darien (no longer a RENARE employee) reported that the Department existed for less than two years, but that it became the focus of jurisdictional disputes between RENARE and Agrarian Reform; its activities were weakened and finally the department disappeared.

It is worth noting that the basis for all planning of colonization in Darien has been the special status of the strip of land bordering the highway. The width of this strip has varied between 2.5 and 8 km, but the process of colonization was to be controlled through the selective granting of access to these lands. The width now stands at 8 km, which constitutes the Agrarian Reform agency's primary jurisdiction.

Currently, the two government agencies most directly related to colonization in the Darien are RENARE (Renewable Natural Resources) and Agrarian Reform, both of which are dependencies of the Ministry of

Agricultural Development (MIDA). RENARE is responsible for all forest resources, including granting of logging permits, protection of forest reserves and parks, forestry extension, watershed management, and research. Agrarian Reform is concerned with land titling and adjudication.

3.2.1.1 RENARE

RENARE's involvement with colonization is indirect, in that its main concern is the control of forest cutting. RENARE officials issue permits for cutting trees on a small scale to farmers in the area, who can cut three trees per month in their own property by paying \$4 for a permit from RENARE and \$3 to the local civic government. A nursery at Villa Darien, which is currently under development has a fairly limited production (possibly 10,000 plants per year; the director of the nursery had only been assigned to the nursery two weeks before the visit, and was in the process of taking inventory). The nursery produces fruit trees principally, along with forest species such as mahogany, cedar, leucaena, and "oak" (Tabebuia spp.), which it sells for \$.25 each. Sales are reported, but on a small scale which seems to be destined principally to the formation of home gardens.

In several schools taungya demonstrations have been established. In the Meteti school, the agronomy teacher manages a plantation of teak interplanted with pineapple. The growth of the teak has been uneven, but approximately 50% of the trees in a 20 m by 20 m plot have reached 3 meters in one year. Other agronomic activities include the planting of fruit trees such as peach palm (Guilielma gassipaes), guanabana (Annona muricata) and mango (Mangifera indica). Heads of families have been intrigued with the performance of the teak, but that their major concern is with short term cash flow rather than long term investments such as forestry.

RENARE has also established a demonstration plot at the edge of the highway, near Villa Darien. Eight species have been planted, from the genera Cedrela, Swietenia, Bombacopsis, Tabebuia, Leucaena and Guilielma.

The other facet of RENARE activities in Darien is the issuance of forest concessions to logging companies. These concessions are extensive, with a legal maximum of 5000 hectares to be exploited over a period of 2 years. It is generally believed that these concessions give rise to abuses, through bribery, disorganization and RENARE's inability to control the

activity with its limited staff (the head of RENARE's forestry department reports that the most optimistic estimate of their coverage of forested areas is 1 forest guard for each 50,000 hectares). RENARE and the MIDA are involved in a clear conflict of interest in the issuance of permits, since concession payments are an important part of their operational funds. Information about concessions is freely available, and there are fairly current maps with locations and extensions. One problem noted with the system of granting concessions pointed out by the RENARE Regional Director is the vagueness of the environmental obligations, which are no more specific than to require that the companies "take necessary measures" to avoid environmental problems. It was also pointed out that the two year time period of the concession was too short to permit or motivate logging companies to reforest.

What may be the most destructive problem associated with concessions is the lack of clear territorial definitions in the activities of the Agrarian Reform. At present there is no map which differentiates state land (over which RENARE would have authority to grant concessions) and land adjudicated by colonists. Problems have arisen where logging companies and farmers think they have rights to the same lands, and in several cases the farmers blockaded roads until the lumber company paid them for extracting lumber from "their" land (Waterman 1984). In order to avoid unforeseen payments to farmers, lumber companies now find it more attractive to work in the Indian reservations of the area where land ownership is more clearly defined; companies pay \$.01 per boardfoot to Indians for wood extracted from reservations.

3.2.1.2 Universidad Popular del Darien

The Universidad Popular del Darien is formally part of the University of Panama, in Panama City. It has been established within the last 5 years, and is in the process of developing an educational program to serve the needs of the farming population of the area, and is located in Villa Darien. It stands on a 21 ha. farm, much of which is forest, and has only one building which is under construction. This structure serves as office, class room and dormitory for some of the University employees.

The UPD has five professors, teaching a range of topics including

horticulture and ecology. Classes are generally taught outside the UPD grounds, in nearby communities during evenings. In the class meeting observed in Nicanor, the lecture was on ecological principles to a group of 30 including men, women and adolescents (few children were present). A group of approximately 10 individuals remained after the class to formalize plans for establishing a demonstration parcel of vegetable crops in the community under the direction of another UPD professor.

On the grounds of the UPD, another demonstration established by the Director of Ecosystem Protection combines native fast growing lumber species and annual crops. This plot consists at present of 1 hectare of forest which has been cleared of trees and brush, leaving only young "robles" (Tabebuia sp.) of 2 to 3 meters height. Roble is a valuable lumber species in this area. The objective of the experiment is to combine the forestry species with common agricultural crops, such as plantain and maize to demonstrate and test alternative cropping methods for the area. The Ecosystem Protection program is new in the University, but it hopes to take a dynamic lead in experimentation and demonstration in agroforestry as a basis for development in the Darien.

3.2.1.3 Parks and Wildlands

The administration of parks and wildlands is a responsibility of RENARE. These areas are threatened by the pressures of land seeking colonists, but play an essential part in the environmental protection which is of great importance for the agricultural future of newly colonized areas.

Slightly more than 15% (1.16 million ha) of Panamanian national territory falls within protected areas (existing and proposed) under the jurisdiction of the Department of National Parks and Wildlife (Appendix E). These lands are protected by 71 employees of the National Park Service. Approximately half of the protected areas of the country are found in Darien, in the Darien National Park and the Filo de Tallo Biosphere Reserve, with 7 and 2 guards, respectively, an average of 1 guard/63,888 ha.

The Darien National Park extends along the Panama-Colombia border, and is an area which was originally administered by the COPFA (Comision Panamena-Americana para la Prevencion de la Fiebre Aftosa) as part of their strategy for preventing the extension of hoof and mouth disease into Central

and North America. Since the disease can be transmitted through live animals or unprocessed animal products, the maintenance of of an unpopulated strip of forest serves to impede the unintentional movement of the disease from farm to farm. Under park management, an effort will be made to remove non-Indigenous squatters from the park, since their extensive cattle ranching techniques are a major environmental disturbance and complicate the control practices for hoof and mouth disease. The Indians do not keep cattle, and practice a non-commercial shifting agriculture on a small scale, or commercially produce plantains. Non-indigenous colonization of the park area has not been extensive due to the lack of access roads which inhibit commercialization of agricultural products.

The Filo de Tallo Biosphere Reserve faces much more difficult problems of management. The area is under the management of the local municipality of La Palma, which is responsible for its maintenance and protection. Nevertheless, the Reserve has not been legally constituted as yet, and the municipality has not kept squatters out of the area. The authority for the titling process within the Reserve area has been ceded to RENARE; although the granting of permissions has been halted, the reserve lands are being continually occupied.

3.2.1.4 Agrarian Reform

Darien at present is experiencing a rapid population increase. The opening of the new highway has made nearly all of the province accessible, or accessible in the foreseeable future. The 1980 census reported 2,554 farms in Darien, up from 1,291 in 1970. The primary objective of the Agrarian Reform agency is to demarcate and begin the titling process on occupied lands. Individual parcels are limited to 50 ha., with a maximum road frontage of 200 lineal meters.

Land titling is not universal in Panama. Only 34,940 of the 150,820 farms in all Panama have land titles, while in Darien, only 45 farms of 2554 were found to be titled in the 1980 census. Farmers are accustomed to carry out all land transactions through letters of sale or other quasi legal methods, and generally have no real understanding of the titling process. To date, agrarian reform has granted only 3 land titles in Darien, but has issued at least 1,000-applications for land adjudication. The slow rate of titling in

part reflects the indecision with regard to the legal status of the recently colonized lands, and in part reflects the lack of resources invested in the process. Applications for adjudication provide Agrarian Reform with records of occupancy, and give the colonist access to bank loans for agricultural purposes. Agrarian Reform officials note that there still remains a certain amount of confusion with the farmers, who in many cases think that the application is in fact their land title.

A major goal of the head of the Santa Fe office of Agrarian Reform is to map adjudicated lands to avoid conflicts. One class of adjudicated lands are those which are recently occupied. These are generally 50 ha. or less, and many have been registered with the Agrarian Reform. Recently adjudicated farms have not been located precisely on maps. The other class of adjudicated lands are those which existed before the construction of the highway. These farms may be quite large, but their precise boundaries are not known. A map has been issued which approximately locates these farms, but is not precise enough for the purposes of the agrarian reform office. The major conflicts which have arisen have been between lumber concessions and farmers, since there is no way for RENARE to know if they are granting concessions in areas occupied by colonists. Latent conflicts exist between old farms and new farms, since Agrarian Reform recognizes that they have no way to know if they may be locating farms in already existing farms.

Another major question is the disposition of lands restricted by plans for the proposed Sea Level Canal. Decree 103 of 1966 established that a large part of the lands of Darien were inadjudicable, in order to avoid future conflicts with the construction a new Canal. The plans for this Canal are generally believed to have fallen through, and the law has not been recognized by Agrarian Reform in the past, although it is still in force,. Consultations with Agrarian Reform lawyers through the main office in Panama has confirmed the inadjudicable status of these lands, but the local officials are under pressure from Banco de Desarrollo Agropecuario functionaries to ignore the law, so the bank can authorize loans on the basis of adjudication applications.

The question of adjudicability of lands is of major importance in Darien. There are 3 major Indian Reservations, one large Biological Reserve and a National Park which occupies the entire border area with Colombia. It is estimated that if the lands declared inadjudicable by Decree 103 are included, 80% of all land in Darien is not adjudicable.

In an operational sense, the question of adjudicability of land seems to be moot. Agrarian Reforms efforts have been restricted to the legalization of farms which have been spontaneously occupied, and in some cases refusing to proceed where there is some doubt as to adjudicability. Nevertheless, there is no evidence of the necessary political will to remove squatters from prohibited areas, so farmers still proceed with land occupation and land transferences in their accustomed fashion.

At the present time the Agrarian Reform agency limits land titles to 50 ha. Nevertheless, it is recognized that this is not a legally fixed limit, and that there are no provisions to prevent these lands from being consolidated into larger farms. It is believed that many farms are jointly owned by family members, and that these farms are really much larger than the 50 ha. limit desired by Agrarian Reform.

3.2.2 National Environmental Commission

Official awareness of the importance of environmental questions has resulted in the creation of the National Environmental Commission. While it has no executive powers, as a presidentially named commission it has direct access to policy makers. Several of their recommendations to the president (CNMA 1983) bear on the process of colonization, and will be mentioned here.

The most comprehensive of their recommendations is the creation of an Institute of Natural Renewable Resources to replace the present National Directorate of Natural Renewable Resources (RENARE). The latter is a dependency of the Ministry of Agriculture, and as such has much less ability to make and carry out policy than it would as an autonomous institute. In recent years RENARE has grown considerably, but at the same time has suffered from its inability to control physical and budgetary resources, which are allegedly siphoned off into other areas designated at the ministry level. The environmental commission recommends that the Institute be given the greatest degree of policy and budgetary autonomy possible to facilitate its work.

The Commission also calls for a specific recognition of the environmental and forestry resources of Darien, and a reinforcement of the

forestry and protection activities in the area. Two other recommendations are for agroforestry research and environmental education. The agroforestry strategy is mentioned in the context of a plan for "Eco-Development" designed to protect fragile environments, and is accompanied by a suggestion for an emergency program to assign 300 state employees to tree nurseries and roadside tree plantation activities (pp. 57-61). Another aspect of the campaign to improve environmental conditions is through "... the permanent retraining of technicians, teachers, students, producers and other users of the information" (p. 40).

3.3 Current Problems Associated with Colonization in the Darien

A brief visit to Darien detected several problems which must be considered in any program for establishing an environmentally sound and sustainable colonization of the area.

3.3.1 Administrative Problems

The most outstanding problems encountered with regard to colonization in the Darien are administrative. The political indecision and the lack of coordination between government agencies combine to frustrate and demoralize the government officials assigned to colonization and environmental protection tasks.

Evidence of the lack of political will can be seen in various situations in the area. For example, the existence of an important natural resource area (Filo de Tallo Biosphere Reserve) with incomplete authorizing legislation is a serious oversight, especially in view of the area's function as a water source for the human population of the area. The damage done to the area may have serious consequences in the event of further delay or lower than average rainfall in the area (as happened in 1981-1982). The inability to define the legal status of lands included in the Decree #103 (Sea Level Canal) is another example. Although the Sea Level Canal plan may not be

revived, it sets a dubious precedent when agrarian reform officials are obligated to operate illegally, and weakens the general strategy of environmental and land use control through the use of formal land titling as an incentive.

Problems of lack of coordination between government agencies are in part a reflection of the lack of definition of priorities and goals. A clear example is the mapping of land claims. Given the repercussions which arise from land tenure uncertainty, mapping of land claims is an indispensable prerequisite to an ordered process of land occupation and use. Nevertheless, the request for such a map has not generated any concrete mapping activity for several months. Similarly, technicians in the field realize the deficiency of basic data for making land use recommendations. Nevertheless, each governmental agency has an independent set of priorities which may not include the generation of information necessary to other agencies. A unified set of regional priorities would be an important step in resolving this problem.

3.3.2 Technical Problems

Darien faces a very important environmental problem, the scarcity of water. As a result, it is necessary to consider all forms of water management and water supply improvement. A major impediment to the implementation of known management techniques is the lack of knowledge regarding economically viable alternatives to existing land use practices. While it may be that the only way to control existing practices is through legal prohibition and sanctions, this strategy is costly and inefficient, and would be advisable only as an alternative of last resort.

Another important technical problem is that of soil fertility maintenance. Indigenous farmers report the use of a 3 or 4 year fallow between grain crops, which they report maintains a stable yield of grain. Some of the recent colonists in the area have adopted this strategy for grain production. Nevertheless, the majority of the farmers of the area practice a more intensive cultivation of grain crops for several successive years; as yields drop to unacceptable levels (usually in 2 or 3 years) fields are sown to pasture, thus removing them permanently from crop production.

Sheet erosion is also a factor in the maintenance of soil fertility.

Much of Darien is relatively flat, so the formation of gullies and landslides in these areas is not a serious problem. Heavy rainfall on pastures however was observed to create muddy runoff even in areas of minimal slopes and catchments areas of no more than a few hectares. These areas do not have well defined stream beds, but the muddy water can be observed standing in pasture covered areas.

3.4 Recommendations

At present, deforestation and colonization are taking place with very little supervision or technical support from government agencies. Although a large part of the Darien is legally protected, the mechanisms for enforcement are deficient, and the areas which are not being colonized are those which are too inaccessible to be desirable to colonists. The Darien National Park and the Indian Reservations have not been greatly affected by colonists, but these are areas which are quite distant from the Interamerican Highway. Filo de Tallo Biosphere Reserve, on the other hand, is located close to population centers and to the highway, and is being colonized despite the presence of 2 RENARE employees assigned to guard the area.

To avoid long term problems in the development of the Darien, a much more decisive program is necessary on the part of government agencies. At present, development plans and environmental protection laws exist but are not enforced due to the lack of administrative and financial support to the local offices. The enforcement of existing laws and the execution of existing plans would have an extremely beneficial effect on the process of development in the area. For example,

1. a more forceful application of environmental controls in the 8 km. strip along the Darien highway by the agrarian reform agency or by RENARE has been prescribed in several development plans for Darien.
2. in 1978 the OAS published a fairly complete set of recommendations for integrated development of the Darien, including colonization and

conservation, but the execution of this plan is not currently in evidence.

3. the administrative confusion arising out of the lack of land occupation maps fairly clearly contributes to the deforestation of Indian Reservations.
4. RENARE officials did not feel that environmental obligations were as clearly stated as they could be in lumber concession agreements, and felt that these documents could be improved.

More recently, a set of recommendations has been proposed by the National Environmental Commission which touches on these problems and many more. The weakest link in the control of environmental problems at this time is execution rather than planning.

There is also a need for the development of basic technical information, especially in the area of agroforestry. Local officials and even farmers have been convinced of the need for some sort of forestry to meet the special needs of the area. At present there are no models ready for immediate implementation in the area, although research has begun on some alternatives. Viable alternatives must address the question of short term utility and profitability of the agroforestry systems, because Darien colonists tend to be poor. There is an active interest in mahogany (Swietenia macrophylla) and cedro espinoso (Bombacopsis quinatum) in the area, and these species are being produced on a small scale in the nursery of RENARE near Meteti.

At present, agroforestry programs exist in RENARE, the University of Panama, the Popular University of Darien, and IDIAP. The development of these programs has been virtually independent, with a notable lack of coordination between them. The program of the University of Panama is the most advanced, and has the additional advantage of being formally associated with the Popular University of Darien. A program for financing and coordinating these programs would be a major contribution to the future development of Darien.

Another area requiring technical support is the development of detailed land use plans for the Province. The Integrated Development Plan for the Darien (Panama 1978) presents a generalized set of recommendations for land use, but these are not specific enough to permit implementation at the field level. As mentioned previously, the enforcement of existing land use

regulations is a major problem. Clarification of land holdings through a process of mapping and land adjudication is a current strategy of local agencies in Darien, but it is being carried out very slowly; more resources and clearer mandates of action must be given to local offices to allow them to carry out this policy.

Another basic set of information which is lacking is the understanding of on-farm land management strategies in Darien, as well as those of logging companies and possibly those of local indigenous groups. Although the general process of colonization and pasture planting is known, there are many questions which must still be answered before effective legislative or administrative strategies can be developed to control land mis-use. Long term plans of farmers, the role of land speculation, the effect of on-farm lumbering, and different types of lumber entrepreneurship, etc. all are factors which are presently unknown, and which must be understood for future development planning.

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Appendix E
Individuals and Institutions contacted during
field work in Panama. 31 July - 10 August 1984.

Name	Title	Agency
Hugo Alvarez		IICA
Dr. Stanley Heckadon		CNMA
Donald Drga		AID
Enrique Andrade		IDIAP
Ing. Sanchez Diaz	Jefe Departamento de Transferencia de Tecnologia	IDIAP
Harmodio Zambrano	Jefe Seccion Pecuario	IDIAP
Roberto Ayala		RENARE
Dra. Raisa Ruiz	Sub-Directora	RENARE
MS Ballester	Jefe Servicio Nacional de Parques	RENARE
Manuel Hurtado	Jefe Seccion Forestal	RENARE
Dr. Jorge Jonas	Director Programa Nacional de Suelos	IDIAP
Marta Cecilia Sarmiento		Estudiante
Anibal Taymes	Professor	UP
Teodolondo Vacorizo	Sub chief Embera - Los Monos	
Miguel Ramos	Grain Middleman	
Luis Fernando Gonzales	Wood Middleman	
Ramon Alvarez	Park Service Director - Darien	RENARE
Isabel Martin	Researcher	FAO
Inocencio Zamora Ramos	School Teacher - Meteti	
Alfonso Waterman	Professor	UPD
Luis Gonzalez	Director - Region Darien	AF
Jose Rojas	Regional Director - Darien	RENARE
Abel Vargas	Farmer	
Alfredo Vergara	Farmer	
Jorge Zanapi	Corregidor - La Palma	
Arturo Romero	Fuelwood Project Resident	CATIE

RENARE	Dirección Nacional de Recursos Naturales Renovables
FAO	Food and Agriculture Organization for UN
AF	Agrarian Reform
UPD	Universidad Popular del Darien
UP	University of Panama
CNMA	Comision Nacional de Medio Ambiente
IDIAP	Instituto de Investigacion Agropecuario de Panama
IICA	Interamerican Institute for Agricultural Cooperation
AID	United States Agency for International Development
COPFA	Comision Panamena-American para la Prevencion de la Fiebre Aftosa

**Appendix F
Wildlands of Panama**

Management Category and Name	Province	Extension (Ha.)
Altos de Campana National Park	Panama	4,816
Portobelo National Park	Colon	11,000
Volcan Baru National Park	Chiriqui	14,000
Darien - National Park World Patrimony Site Biosphere Reserve	Darien	575,000
Soberania National Park	Panama & Colon	22,500
La Amistad National Park (Proposed)	Chiriqui & Bocas del Toro	150,000
Bocas del Toro National Park (Proposed)	Bocas del Toro	6,300
Isla de las Perlas National Park (Proposed)	Panama	
Cope National Park (Proposed)	Cocle	35,000
Chagres National Park (Pending)	Panama & Colon	76,000
Cerro Hoya Resource Reserve (Pending)	Veraguas & Los Santos	18,000
Montuoso Forest Reserve	Herrera	10,000
Wildlife Reserve Cenegon del Mangle	Herrera	
Wildlife Reserve Isla Iguana	Los Santos	53
Wildlife Reserve Penon de la Honda	Los Santos	
Wildlife Reserve Cienaga de las Macanas (Proposed)	Herrera	
Recreational Park Lago Gatun	Colon	120
Recreational Natural Area Metropolitana (Curundu)	Panama	265
Protective Forest Palo Seco	Bocas del Toro	240,000
TOTAL AREA		1,163,054

Source: Internal Documents, RENARE.

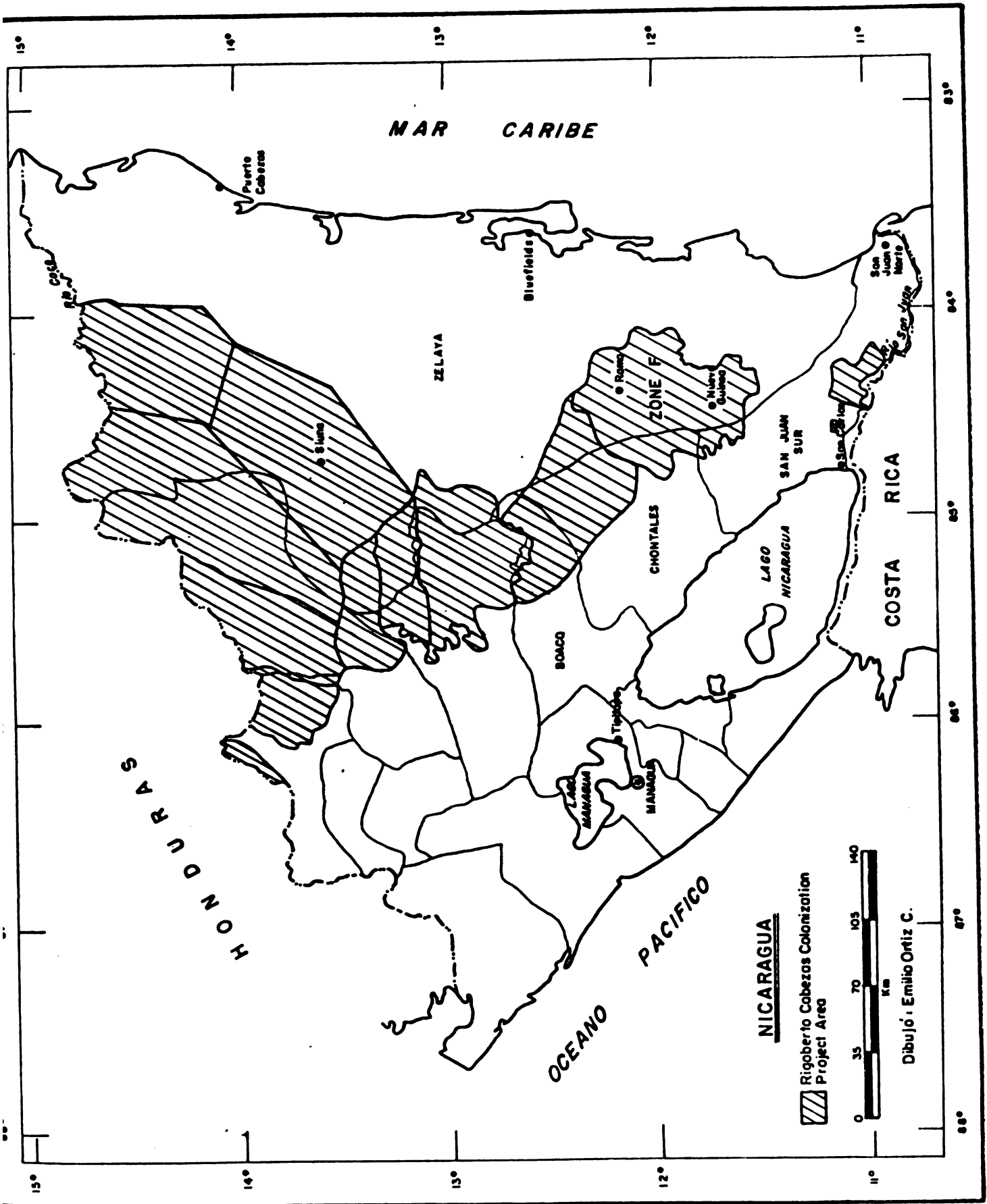
Chapter 4

Colonization in Nicaragua

4.1 Overview

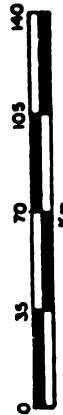
Nicaragua possesses some 52,000 km² of humid tropical lands on its eastern coast, in the Provinces of Zelaya and Rio San Juan. The climate of this area is much more humid than the rest of the country, and attempts to incorporate it into the national economy have been only temporarily successful. Banana, oil palm and cacao have been commercially produced, but their importance declined due to disease problems. Experimentation with rubber began in the 1940's at the "El Recreo" experiment station, and coconut and "raicilla" (*Hipecacuana* sp.) have been commercially produced on a small scale. A plan for large scale colonization of the region was elaborated and implemented in the 1960's to relocate farmers from the intensively used agricultural lands of western Nicaragua, and it was expected that farmers could produce grain using agricultural machinery and chemicals, along with extensive cattle ranching (Marin 1968). Much to their credit, the present Nicaraguan government has recognized the serious ecological limitations for the production of annual crops in these humid regions, and is beginning programs of permanent crop plantation. Nevertheless, a large colonist population of small farmers has already been established in the area, which will present planning and development problems in the future.

The colonization of the Atlantic area was begun under the name PRICA (Proyecto Rigoberto Cabezas de Colonizacion) in the 1960's. The area near Rama and Nueva Guinea was designated "Zone F" for the project, and covered more than 800,000 ha (see map). The project included plans for the colonization of the entire western foothill region of more than 5 million ha



NICARAGUA

Rigoberto Cabezas Colonization
Project Area



Dibujó: Emilio Ortiz C.

which bordered on the Caribbean lowlands, in a nearly continuous belt from the Costa Rican to the Honduran border (see Appendix G). Zone F (also known as Rigoberto Cabezas), and specifically the area of Nueva Guinea, was selected as the focus of the present investigation. At the present, Nueva Guinea is no longer part of the agricultural frontier, but a well established community. More active colonization fronts are found in San Carlos, Siuna and Kukra Hill, near Bluefields, but these areas are too recent for information to be available.

Little written information is available regarding the Rigoberto Cabezas colonization area. With the revolution of 1979, many government files and documents disappeared or were dispersed, and information which has been assembled under the new government in most cases is not in published form, and circulates as internal documents within the ministries. Many of these documents are not available for consultation. The Nueva Guinea area was not visited during this investigation, due to the possibility of guerrilla activities. Information has been assembled through interviews with individuals listed in Appendix H, many of whom have had first hand experience in Nueva Guinea in recent years.

In the past 4 years, a new policy for development of Zelaya Department has begun to be implemented. This policy involves the emphasis on perennial crops such as cacao, rubber, oil palm and coconut, managed in cooperatives. These cooperatives do not contemplate the production of annual crops. Only the cacao plantation project is presently under way, and the first phase of the plan is projected to bring between 10,000 and 20,000 hectares of land under cultivation with the four perennial crops.

4.1.1 The Caribbean Region of Nicaragua

The primary objective of colonization in the Caribbean region was to resettle farmers displaced from fertile alluvial soils of western Nicaragua by cotton production, although the immediate motivation for at least part of this movement was a volcanic eruption which affected farm lands in the west. Another, unstated, objective seems to have been the extension of cattle pastures into the tropical regions of Nicaragua, and the linking of those pasture areas to the western Nicaragua through a series of new roads. Neither of these objectives takes into account the special conditions or

capabilities of tropical regions, and in fact seem to be based on the assumption that conditions are similar to the western part of the country.

Zelaya Department is a broad plain generally lower than 100 m altitude, which extends 150 km inland from the Caribbean in some areas. Rainfall ranges from 2,000 to 6,000 mm annually, and is heaviest in the southeastern coastal regions from San Juan del Norte (on the border with Costa Rica a record 8162 mm were recorded in 1942) to Bluefields, and inland along the Rio San Juan, generally decreasing northward to the Rio Coco, on the frontier with Honduras. Most of the department experiences a brief dry season of 2 to 3 months, during which average monthly precipitation is below 60 mm. Average temperatures are generally 25 C or above. Most of the remaining forests are located in the Atlantic region, with the most important categories of forest being lowland rain forest and highland rain forest ("cloud forest") (see Table 10 and Map; note that Table 10 refers to all Nicaragua.).

Despite its great geographical extension (approximately one half the surface area of Nicaragua), the Caribbean region of Nicaragua has little population. In 1968, the region had a population of 120,870 (19,047 in Rio San Juan and 101,833 in Zelaya) as compared to the national population of 1,875,297. In terms of area, the Caribbean region covers 66,542 km² of the total national territory of 118,350 (7,448 in Rio San Juan and 59,094 in Zelaya). Population density in the Caribbean region was 1.79 inhabitants per km² as compared to 15.56 for Nicaragua as a whole (Incer 1970).

4.1.2 Proyecto Rigoberto Cabezas de Colonizacion - PRICA

PRICA was a highly ambitious and optimistic plan based on inadequate information. Two basic misconceptions were that large extensions of suitable agricultural land existed in the area, and that large tracts of land were unoccupied. The activities of PRICA were concentrated nearly entirely in the Departments of San Juan Sur and Zelaya (See Map and Appendix). The project as a whole was programmed to affect 5.8 million ha, but most activity seems to have been concentrated in the Rigoberto Cabezas sub-area.

At the beginning of the settlement of the Rigoberto Cabezas sub-area within the PRICA project (Zone "F"; one of approximately a dozen) a survey

Map 9 - Forest Cover - Nicaragua 1982.

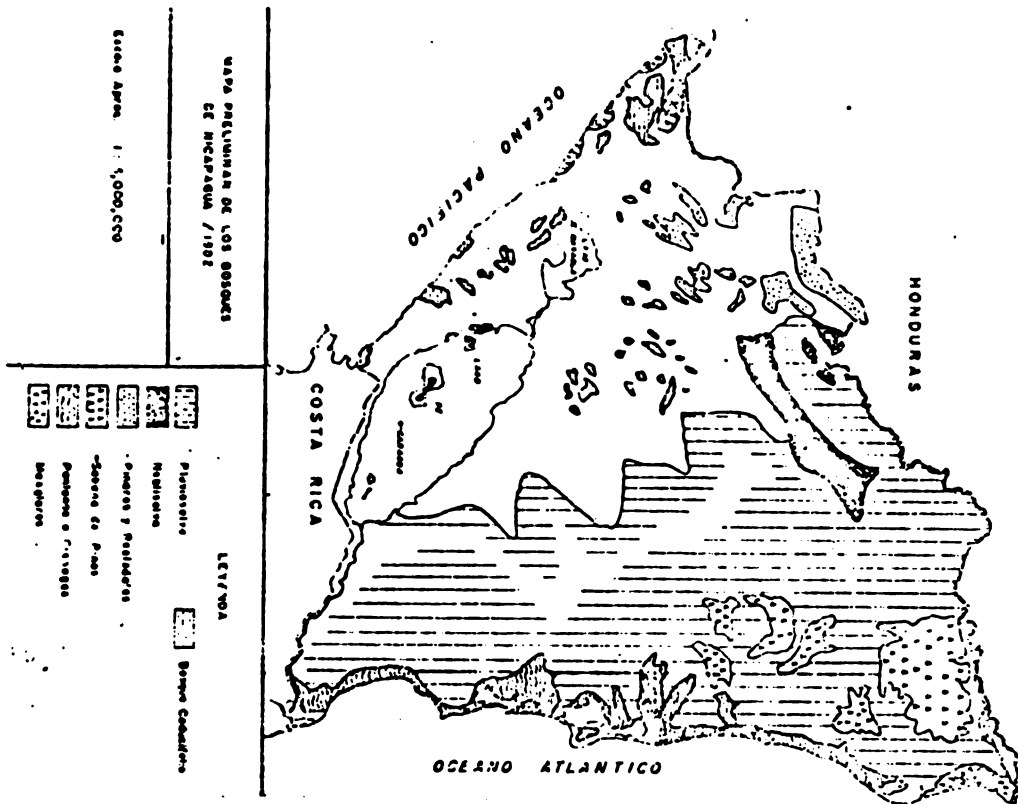


Table 10
Areas and Types of Forests - Nicaragua

Type of Forest	KM ²
Lowland Rain Forest	25,000
Highland Tropical Rain Forest	10,000
Dry Tropical Rain Forest	4,000
Lowland Pine Forests	4,500
Highland Pine Forests	1,200
TOTAL	44,700

Source: Corrales 1983.

Pluvioselva = "Rain forest", Nebli selva = "Cloud forest", Pinares y Robledales = "Pine and Oak forests", Sabana de pinos = "pine savannah", Pantanos o Ciénagas = "Marshes and Swamps", Manglares = "Mangrove Swamps", Bosque Caducifolia = "Deciduous forest".

Source: Corrales 1983.

team set out to investigate the condition of the land. In an area of 860,000 ha. the IAN (Instituto Agrario de Nicaragua) had expected to formalize the title of some 1,000 existing family farms, and settle 3,500 more in the same area. Taylor (1969) reports, however, that survey teams found the area to be filled with settlers at the time of the first visit by IAN (no further documentation was located to indicate what had been done in that case).

Initial estimations of land use potential for the area seem to have been overly optimistic. PRICA documents (IICA-MAG-BID 1978) suggested that 33% of the land in Zone F was appropriate for all kinds of agriculture (Table 11). This figure seems unrealistically high for an area of high rainfall, and later surveys of the area report a drastically reduced area for arable land. Whereas PRICA evaluations indicated that current land use left a great possibility for improvement in land use and increase in production, (Table 12), land may have been in use up to or beyond its capacity even in 1978.

One explanation offered by a present employee of IRENA for the colonization project is that it did not have land distribution as a major objective. Large tracts of land were said to be assigned to military personnel and politicians, and the development of a small farm population was actually to create a work force for large ranches. Small farmers were reported to be contracted for deforestation and the sowing of pasture. Another motivation was the supply of raw material for the plywood factory established at Tipitapa, which is near Managua on the road to the Rigoberto Cabezas colonization area.

In 1978 the population of the Rigoberto Cabezas area was approximately 26,089 (See Table 13). Sixty-five percent of this population was distributed in 24 communities, with nearly 35% unassociated with the communities. Comparing population data with land titling information (Table 14), the large majority of titles awarded and lands titled were outside the planned colonies. The average size of farms outside the colonies was twice that of farms inside the colonies. These unexplained inconsistencies in titling effort leave some doubt as to the objectives of the PRICA program, but the lack of documentation makes it difficult to reach conclusions.

Table 11
Land Use Potential for Zone "F", PRICA
All measurements in manzanas.

Use potential	Area	%
Broad (all uses)	282,919	33
Broad (Perennial)	0	0
Limited	181,130	21
Very Limited	329,821	38
Forestry	46,905	5
Restricted	21,454	2
	-----	-----
TOTALS	862,229	100

Source: IICA-MAG-BID.

Table 12
Land Use in PRICA Zone "F", 1977
All measurements in manzanas

Land Use	Area	%
Annual crops	1,248	0.14
Pastures	341,301	39.58
Pastures and crops	151,188	17.53
Forests	256,969	29.80
Forests and Crops	82,332	9.56
Forests and Pastures	29,191	3.39
	-----	-----
TOTALS	862,229	100.00

Source: IICA-MAG-BID 1978.

Table 13
Population Distribution for Rigoberto Cabezas
Project Area - 1976.

Community	Population	# Families	% Population
Nueva Guinea	1,989	104	7.69
Río Plata	437	66	1.65
Verdun	685	117	2.63
Yolaina	746	116	2.86
Los Angeles	908	114	3.48
La Esperanza	761	139	2.92
Nuevo Leon	535	93	2.05
Jerusalen	629	108	2.41
Corocito	615	84	2.36
Los Laureles	683	98	2.62
Tacanistes	515	97	1.97
Talolinga	648	100	2.48
Kurinwas	603	98	2.31
San Jose	645	128	2.47
San Martin	511	118	1.96
Río Rama	752	138	2.88
San Antonio	905	117	3.47
San Ramon	446	93	1.71
San Miguel	899	141	3.45
Naciones Unidas	791	151	3.03
Nuevos Horizontes	518	97	1.99
Providencia	632	181	2.42
Serrano	727	169	2.79
Somoza	509	207	1.95
Rigoberto Cabezas*	9,000	1,500	34.55
	-----	-----	-----
TOTALS	26,089	4,374	100.10

* Population outside defined settlements.
Source: IICA-MAG-BID 1978.

4.1.3 Nueva Guinea in the 1980's

The general evaluation by Ministry of Agriculture personnel of the colonization experience in Nueva Guinea is that it has been disastrous. Yields are low, costs of production are high, and the rate of repayment on agricultural loans is 3%.^[1] It is reported that at least in two communities (Talolinga and Kurinwas) lands are being abandoned due to the severe competition from weeds.

In view of the negative evaluations by agronomic workers, recent data show a surprising orderliness in farms and farm development. MIDINRA has assembled information for 120 farmers whose lands are destined to be affected by the cacao project^[2]. This information shows that the majority of the farm land is presently in pasture, while some 24% is used in agriculture (Table 15). The use of an average of 23 mz. in the production of corn, rice and beans on certain farms makes it seem likely that there is extensive use of wage laborers. The existence of a large landless population is further suggested by data on membership in the proposed cacao cooperatives, where only 7.5% of the members of the new cooperatives are land owners (11 of 145); nearly half (1,330 mz.) of the required land has now been assigned to the cooperatives.

The majority of food grains produced in the area are produced for sale, while production of plantains and tubers is strictly for home consumption (Table 16).

There has been considerable stability in farm size since the initial colonization. Table 17 shows that over half the farms have 50 mz. which is the size of initial allotments made by IAN, and 85% of the farms are

1. Deforestation of new lands has continued, and has slowed only recently in response to the active guerrilla warfare in the countryside.

2. These statistics have been copied from the few available reports encountered. It was not possible to determine the sampling strategy, the size of the larger population, nor the methods used to define the strata "agriculture", "agriculture and ranching" or "ranching" for farm types.

between 30 and 99 mz. The most successful farmers, i.e. those who have managed to buy cattle, are those who have been the longest in the area (See Table 18). Sixty-four percent of the 120 farmers (77 individuals) have been on their farms more than 7 years[3].

The population of Nueva Guinea has grown tremendously since its establishment. Deve (1983) estimates that there are 85,000 inhabitants (13,000 families) in Nueva Guinea, while other estimates are as high as 100,000 inhabitants (reported by INETER). The 800,000 ha originally destined for the Rigoberto Cabezas colonization could theoretically be divided into 16,000 parcels of 50 ha, which suggests that Nueva Guinea should be regarded at present as a mature, if poor, agricultural area.

Agronomists working in the area note that there have been some technological innovations by farmers in response to the environmental conditions they face. These include the abandonment of land plowing and brush burning, to avoid destroying the thin layer of topsoil. Farmers have also adopted a fallow rotation of 3 to 5 years between crops.

4.2 Current Development Plans for Eastern Nicaragua

4.2.1 IRENA

The Nicaraguan Natural Resource Institute is the national entity most concerned with questions of forest conservation and resource management.

3. This statistic is surprising if compared to the highly successful Cariari colony, in Costa Rica (Jones 1983), where only 54% of the farmers had been on the same farm more than 6 years. Cariari possesses relatively good soils for a humid tropical zone, so the similarity of the permanence of colonists in the two colonies deserves some further attention.

Table 14
Land Titles - Area and Number in Nueva Guinea - 1976
All measurements in manzanas - 1 mz. = .69 ha.

Colony	#	Area
Nueva Guinea	97	4,820
Los Angeles	53	2,217
Verdun	85	5,174
La Esperanza	91	4,522
Yolaina	92	4,473
Nuevo Leon	51	2,485
Outside defined colonies	2,184	222,420
	-----	-----
TOTALS	2,653	246,111
Percent outside defined colonies	82	90
	Inside of colonies	Outside of colonies
Average farm size	51	102

Source: ICA-MAG-BID 1978.

Table 15
Land Use for Different Farm Types - 120 Farmers in Nueva Guinea

Type of Farm	Type of Land Use on Farm									
	Agriculture		Pasture		Forest		House plot		Total	
	Area	%	Area	%	Area	%	Area	%	Area	%
Agriculture	23	47	23	47	2	4	1	2	49	100
Ranch and Agriculture	11	23	34	72	0	0	22	5	47	100
Ranch	5	6	67	90	1	1	2	3	74	100
Averages	14	24	41	71	2	2	2	3	57	100

Source: Project Report, MIDINRA Cacao Project.

Table 16
Destination of Cultivated Crops for
120 Farmers in Nueva Guinea

Crop	% consumed	% sold
Rice	40	60
Maize	35	65
Beans	30	70
Tubers	100	0
Plantain	100	0

Source: Project Report, MIDINRA Cacao Project.

Table 17
Farm Size among 120 Farmers of Nueva Guinea
Measurements in manzanas. Date approx. 1984

Farm Size	# of farms	%
Less than 30	13	11
31 to 49	12	10
50	75	62
51 to 99	15	13
More than 100	5	4
TOTALS	120	100

Source: Project Report, MIDINRA Cacao Project.

Since the revolution of 1979, the policy focus of national institutions has been explicitly directed to production for the generation of income. IRENA has been generally overlooked in this process, since due to major communications problems their major perceived function was that of the obstruction of the productive process. In August, 1984, IRENA is in the process of incorporation into the Agricultural and Agrarian Reform Ministry, which many hope will provide it with a better position for communicating and enforcing their mandated objectives.

The major policy interest of IRENA in humid areas is the improvement of forest management techniques. A Bulgarian team was working on this plan until August of 1984, when they were retired from the area due to intense guerrilla activity, so this work will be suspended for some time. A report is being prepared in the meantime. A Swedish team is also working on this problem.

IRENA has an office of cooperatives which is planning a joint CORFOP-IRENA project for the production of charcoal from "almendro de rio" (Andira inermis) which has a wood too hard to be commonly used. One of the major activities of this office is seen to be environmental education, which will be carried out in agricultural areas. Instruction will be given in cooperatives and schools, focusing on conservation and the prevention of forest fires. This office has also become involved with the promotion of agroforestry, through the establishment of demonstrations in a few private farms of the Nueva Guinea area.

At present, a draft of a "Natural Resources Strategy" is being considered by government authorities, although no copies are presently available for wider circulation. The major foci were presented verbally in interviews with members of the IRENA staff. These include;

1. Management of natural forest areas.
2. Enrichment of degraded forests.
3. The process of natural regeneration.

The details of the strategy are expected to be presented in the final report by the Bulgarian Mission.

The Sub-director of IRENA emphasized that everything having to do with the advance of the agricultural frontier was the province of MIDINRA

and CIERA, and not part of the mandate of IRENA.

4.2.2 CORFOP

CORFOP is the nationalized wood processing industry, which was originally part of IRENA, but separated several years ago in an administrative reorganization.

The major concern of CORFOP is forest production. In Nueva Guinea their major activity which is concerned with the management and exploitation of broadleaf forests. Investigation, however, is limited to small areas isolated within the forest production areas.

Another management strategy of CORFOP is the development of forestry cooperatives. One suggestion which is still in the planning stages is the management of unproductive forest areas for fuelwood. The suggested project areas would be brush lands which produce no marketable timber, which would be harvested for fuelwood, and planted to Eucalyptus. While this strategy could conceivably be applied in Nueva Guinea, it was reported that it would be more likely in areas closer to existing population centers in western and central Nicaragua.

It is noteworthy that individuals in other ministries perceived CORFOP's activities as highly exploitative, and short sighted. They cited an exclusive focus on harvesting with little emphasis on reforestation, and insufficient attention given to the design of management strategies.

4.2.3 MIDINRA - Cacao Project

One of the most active projects in the development of land use alternatives for the humid lands of Nicaragua is the MIDINRA cacao project. This is an ambitious project which attempts to redress some of the problems begun through the haphazard colonization which had previously been promoted in the area. Members of the project staff pointed out that farmers had been brought from the Pacific coast to the Atlantic area by the PRICA project without any preparation or technical assistance. Early

research efforts in the "El Recreo" experiment station tested the possibility of lime applications in the acid soils of the area, but the results of that activity indicated that the treatment was too expensive to be economically viable, and no comprehensive management recommendations seem to have resulted.

Cacao is one of four crops MIDINRA is promoting for cultivation in tropical areas. The other crops are rubber, coconut and oil palm. Of the four projects, cacao, coconut and oil palm are the most developed, while research was still being conducted on rubber production in August of 1984. While the immediate plans for these projects contemplates less than 20,000 hectares, MIDINRA technicians see the cultivation of these crops being implemented on a very large scale in the relatively near future.

The cacao cooperatives are being located on the best lands available, with the objective of completely replacing the production of annual crops in the area. A number of cooperatives will be formed of 8 to 25 families each, with an average of 6 mz. of cacao per family. The present plan calls for the plantation of cacao with plantain (*Musa* spp.) as shade, which will be replaced later with tree species. A plan was mentioned for the plantations to be established with 30 year loans with a 7 year grace period, but the final decision on financing will be made at the Ministry level, by MIDINRA and the National Finance System.

The formation of the cooperatives began with donations of land and purchases from farmers who did not wish to participate in the project. This proved to be too expensive, and the project now relies on other methods[4].

Project technicians felt they faced several problems in the implementation of the project. First was the poor track record of government agencies in the area. These farmers had seen several projects come and go, where the production of pineapple and coffee had been promoted, only to discover that no marketing provisions had been made, so that crops could not be sold. Another problem encountered was the lack of coordination between the cacao project loan program and that of the

4. The director of the Cacao and rubber Projects clarified that these lands are not expropriated, and refers to the Agrarian Reform Law, which "clarifies all points regarding the lands of our country".

National Development Bank, which resulted in some cases in farmers using one loan to pay off another loan, rather than to make the prescribed investments.

One of the weakest links in the development of alternative crops is the capacity for biological research and the maintenance of germ plasm collections. An active program had been established at El Recreo in previous years, but administrative reorganizations left the station without any strong institutional affiliations for a time, during which the technical staff and collections were dispersed. Operations have been moved to a new station near Nueva Guinea, called Los Pintos, and in August 1984 there seemed to be an increasingly close cooperation between the Cacao and Rubber Projects and the research station at El Recreo.

4.2.4 Land Management Planning

A number of planning departments were encountered in different institutions. The most encompassing of these is INETER (Instituto Nicaraguense de Estudios Territoriales), but both IRENA and MIDINRA have planning departments which deal with questions of land use planning. Only INETER is discussed, because the other planning agencies do not consider integrated agricultural and forestry land use planning to be their concern, and focus almost exclusively on the activities of their respective dependencies. Nevertheless, there still seems to be some doubt as to the final status and administrative authority of INETER with respect to the other planning departments.

INETER is in the process of developing overall land use strategies within a "National Framework for Physical Planning". One of their major tasks is the collection and organization of data. In INETER the need for biological investigation into appropriate cropping strategies was recognized, and the experimental station at El Recreo was cited. Crops such as plantain, pineapple, coffee and tropical tubers were mentioned as possible cropping alternatives to the current focus on basic grains seen in Nueva Guinea.

The maintenance of Nueva Guinea's current agricultural focus was seen as extremely costly for the nation, given the low output of the area and the necessary government support. Costs of production are thought to

be 3 times higher in Nueva Guinea than in other areas of the country for the production of grains. At the same time, natural fertility of the area has declined drastically over the past 15 years, and yields for unfertilized fields are currently one third what they were at the time of colonization. In INETER it was asserted that cattle ranching is unsuccessful in the area, due to the excessive humidity which affects the health of the animals, but a technician from MIDINRA's planning group reported that cattle production was one of the best alternatives for the area.

While there is no formally defined policy with regard to land use as yet, a general strategy has been suggested. This strategy would focus on the settlement of alluvial valley lands, with Sebaco and Jalapa given as examples (these areas are neither particularly humid nor lowland forest areas). A major focus would be the use of "black soils", vertisols which expand and contract with humidity and have been avoided for agricultural purposes due to a lack of appropriate land use strategies. These soils are fairly common, and represent a major soil resource if they can be made to produce, although these tend to be found in the drier Pacific Lowlands of the country. It might be summarized that INETER seems to have a good grasp of environmental problems and the need for a proper planning of their use if they are to contribute to national development. The next major hurdle for the agency is to implement its recommendations.

4.2.5 Planning for Humid Tropics

A new administrative structure is being formed which will deal exclusively with development questions in the Humid Tropics. These are the Directorates of Humid Tropics, and Teaching and Investigation, of MIDINRA.

The Directorate of Humid Tropics is only 8 months old, and is still in the process of formation. At the present its function is to serve on the MIDINRA "Project Council" and provide information and perspectives on humid tropical land use in the process of project formation. This office has identified several problems of importance for the development of the Nueva Guinea area.

1. fuelwood; the extensive deforestation in the colonization area has created a fuelwood scarcity especially in heavily populated areas. Projects should be designed with this problem in mind, and try to use

fuelwood producing trees wherever possible.

2. mixed cropping strategies; the intermixing of crops is suggested as a way to avoid environmental problems associated with grain production in humid areas, and at the same time provide a subsistence for farmers. Specific mention was made of grains and plantain, although in the case of grains this was seen as a strictly non-commercial, small scale strategy.
3. soil fertility management; it may be desirable to include an understory of small plants in permanent crops, both for reasons of fertility and soil erosion. A need is also seen for the consideration of soil recuperation in degraded areas, and for special studies of the use and management of acid soils.
4. water balance; while the Nueva Guinea area generally has a short dry season, it seems to be increasing in length and intensity. There are no sources of groundwater in the area, and in a recent especially severe dry season cacao production was notably affected.

The Directorate of Teaching and Investigation is also a recently formed office which formally joins the UNAN (Autonomous National University of Nicaragua) with MIDINRA. The objective is to reinforce MIDINRA's capacity for agricultural development through the linking of training and research facilities. For the humid tropical area, it has been suggested that a training center be established in El Recreo using the considerable existing physical plant, which had been established for rubber research in the 1940's for housing and labs. The "Fondo Simon Bolivar" funded development of the germ plasm and experimental capacity of the station. This center would give agronomists and other biological scientists training specific to the problems of agricultural development in humid tropical areas. In its initial stages, this center would have to be staffed by MIDINRA technicians since the University at present has no one who could carry out these activities. The program is seen as an answer to the short term need for technicians, and the students would be given 3 years of generalized training in the University in Managua, and 2 years of specialization for some students in El Recreo. The objective would be the production of 30 technicians by 1986, considering that there now exist a pool of students who have completed their generalized training at the University.

A strategy for investigation has still not been fully outlined, although there are plans to begin a school of forestry, and a division of watershed

management.

4.3 Conclusions and Recommendations

The outstanding feature of all aspects of Nicaraguan agricultural development at this time, and not only in the field of colonization and humid tropical development, is its lack of fixed organization. Offices, committees, and government agencies are in a state of change and for the most part plans and strategies have only begun to be sketched out. Projects seem to start at a low level, and there is a notable lack of coordination between different agencies.

Coordinating offices such as INETER and the Directorate of Humid Tropics are too new to fully exercise their functions, and project planners generally proceed without consulting them on that assumption. They face a major challenge in achieving that their recommendations are respected by other agencies.

As a result, there is a tendency to focus on short term rather than longer term problems, and with special emphasis on commercial production. An especially critical manifestation of this problem is in the area of colonization. While the government has taken a very appropriate approach to development in the humid tropics in their selection of perennial crops over annual crops, this project will have a minimal impact in the next 5 or even 10 years, due to the long maturation period of perennials. The 20,000 mz. which may be dedicated to perennial crops in the currently envisioned projects are 2.5% of the Nueva Guinea area (no to mention the rest of the Atlantic coastal area), and the few thousand families which may directly benefit are a small portion of the existing population. The effects of the large remaining population on existing forests and exposed soils could be disastrous.

The weakness of overplanning becomes especially critical when the lack of training and inexperience of project technicians and managers are considered. There is a tendency to focus narrowly on project objectives and ignore peripheral considerations despite their potential importance for the

success of the project.

Areas which require technical support are:

1. the provision of support for the training of technicians. The lack of trained and experienced technicians is a major bottleneck in agricultural development. For tropical areas, there are virtually no technicians available for training or project execution.
2. support for cacao project. The cacao project is underway, but still needs information with regard to management alternatives. Questions of varieties of shade, spacings, management practices, etc., need to be defined for the project area. There is also a need for integrated planning including areas surrounding project areas, especially where this could help to control erosion or improve the water balance for the cacao.
3. support of humid tropics program. The MIDINRA offices which are specifically concerned with development questions in the humid tropics are in the process of formation. These offices have only recently been established, so their programs are not yet formulated, but their planning at this stage indicates that they will require technical support in alternative production strategies, such as agroforestry, as their program develops.
4. some provisions must be made for existing colonist populations. While it is clear that these farmers are a burden on the economy, unless they are given technical alternatives, they will continue to cause environmental damage in their efforts to earn a living. The long time horizon for the implementation of the permanent crop programs, such as Cacao mean that some interim solutions must be encountered.

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Appendix G - Summary of Rigoberto Cabezas Colonization Project

Zones and Projects	Allocated Lands	Untitled Lands*	Available*
Zone A	1,057,477	777,107	777,107
Jalapa	32,173	9,193	9,193
Murra and Quilali	187,368	32,428	32,428
Wiwili	351,444	248,994	248,994
Bocay-Lakus	486,492	486,492	486,492
Zone B	1,356,149	1,038,786	1,038,786
Sifuna	841,967	540,754	540,754
Tasba Raya	514,182	498,032	498,032
Zone C	376,727	233,101	233,101
Somoza Garcia	197,188	140,961	140,961
Rio Bijao	179,539	92,140	92,140
Zone D	1,031,439	908,664	908,664
Waylawas	229,046	229,046	229,046
La Cruz de Rio Grande	692,485	569,710	569,710
Hawasang	109,908	109,908	109,908
Zone E			
Santo Domingo	502,517	273,929	273,929
Zone F			
Rigoberto Cabezas	862,229	616,118	616,118
Zone G	194,729	169,516	169,516
Rio Sabalos	132,628	132,628	132,628
El Castillo	3,732	0	0
Rafaela Herrera	55,640	36,383	36,383
La Acuzena	2,729	505	505
Zone H			
Matiguas	422,414	280,140	280,140
TOTALS **	5,803,681	4,297,361	4,297,361

Source: IICA-MAG-BID 1978.

* These labels are taken from the original table.

** Incorrect column totals taken from original report.

Appendix H - Individuals Consulted for Nicaragua Study

Name	Title	Institution
Michel Montoya	Director	IICA-Nicaragua
Romeo Martínez		IICA-Nicaragua
Daniilo Gomez	Acting Resident Fuelwood Project	CATIE
Julio Castillo	Director	IRENA
Denis Corrales	Sub-Director	IRENA
Vladimir Perez	Director - Planning	IRENA
Frank Sequeira	Director - Direccion de Tropico Humedo	IRENA MIDINRA
Francisco Berrios	Director - Direccion de Investigacion y Ensenanza	MIDINRA
Miguel Reyes	Director - Fuelwood Project	IRENA
Lino Machado	Encargado - Proyecto Nueva Guinea	IRENA
Lennart Haggerby		SWEDFOREST
Jorge Ramirez	Director - Proyecto Cacao y Caucho	MIDINRA
Liana Babbar	Planificacion Perspectiva	MIDINRA
Tania Ammour	Planificacion Economica	MIDINRA
Roberto Araquistain	Director - Proyecto Control de Erosion de Managua	IRENA
Juan Jose Montiel		CORFOP
Victor Tercero	Planificacion Fisica	INETER
Michael Carman	Planificacion Perspectiva	MIDINRA

Appendix I - Abbreviations Used

PRICA	Proyecto Rigoberto Cabezas de Colonizacion Agricola
IRENA	Instituto Nicaraguense de Recursos Naturales
CORFOP	Corporacion Forestal del Pueblo
MIDINRA	Ministerio del Instituto Nicaraguense de Reforma Agraria
IAN	Instituto Agrario Nicaraguense (no longer exists)
IICA	Instituto Interamericano de Cooperacion Agricola
CATIE	Centro Agronomico Tropical de Investigacion y Ensenanza
INETER	Instituto Nicaraguense de Estudios Territoriales

Chapter 5

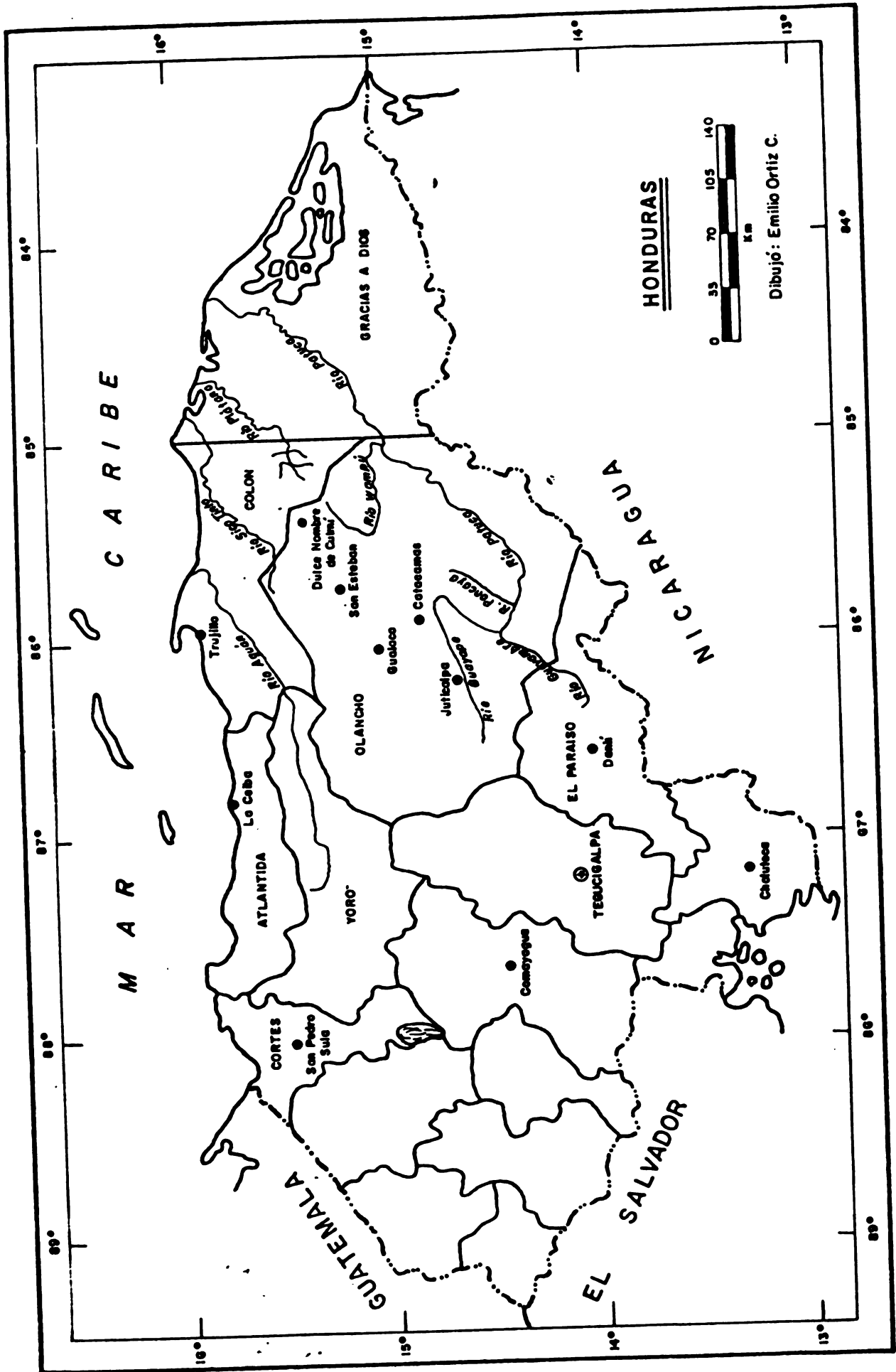
Colonization in Honduras

5.1 Introduction

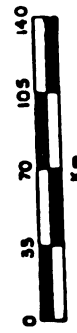
The process of colonization is of extreme importance for Honduras since it competes for forest resources in an economy where wood exports to the US for 1981 (\$448 million) represent approximately 20% of its Gross National Product (USAID no date). At the same time, the value of wood lost through deforestation in broadleaf forests (largely for agricultural purposes) is estimated to be \$640 million annually (MRN 1984). In addition, Honduras has suffered from periodic flooding of agricultural valleys, the severity of which can be linked in part to the process of uncontrolled deforestation in upper watershed areas. At the root of these problems is the combination of poor soils and insecurity of land tenure which result in a generalized strategy of shifting cultivation. In many areas, primary and secondary forest remnants are continually brought into cultivation within agricultural zones, in a process of land conversion that is not formally recognized as "colonization", but rather as a very long fallow system. At the other extreme, a well defined process of new land colonization is taking place in sparsely populated portions of the country, where large expanses of primary forest are being incorporated into the "agricultural frontier". This report will focus on these latter areas, where new land colonization has occurred adjacent to or within major forested areas.

5.1.1 Distribution of Population

While the population density of Honduras is not extremely low by Central American standards (25 inhabitants per km²), colonization of new lands is a major feature of the agricultural economy due to the skewed



HONDURAS



Dibujó: Emilio Ortiz C.

Table 18
Population Density by Departments - Honduras

Department	Households	Area (Kms)	Inhabs. Per Km	Forest Area	% Forest
Central Region					
Atlantida	27,426	4,251	6.45	3,032	71.32
Choluteca	32,930	4,211	7.82	875	20.78
Comayagua	23,362	5,196	4.50	2,424	46.65
Cortes	66,184	3,954	16.74	1,855	46.91
Francisco Morazan	77,393	7,946	9.74	4,186	52.68
Islas de la Bahía	2,785	261	10.67	44	16.86
La Paz	11,375	2,331	4.88	837	35.91
Valle	15,604	1,565	9.97	345	22.04
Western Region					
Copan	27,491	3,203	8.58	931	29.07
Intibuca	14,243	3,072	4.64	1,236	40.23
Lempira	22,536	4,290	5.25	1,178	27.46
Ocotepeque	9,308	1,680	5.54	478	28.45
Santa Barbara	32,884	5,115	6.43	1,900	37.15
Eastern Region					
Colon	14,271	8,875	1.61	8,706	98.10
El Paraiso	23,713	7,218	3.29	2,350	32.56
Gracias a Dios	3,369	16,630	0.20	14,033	84.38
Olancho	24,910	24,351	1.02	20,426	83.88
Yoro	33,220	7,939	4.18	5,652	71.19
TOTALS	463,004	112,088	4.13	70,488	62.89

Sources: FAO 1965, Honduras 1978.

Table 19
Land Use Potential - Honduras

Potential Land Use	Area (Kms)	% Total
Intensive Annual Crops	8,726.00	7.8
Intensive Perennial Crops	0	0
Extensive Annual Crops	1,494.80	1.3
Extensive Perennial Crops	8,670.10	7.8
Silvo-Pastoral	1,036.80	0.9
Broadleaf Forest	31,895.00	28.6
Mangroves	1,450.20	1.3
Pine forest	28,281.70	25.3
Protection	30,173.30	27.0
TOTALS	111,728.00	100.0

Source: FAO, 1967.

distribution of population within the country. The Honduran population is concentrated in the western and central parts of the country. Only relatively recently has the northern coast experienced an increase in population, and the three largest departments in the country, Olancho, Gracias a Dios and Colon, remain sparsely populated (See Table 18). The economic centers of the country are still located in a "corridor" which runs from the Gulf of Fonseca on the Pacific Coast, through Tegucigalpa and Comayagua, to San Pedro Sula near the Caribbean, and including the cities of La Ceiba and Trujillo in the coastal area (in the Departments of Choluteca, Valle, La Paz, Francisco Morazan, Cortes, Comayagua and Atlantida). The subsistence agricultural base for the country has traditionally been the western part of the country, between the central "corridor" and the Salvadorean and Guatemalan borders, including the Departments of Copan, Intibuca, Ocotepeque and Santa Barbara. Population growth, soil exhaustion and the competition for land between subsistence farmers and commercial export producers have resulted in pressures to move into low population density areas of the northern and eastern part of the country (Yoro, Olancho, Gracias a Dios, Colon and El Paraiso).

The case of Choluteca may be taken as a negative example of the process of agricultural expansion, and a worst case scenario. As an area of relatively good soils, and easy access both by sea and by land, Choluteca has become a major commercial agricultural area. Commercial development has proceeded with little overall land use planning. Subsistence farmer populations were displaced pressures caused by the introduction of higher value export crops into their agricultural areas (DeWalt 1982; CSUCA 1978). These farmers relocated on the sloping areas of the upper watersheds which drain into the Choluteca basin. The result has been a near total deforestation of the area, and a subsequent drying trend in both Choluteca and in Tegucigalpa (Tegucigalpa is in the headwaters of the Choluteca basin); the drying trend has most concretely been demonstrated by the disappearance of permanent springs and watercourses in small farm agricultural areas, and residents of Tegucigalpa complain of a mean temperature rise over the past 20 years (Dulin 1984b).

A major factor in the problems of the Choluteca basin are related to inappropriate farming practices, which rely on burning for weed control and land preparation, but leave barren, and easily erodible land at the initiation of the rainy season. It has been reported that farmers use a "slash and mulch" strategy under certain circumstances, where instead of burning, brush from land clearing is left in the field. It is not clear what the scale of this

activity is, and whether that scale could be sufficient to reverse current trends (DeWalt et.al. 1982). As an immediate solution to flooding of lowlying areas in the Choluteca basin, an expensive watershed management project has been started for Choluteca (Ministerio de Recursos Naturales 1984), but farmers have already begun to move, both individually, and as whole communities, into forest areas to seek more fertile lands.

In Choluteca, a combination of overintensification of annual cropping using essentially shifting agricultural techniques and commercial pressures pushing grain farmers into areas of poor soils have combined to create a pressure for the abandonment of old agricultural lands and the colonization of new areas. What is especially disturbing is that this process has begun on fairly good soils; the replication of the process in areas of poorer soils has ominous implications, since the whole process from clearance to abandonment is likely to be much faster.

5.1.2 Land Use Potential

The distribution of good agricultural land is another motivation for colonization in Honduras. In a country where less than 10% of the soil is suitable for the intensive production of annual crops, one third of this land is found in the valley bottoms of the sparsely populated eastern provinces (see Table 19).

The forest cover gives another indication of the generally poor quality of Honduran soils. Pine forests cover more than 27,000 km². These forests are generally located in poor sandy soils in areas of moist climates, and are not appropriate for permanent agriculture. Broad leaf forests cover 40,000 km², and while these forests are taken as indicators of better soils, their agricultural capacity is limited by the high rainfall and ambient temperatures which combine to acidify soils and break down organic matter (FAO 1965).

Despite the limitations on land use potential, population pressure has led to massive land conversion of lands with limited production potential to agricultural purposes. In an analysis of the state of land use in areas of broadleaf forests, it was concluded that nearly half the land in these areas was now being used for agriculture (see Table 20). One problem illustrated by the table is that in parts of Honduras, there the potential remains to increase food production, since there is more "cultivable" land than there is

"cultivated" land; however, much of this cultivable land is used for pastures. In the broadleaf forest region, over 30,000 families have been settled through agricultural reform programs (see Table 21) on 138,719 ha. Comparing land reform in broadleaf areas to land reform on a national level, 67% of the families affected by reform are in the broadleaf area, as are 71% of the lands affected.

The exploitation of forest resources is one of the alternatives for economic development of Honduras, given its difficult soil conditions. The major efforts for forest industry development have been directed toward the pine forests. While these represent less than one half the area of the standing forests, and only one third of the volume of total wood in existence in Honduras (see Table 22) some 98% of all commercial wood production is pine.

In the exploitation of broadleaf forests the lack of proper management techniques constitute a major problem. Very few species are utilized, and the remaining forest area is damaged by the logging operations. According to COHDEFOR figures, 11 species make up 94% of all wood exploited in broadleaf forests (Table 23), with an average of 10 to 15 m³ per hectare exploited. These logging operations are further marred by a lack of conservation techniques, so that the forest remaining after logging is severely damaged (Hernandez and Desloges 1982). Commercial logging also focuses on relatively pure, dense stands of commercially valuable species to reduce production costs, leaving only low grade forests.

One of the more intriguing aspects of COHDEFOR's overall program is the Sistema Social Forestal (Social Forestry System). In a country with abundant forests, poor farming potential, and a large unemployed population, the SSF's objective of incorporating farmers into forest exploitation is an extremely attractive concept. Cooperatives have been established for the production of resins, fuelwood and lumber (See Table 24). Nevertheless, the introduction of these cooperatives has been sporadic and inconsistent, in part due to funding problems.

5.1.3 Institutional Aspects of Colonization

Two Honduran institutions are of major importance in the process of new land colonization; INA (Instituto Nacional Agrario - National Agrarian

Table 20
Land Use in Forested Lands (km²)

Land Use Category	Sula	Olancho	Aguan	Mosquitia	Nation
Total Area	16,165	18,367	15,610	21,089	112,088
Deforested	2,678	563	948	0	25,636
Cultivated	1,935	432	749	109	7,187
Cultivable	1,491	1,208	2,983	3,214	10,463
Pasture	3,456	1,002	1,508	131	13,706
Forested	10,062	16,164	10,930	18,492	70,488

 * In the source document, no explanation was given for inconsistencies in the column entries and column totals.
 Source: Hernandez and Desloges 1982.

Table 21
Lands Affected by Agrarian Reform
in Broadleaf Forest Areas

Agricultural Administration Area	# families	# ha.
North Eastern (Olancho)	1,412	8,217
Central Eastern (Danli)	2,466	19,982
Northern (San Pedro Sula)	11,078	48,049
Atlantic Coast (La Ceiba)	7,107	62,471
SUBTOTAL	22,063	138,719
National Total	32,697	196,178

Table 22
Wood Production in Honduras

	Production		Wood Existence		
	1,000,000 boardfeet	M ³	10 ⁶ M ³	Total 10 ⁶ Ha.	Dense 10 ⁶ Ha.
Broadleaf	4.50	29,264	420	3.00	1.86
Pine*	226.60	1,000,000	170	2.73	1.93
TOTAL	231.10	1,029,264	590	5.73	3.79

* Wood existence data for Pine taken from FAO 1968.
Source: Hernandez and Desloges 1982.

Table 23
Broadleaf Species Exploited in Honduras

Species	% wood exploited
Mahogany	47.5
Cedar	11.7
Sangre	8.8
Ceiba	6.7
San Juan	6.7
6 other species	12.6
TOTAL	94.0

Source: Hernandez and Desloges 1982.

Institute) and COHDEFOR (Corporacion Hondureno de Desarrollo Forestal - Honduran Forest Development Corporation).

5.1.3.1 INA

INA is the agency charged with the fundamental aspects of agrarian reform in Honduras. Their major activities are land adjudication, titling, and the organization of farmers into cooperative units. The activities of INA are mostly focused on the lands of more the densely populated regions of the country, where underutilized lands or remnant forests are adjudicated for peasant groups (See Table 25). In Olancho, the activities of INA have been directed in part toward forested areas, as land pressures push farmers to look for new lands. INA's strategy is built around the maintenance of administrative and technical ties with "asentamientos", to promote their cooperative model and to give access to technical assistance. A major new program is the titling of lands, carried out in coordination with AID. Titling motivates farmers to stay on a single farm and improve it for their own use, and to avoid the tendency for farmers with insecure title to sell to avoid conflicts with others who may claim to have a more formal title to the land. The titling program has been initially directed more toward established farming areas rather than areas of colonization.

INA is ideologically an agrarian reform agency, rather than a colonization agency. Its activities are oriented toward the improvement of peasants' abilities to hold on to valuable land in major agricultural areas, and give them the opportunity to improve their income and political status through the exercise of their cooperative commonality of interest. The principal areas of activity of INA have been in Choluteca and Cortes, and more recently in the Aguan River Valley. INA simply does not have the experience or the mandate to organize appropriate colonizations of humid areas. Nevertheless, it does find itself in the position of colonizing forested lands, as in the case of Bajo Aguan and in various other destinations for land hungry peasants in eastern and northern Honduras.

The incorporation of national lands into agricultural activities is a legal no-man's land in practice. A series of overlapping obligations and responsibilities hinder the effective implementation of policies even in cases where it is clearly in the immediate public interest. For example, the

Table 24
Sistema Social Forestal Cooperatives - 1977

# of groups	Activities	# of families
92	Pine resin collection	4,236
3	Sweet gum resin collection	40
3	Tuno latex collection	74
21	Pit sawing	400

Source: USAID 1978.

Table 25
Agrarian Reform Colonies in Eastern Honduras - 1983

District	# members	# ha.
Catacamas	689	4,950
Dulce Nombre de Culmí	302	3,745
Sta. Maria del Real	140	565
Sn Fco. Becerra	49	174
Juticalpa	866	4,272
San Esteban	227	1,443
Sn. Fco. de la Paz	11	210
TOTALS	2,284	15,359

Source: INA Records, Tegucigalpa.

Table 26
Agroforestry Combinations on Central American Farms

Tree formation	PERCENTAGE OF FARMS PER COUNTRY			
	Costa Rica	Panama	Nicaragua	Honduras
Living fences	84	87	50	19
Fruit trees	98	94	78	53
Timber	40	44	42	16

Sources: Jones 1982, Jones and Otarola 1981, Jones and Perez 1982, Lemckert and Campos 1981.

watersheds which generate the potable water supplies for Tegucigalpa and Juticalpa are both being endangered by the process of land clearance. Despite the legal formation of the La Tigra national park to protect the Tegucigalpa water supply, no institutional mechanism for preventing the entry of squatters has appeared (Dulin 1984). In Juticalpa, a small group of 20 squatters invaded the watershed generating the city's water; INA was called in to remove the squatters, which it did, but they returned. INA officials are now unwilling to take further action, because they feel that the local authorities are not prepared to make the political commitment to reinforce INA activities, so that they must bear an unreasonable portion of the abuse and ill-feeling which accompanies the removal of the squatters. It seems clear that the enforcement mechanisms are not sufficiently well defined to permit the control of land use patterns even in areas of easy access for government institutions; the possibility of carrying out the necessary enforcement activities in remote areas with little permanent government presence would seem to be correspondingly remote.

5.1.3.2 COHDEFOR

COHDEFOR is required by law to administer all forest lands in Honduras. It was formed in 1972 to nationalize forestry interests, which had been controlled by foreign companies, and which, it was argued, had led to highly exploitative management practices and the expatriation of national income. COHDEFOR was given sweeping powers to regulate all forestry activities, and took over all phases of the lumber industry, from management and production to marketing.

Since more than half of Honduras is forested, COHDEFOR's activities bring it into direct contact with peasant farmers. These contacts have been conflictive in some cases, where COHDEFOR controls or prohibits certain peasant activities which it feels infringe on forest properties (See Murray 1981, Jones 1982). As part of the response to these potential conflicts, COHDEFOR has instituted a series of programs under its Sistema Social Forestal (SSF) mentioned above where peasant farmers associate in "Agroforestry" groups or cooperatives to exploit forest resources on a small scale. Three major activities of these groups are resin tapping (both pine and sweet gum), firewood production, and hand preparation of tropical hardwoods. Only the last of these is found in the recent colonization areas

of the country; sweet gum resin tapping cooperatives had been formed near Culmi, but low world prices lead to their abandonment.

A major effort for the management of broadleaf forest areas has been made by a series of COHDEFOR-CIDA projects. The oldest of these projects is the Cooperative Agroforestal Atlantida Honduras Limitada (COATLAHL), built around the philosophy that small scale hand sawing operations can exploit forest resources on a small scale more completely and more economically than can large scale enterprises. This project was begun to utilize wood which had been damaged in tropical storms on the North Coast of Honduras. Trees are sawed up with chainsaws and marketed in "tablones" (large, thick boards) under the direction of COHDEFOR. The organizational model for this operation is very similar to that used by other COHDEFOR "agroforestry" cooperatives, where small scale operations are licensed and overseen by COHDEFOR, but ideally managed in the form of cooperatives or small scale businesses.

Unfortunately, the overall tenor of relationships between COHDEFOR and farmers tends to be negative on nearly all levels. Large land owners come into conflict with COHDEFOR due to the strategy of "fence creeping", where a legally established property is extended out into national forest lands by simply moving the fences. Since ground inspections are spotty and infrequent by COHDEFOR, and adjacent squatters cannot usually contest the claims of the more powerful landowners, this strategy is generally practiced with impunity. Nevertheless, COHDEFOR is aware of the practice and takes measures to prevent it, thereby earning the animosity of large cattle ranchers.

In a very general sense, COHDEFOR's mandate creates conflicts with the traditional agricultural production strategy of Honduran small farmers. The general pattern of shifting agriculture, and the poor farmers' practice of producing fuelwood to supplement low incomes are adaptations to very difficult environmental conditions, where farmers have managed to make a living from agriculture in lands which are of very poor quality. The use of fire for land clearance and pasture management allow the use of land which cannot generally be made to produce in an intensive fashion. Since COHDEFOR is charged with the prevention of forest fires and the control of land clearance, antagonistic relationships frequently arise between the Corporation and farmers.

Finally, COHDEFOR's legal control over all trees may possibly be the

country's greatest disincentive to reforestation. It is common to hear stories of farmers who have forests on land they consider their own, or even forests which they have either planted or managed for their own long term benefit, which are granted by COHDEFOR to a third party as a forestry concession with little or no remuneration to the farmer. In the end, farmers are very unsure of their rights to forest on the land they manage. COHDEFOR's legal mandate is so sweeping that farmers feel severely constrained in their land use decisions by what they feel to be unreasonable restrictions on land clearance, since COHDEFOR generally tries to discourage deforestation for agriculture, and grants permission through a bureaucratic procedure. It is suggestive that a survey of on-farm tree plantings in agroforestry combinations found an exceptionally low incidence on Honduran farms (see Table 26), as if farmers tended to deforest to avoid the controls of COHDEFOR.

The outcome of the numerous conflicts between COHDEFOR and farmers is a lack of farmer interest in forest resources, and a carelessness with regard to their preservation. The lack of understanding on the part of the farmers of COHDEFOR's function and goals, and the traditional situation of Honduras as a country with a nearly limitless agricultural frontier create a situation of extreme difficulty for the control of further deforestation and inappropriate land use in the new agricultural lands of Honduras. COHDEFOR's mandate loses moral force due to cases of corruption of COHDEFOR officials. The farmers' perception of its activities a arbitrary limitation of their agricultural activities, and COHDEFOR's institutional policy of favoring large lumbering interests over farmers' interests create an extremely negative situation, where farmers look at the evasion of conservation regulations as a fact of life, and have even been reported to sabotage forest resources in retaliation for their grievances with COHDEFOR (Murray 1981).

5.1.3.3 Ministerio de Recursos Naturales

The Ministry of Natural Resources (MNR) has a relatively small involvement in colonization at the present, although this is likely to change in the future. The MNR is implementing land management in agricultural areas with innovative projects on a fairly large scale, and have proposed another large project for the management of the colonization area of Rio

Table 27
Population Change in Urban Centers of Olancho

City	Population	
	1974	1981
Juticalpa	10,075	18,229
Campamento	2,278	4,122
Catacamas	9,134	17,526
San Francisco de la Paz	2,291	4,145

 Source: Hernandez and Desloges 1982.

Table 28
**Agricultural Production of Aguan Valley as
 Percent of National Production**

Crops	Grapefruit	Pineapple	Coconut	Banana
% national production	87.5	84.7	63.1	45.5
Crops	Rice	Pork	Beef	
% national production	20.1	13.5	10.8	

 Source: Hernandez and Desloges 1982.

Sico-Rio Paulaya.

The management of the Choluteca River Basin is a major land management project, financed by AID. The Choluteca River Basin is not a colonization area, but the project is experimenting with methods of incorporating peasant farmers into land management programs.

A new proposal is for the "Rehabilitation of Principal Watersheds of the Atlantic Coast" is being prepared for financing, with the objective of improving patterns of land use in the watersheds of the Eastern Atlantic Coast. The watersheds affected will be those of the Rio Cangrejal, Papaloteca and Sico, which are located in the sparsely inhabited areas of Eastern Colon.

5.2 Colonization Areas

The process of colonization in Honduras has been a mixture of directed and spontaneous land settlements. The most common pattern seems to be the spontaneous movement of farmers into new lands quickly supported by the government. Nevertheless, one major directed effort at land colonization has taken place in the Aguan River Valley, and it is the showpiece of the agrarian reform institute (INA)[1]. A number of other areas are being colonized with less direct support from the government. These areas are; the Cordillera Nombre de Dios, near Trujillo; Dulce Nombre de Culmi, at the headwaters of the Rio Platano in Olancho; the Valle de Agalta, near San Esteban in Olancho; upper Patuca (also in Olancho) on both

1. The development of river valleys is an important part of Honduras' agricultural development strategy. Other valleys in addition to Aguan, for example the Jamastran Valley, may well be examples of directed, new land colonization. But, due to the diffuseness of these development activities, and the lack of information as to the state of the vegetation before the valley development activity, it was not possible to determine how many more of these valleys should be considered as forest land colonization

the North (Poncaya) and South (Palestina, Nueva Choluteca) sides of the river; middle Patuca, near the confluence of the Rio Wampu, in Olancho and Gracias a Dios (see map). A new project is being proposed for the Rio Sico-Rio Paulaya area, but no detailed information regarding the project is yet available.

The Cordillera Nombre de Dios is in an area which has experienced major population increases in the last 20 years. A major attraction has been the economic development of the North Coast, mainly based on the development of agricultural export industries. Another factor in the population growth of the area has been the Bajo Aguan colonization project, where thousands of farmers have been brought in to utilize the fertile valley lands. For a variety of reasons, there has been a high desertion rate among the new farmers. In conjunction with these new population pressures, and in part as a direct result, forests have been cleared from the slopes of the Cordillera in recent years.

Dulce Nombre de Culmi is the end of a road construction project destined to reach the Atlantic Coast. The access to new lands has been accompanied by the establishment of new agricultural colonies.

The Upper Patuca River has also been the site of colonization activities, and is one of the most active areas of deforestation in the country. The exploitation of the northern bank of the river was begun by logging concessions, which opened roads for the extraction of mahogany and cedar; these roads were then used as access routes by farmers who are now in the area. The southern bank of the Patuca was the site of an organized, religiously inspired forest land colonization, which began at "Nueva Palestina" (Smith-Hinds 1980). Since the first occupation in 1973 the population of the area has continued to grow, and the original colony is now one of 21 in the area.

In Gracias a Dios, colonization seems to be in an incipient stage. In the middle Patuca Valley, a major resettlement of Miskito Indian refugees from Nicaragua has been established, near the confluence of the Rio Wampu. At the same time, the upper areas of the Rio Platano Biosphere reserve are the object of spontaneous colonization, although efforts have been made to control it.

The colonization activities will be discussed here by Department to give an overview of the process.

5.2.1 Olancho

Olancho is the center of colonization activities in Honduras at present. Although the capital city of Juticalpa has existed since the colonial period, it has been isolated by bad communications networks. In 1967, the Guayape Valley was indicated as the center of a major colonization effort (Minkel 1967), and in 1980 an all weather road connecting Juticalpa and Tegucigalpa was finished. With the construction of the road the population of urban centers grew nearly 100% over a period of 7 years (see Table 27).

5.2.1.1 Guayape River Valley

Although the Guayape Valley had been identified as a focus for the present investigation on the basis of information from 1967 (Minkel 1967), by 1984 it had completely lost its character as a colonization area. The Guayape Valley is 12 km wide by 60 km long, with reasonably good alluvial soils and is now completely deforested; nearby mountains show deforestation on fairly steep slopes as farmers search for new lands, and the valley is a major producer of cotton and basic grains. At present a plan for Integrated Rural Development of the Guayape Valley is being proposed by the Department of Hydraulic Resources of the Natural Resource Ministry, but this plan is mainly concerned with the development of irrigation tapping enormous underground aquifers. In fact, no government official interviewed recognized Guayape as a "colonization area" at present nor in the recent past.

Although the Guayape River Valley itself is not a colonization area, it is one site of a potentially important experiment in land management being carried out jointly by Peace Corps, CARE and SANAA (Servicio Nacional de Aguas y Alcantarillas). This project is designed to improve watershed maintenance, water quality and water supply through works undertaken at a community level. Peace Corps volunteers give demonstrations and lectures, but also participate actively in the implementation and construction of the management and conservation works on individual farms. Two Peace Corps volunteers were interviewed on their activities, one who had worked two

years in Zopilotepe, a small community in the upper reaches of the Guayape River Valley, and another who had worked in Choluteca. The agricultural pattern for Zopilotepe was reported to be one of small farms producing corn and rice on flat valley lands, and grazing cattle on the hill sides. Activities which were promoted were; the establishment of river bank hedges, efforts to install terraces on hillsides, watershed maintenance for improved water production; agroforestry interplanting systems with corn and Leucaena; river bank plantations with mahogany and cedar; reforestation of hillslopes with mahogany and cedar; the plantation of fruit trees; the replacement of burning for land preparation with mulching.

The response to these initiatives was varied. The construction of terraces was not deemed to be mechanically useful, due to the exposure of soils to erosion in the construction process. Conservation works in general were not appreciated as such, but farmers were interested in reforestation with valuable timber species (mahogany and cedar), and in the improvement of the amount and quality of water available. River bank plantations, especially with timber species, was well received. Farmers were also interested in Leucaena plantations, probably for fuelwood. Attempts to establish orchards generally failed due to disease, but farmers were still interested in some fruit trees. Farmers felt that burning was necessary for production, despite the erosion problems it presented.

Despite the mixed results of this experience, it represents an important step in the involvement of farmers in conservation activities on a larger scale. It must be emphasized that the personal commitment and participation of Peace Corps volunteers represents a much more persuasive model than that of the transient agricultural extension or watershed management technician. Some of the proposed conservation techniques are not mechanically functional, and others are not economically practical, but some are appealing to farmers and represent an important source of experiences for future experiences.

5.2.1.2 Upper Patuca River - South Bank

The areas currently identified as "colonization areas" in Olancho are the north and south banks of the upper Patuca (Poncaya on the north, and Palestina on the south) and Dulce Nombre de Culmi. The two banks of the

upper Patuca offer an interesting contrast in the process of colonization. Nueva Palestina is a peasant organized colonization scheme documented most extensively by Smith-Hinds (1980). Repeated floods and droughts, and land tenure conflicts in Choluteca motivated poor farmers to seek new lands in the sparsely populated lands of the Patuca River Valley. In coordination with the Catholic church, local leaders from the Choluteca communities of El Corpus and Concepcion de Maria made an exploratory survey to the Patuca area in January of 1973. After making another exploratory trip with representatives of the INA and the UNC (National Farmers' Union), it was decided that the newly identified area could be colonized if the access road was improved. The first migration to the area occurred in April of 1973, and was made up of 83 men and 13 women.

The occupation of New Palestine marked the beginning of several communities in the area. Before the entire colonization group could be assembled in October of 1973, non-community members had begun to occupy the lands claimed for the New Palestine settlement. In December of 1973, a splinter group split off from the main settlement due to a dispute over private ownership of cows, and became the nucleus of "Las Camelias". In 1975, two more groups were formed by new settlers, one called "Nueva Esperanza" (with more than 30 families) and "20 de Mayo" (54 families; these last figures come from Smith-Hinds 1980, and are different from those provided by INA, which shows no "20 de Mayo", and reports initial an population of 12 for "La Esperanza". INA reports an initial population of 38 families for "La Palestina").

There is no information on the initial population of the south bank of the Patuca, but Smith-Hinds estimates a population of 800 to 1000 families "today" (probably slightly before 1980). INA records report over 500 families in 22 agrarian reform communities for 1984 (see appendix A), but give no indication of how many other families might be found in the region. The head of COHDEFOR's Olancho office estimates a population of 10,000 families in the area south of the Patuca (including INA and non-INA colonies), while the head of the INA office estimates 5,000 families.

The productive emphasis of the communities on the south bank of the river is nearly exclusively on annual crops (see Appendix J). All but one community report the production of corn, beans and rice as their major activities, with cattle production reported in six communities, and coffee in two. It is striking that although the original communities in the area had organized wood production teams as part of their communal activities, and in

fact depended on lumber production as their major source of income, this activity seems to have completely disappeared.

The cooperative form of organization is potentially a valuable method for controlling forest destruction. Since community land is indivisible, and not individually owned, it does not allow the possibility for the encroachment of large landed interests on lands where disillusioned farmers might be willing to sell land, and can serve as a control of land speculation by small farmers who occupy and clear land only for later sale. The presence of government services, such as health, extension, and road maintenance serves as an incentive for farmers to remain associated with the cooperative.

Despite the potential benefits of the cooperative colonization strategy, it may also contain elements which promote deforestation. Residents of Nueva Palestina commented that the community served as a base for reprovisioning independent farmers of the area, and in fact may serve as a spring-board for the colonization of more distant lands. Members of several cooperatives in Olancho were questioned as to the non-cooperative use of lands by members; it was generally acknowledged that farmers had separate individual plots within the lands adjudicated to the cooperative, but all insisted that no lands outside the cooperative were used by cooperative members, in accordance with the regulations of INA. However, the presence of government (INA or COHDEFOR) officials at the time of the interviews make it unlikely that members would admit to circumventing regulations. In Comayagua, outside the presence of government officials, INA cooperative members freely admitted the possession of lands outside INA cooperatives; these lands in fact were an integral part of the farmers' economic strategies, where the land available to them in the cooperative was complemented by non-cooperative lands. While no evidence of this strategy was seen in the brief visit to the colonization areas, it does not eliminate the possibility that cooperative members in fact are opening private farms outside the cooperative in preparation for a final separation when their activities are discovered.

5.2.1.3 Poncaya - Upper Patuca River Valley - North Bank

The colonization of the north bank of the Patuca has followed a different path. Communities were established with little intervention of INA

(INA only reports one colony for the area), and the major institution involved in the area has been COHDEFOR, with a plan incorporating the COATLAHL model. This area was originally opened for logging, and then followed by spontaneous colonization of the area by farmers using logging roads. Farmers have been organized into pit sawing cooperatives to exploit remaining forest resources, and at the same time a series of swaths have been cut through the area to demarcate forest protection zones. The objective of this demarcation activity is to clearly indicate to farmers where protected areas begin, and make the control of the expansion of the agricultural frontier more manageable. Members of the Olancho COHDEFOR office estimate 4,000 families in the area.

Communication with both banks of the Patuca is very bad. From Catacamas to the Poncaya Area is reported to be a journey of 7 hours, although the linear distance is approximately 35 km. The regional office of COHDEFOR had no vehicles available capable of making the journey during the week of 17 September, since the two which were in satisfactory condition were occupied in other activities. From Juticalpa to Palestina is a linear distance of approximately 40 km, which is generally a journey of 3 hours [2]. A trip during the week mentioned lasted 6 hours due to a flat tire and the lack of proper tools to change tires. The Juticalpa-Palestina road passes several provisional log bridges which have eroded to a point that a jeep passed with difficulty. These bridges cannot be expected to be serviceable at the end of the 1984 rainy season. A much better road is reported to connect Patuca with Danli.

5.2.1.4 Other Areas - Agalta, Guayambre and Gualaco River Valleys

The process of colonization in Olancho is by no means homogeneous, and in fact demonstrates a certain "leapfrog" pattern. Following the new Juticalpa-San Esteban road to the north from the Guayape Valley, the first valley encountered is Gualaco. This area seemed to be in the hands of relatively few ranchers, and little agrarian reform activity was noted,

2. The roads to both sides of the Patuca are considerably longer than the linear distances cited due to the need to pass through mountainous areas.

although the area had been deforested through the use of fire for pasture clearing. After the Gualaco Valley the road enters into the Agalta Valley, where San Esteban is located. This area shows much more agrarian reform colonization, and is presently the site of the Corfino production forest, which is a major lumber production operation of COHDEFOR. There seems to be little integration of INA and COHDEFOR in this area.

A similar pattern of settlement is found going to the south from Juticalpa. Before reaching Patuca, the road passes the Guayambre River Valley, which is in the hands of two large ranches[3]. It was reported that attempts to invade these lands by small farmers had resulted in gunfights with the ranch cowboys. The Patuca Valley, on the other hand, has been nearly completely opened to agriculture through the efforts of small farmers and INA, and larger farms seem to be coming in afterwards.

Valley colonization is a general pattern in Honduras. In the south, the Valleys of Jamastran and Troches have been fairly recently colonized, as apparently has the Valley of Quimistan in the Northwestern part of the country (this area appeared as a major fuelwood producing area in surveys carried out in 1981-1982, which suggests the area was being deforested for agriculture, Jones and Perez 1982).

5.2.2 Colon

5.2.2.1 Bajo Aguan

The most ambitious colonization undertaken in Honduras is Colon's Bajo Aguan, the lower Aguan River Valley. Abandoned by the banana companies in the 1930's, the infrastructure of the valley had reportedly all but disappeared by the 1950's, and the remaining towns were greatly reduced in size. In 1961, the reported population was 68,000 inhabitants despite

3. The Guayambre Valley was the site of an earlier version of Corfino, where a sawmill was installed in a frontier colonization area for commercial exploitation of the relatively rich forests. The sawmill is now abandoned, and the town built for the workers is more than 50% deserted.

efforts in the 1950's to recolonize the area, leading Nelson (1972) to conclude that the project had been a total failure. After 1974, the population of the valley began to increase rapidly due to spontaneous and induced colonization, and in 1980 it had 181,000 inhabitants. The Aguan Valley covers 200,000 ha, although the entire Aguan watershed contains over 1,000,000 ha (Van Ginneken 1981).

While it is questionable whether the activities carried out in the Bajo Aguan can be characterized as "new lands settlement", the project is the showpiece of the Agrarian Reform Institute, and deserves mention as such. Some INA officials insist that the Aguan Valley had virtually reverted to forest by the time of the settlement project, although the population of 68,000 in 1961 calls this observation into question.

The Aguan Valley is a major agricultural area of Honduras. Despite an "underutilization" of the available lands, the area produces the majority of the nation's pineapple, grapefruit and coconut, and nearly half its banana (see Table 28). In the lower Aguan Valley alone, Van Ginneken reports over 149,000 ha of land with slopes of less than 10%.

The development strategy for the Aguan Valley has been directed toward the formation of agricultural production cooperatives to manage large farms of permanent crops, such as oil palm, coconut, citrus, etc. The statistics from Table 28 indicate that in productive terms, the project has been successful. However, there have been reports of problems with the cooperative strategy employed. Large numbers of farmers have occupied the steeper lands surrounding the valley floor (Van Ginneken 1981), and at least some of these are disenchanted cooperative members who have attempted to revert to individual farming on the only lands available to them (Hughes-Hallett 1984). INA officials report that this problem has diminished since the permanent crops have reached fruition, increasing incomes. Nevertheless, it should be noted that abandonment is a generalized problem in agrarian reform settlements; nearly 30% of the 45,000 families initially settled in INA colonies were reported to have left them by 1978 (USAID 1978).

5.2.2.2 Rio Sico - Rio Paulaya - Rio Cangrejal - Rio Papaloteca

The Eastern Atlantic watersheds of the Rivers Sico, Paulaya, Cangrejal and Papaloteca represent some of the most important reserves of good agricultural lands in Honduras. The Rio Sico watershed is thought to contain 19.9% of the cultivable land for the country, but only 1.5% is used at present, due to communication problems.

The Rio Cangrejal watershed of 39,700 ha has 15,000 ha deforested for agricultural purposes[4]. It is assumed that this land is being used for migratory agriculture, due to the soil characteristics of high rainfall areas.

The project proposes to 1) collect land use information, 2) conduct a census by watershed 3) prepare a map of land tenancy 4) conduct extension services in both agriculture and forestry and 5) relocate people who are on land inappropriate for agriculture. Funding has not yet been arranged.

5.2.2.3 Rio Platano

The Rio Platano is a Biosphere Reserve which has not been fully implemented due to budgetary problems. The reserve has been threatened by immigrant colonists in at least two instances, and at present its future is not altogether secure.

Miskito Indian refugees introduced from Nicaragua have been reported to explore new areas outside the resettlement areas officially designated for their use, most significantly the upper areas of the Rio Platano Biosphere Reserve.

Another settlement of refugees was begun with Salvadoreans, in the area of Dulce Nombre de Culmi. This area is near the headwaters of the Rio Platano, and contiguous to the Biosphere Reserve. Complaints as to

4. Data are taken from a project profile, and figures are not available for all watersheds.

incursions into the protected area brought an official decision to halt the occupation of the area, but COHDEFOR officials could not say whether these changes had actually been implemented or not.

With both of these cases, international and humanitarian pressures are presenting problems in the design and implementation of appropriate land use, but no satisfactory mechanism seems to have developed to review and redirect these refugee colonization activities.

5.2.3 Gracias A Dios

The easternmost department of Honduras is the most lightly populated, and the least developed in terms of physical and administrative infrastructure.

The colonization of the department been done mainly by foreigners, principally political refugees from El Salvador and Nicaragua. The obvious pressures involved in settling these people has lead to planning and management problems, and more than a little obfuscation on the part of authorities as to what precisely has been done.

The major new settlement of refugees has been established for Nicaraguan Miskito Indians in the Middle Patuca area, near the Wampu River confluence . The Miskitos traditionally are a hunting and gathering population with little interest in agriculture. Nevertheless, the concentration of population in a relatively small area may force a change in their agricultural productive strategy. Several population estimates exist, between 15,000 and 30,000.

A national commission has been assembled, consisting of members of relevant government institutions to evaluate the introduction of the Miskitos into Honduras, and make recommendations as to how to ensure the least damaging process of settlement. One major concern is the location of the new settlements. COHDEFOR employees expressed that the middle Patuca is an area extremely susceptible to land degradation, and recommend investigations into the relocation of the refugees and the establishment of a much stronger support service, with international funding, to help ensure that the new inhabitants are able to make the land produce in a sustained manner.

5.3 Conclusion and Recommendations

5.3.1 Conclusions

A number of important experiments in land use techniques and colonization planning have been carried out in Honduras, but in general these have lacked a generalized environmental perspective which would serve to orient these experiences toward the resolution of broad problems of environmental management in the tropics. The experience of INA in Bajo Aguan is exceptional in its breadth and scope. The "Agroforestry Cooperatives" of COHDEFOR are unique in Latin America, and offer promising solutions to certain problems. Nevertheless, there is a clear need for a coordinated approach to the problems of land use in humid areas which would incorporate aspects of both the INA and the COHDEFOR strategies.

The Lower Aguan Project is important as a pioneer experience in tropical land development, since the project attempts to create a major new agricultural region. The objective of this project is considerably more ambitious than other projects of humid tropical land use, since it has envisioned and funded an integrated agro-industrial development of the area, rather than the re-creation of a subsistence farming economy. At the same time, there have been notable problems in the process of development in Aguan; there has been some reluctance by farmers to accept the cooperative structure, and more importantly, the uncontrolled expansion of hillside agriculture in areas which endanger the valley development project indicate potential problems for this and similar projects. The Aguan Project is an extremely well financed project by Honduran standards, so it is a valuable testing ground for alternatives; this same financial advantage may indicate that the methods used and results obtained will be difficult to duplicate in other areas.

It is necessary to address the question of small farm land use in marginal lands, such as the upper Aguan, or the hillsides of the lower Aguan. Despite the orientation of the agrarian reform toward the colonization of flat, relatively fertile valley lands, the small-farmer population has continued to grow in new colonization areas and adjacent to the INA colonization

schemes. This phenomenon suggests that some basic aspects of small farmer economics are not understood, and that the levels of remuneration programmed for INA colonies do not completely compensate for the farmers' abandonment of their small farm production strategy.

The urgency of the need for land use innovations has been made clear by the repeated floods suffered in Honduras. Virtually all parts of Honduras have been affected by flooding at some time. While these floods can be directly tied to exceptional climatic conditions, such as Hurricane Fifi, the actual event of flooding is the final event in a long series of land mismanagements. Van Ginneken (1981) recommends that steps must be taken to ameliorate the effects of cultivation in the steeper areas of the Aguan Valley to avoid endangering the investments made in the valley, a recommendation which should be extended to many other areas in Honduras.

Heavy rains are the norm in Honduras, and the problems experienced in old agricultural areas are likely to be duplicated in new agricultural areas unless steps are taken to avoid the replication of problematic agricultural production strategies. During the rainy season of 1984, in September, the several major rivers of Olancho, the Guayape, Guayambre, and Patuca were observed to be extremely muddy, almost certainly as a result of farmland clearance in the upper reaches of the rivers. These areas have not reported problems of flooding, but this may be a reflection of the low population density of the area so flooding problems either go unnoticed, or have no social or economic impact.

One major failing at present is the lack of alternative strategies for production which incorporate positive soil conservation measures. Although farmers and government workers are aware of the need to utilize soil conservation techniques, and incorporate "agroforestry" techniques into their activities, there is a generalized lack of concrete recommendations or demonstrations in areas which need them. There is also a need to develop permanent crop alternatives and forestry alternatives which can be validated and recommended to farmers in the relevant areas.

Several opportunities exist at present to study the costs and benefits of watershed and soil fertility management strategies. The work being carried out in association with the Choluteca Watershed Project can serve as a field experiment to be adapted to the conditions of other areas in the country. CARE-SANAA in coordination with Peace Corps is carrying out a project of "micro-watershed management" where conservation techniques are

being introduced at the farm level. In Choluteca, the existence of a mulching strategy as an alternative to burning deserves attention as a possible method for improving land use techniques. All of these experiences should be carefully analyzed for their possible contributions to the development of broad strategies of land management which can be introduced in new lands colonization areas.

The efforts of INA and COHDEFOR in the establishment of cooperatives are also activities which deserve more detailed attention. The establishment of forestry cooperatives, and communal land holding groups could be strategies of major importance for the development of forest industries and protection of forest resources, if the economic and organizational problems which have made them unattractive to farmers in the past could be overcome. Nevertheless, no systematic review has been done of the impact of INA colonies on adjacent forest areas, nor has the Sistema Social Forestal of COHDEFOR been given the attention it deserves. An especially important question to be answered is how to deal with the problem of paternalism in these types of projects. This as a major problem in the establishment of the cooperatives in the Bajo Aguan Valley, where it seems to many farmers that cooperativization means no more than that they work for a large government run corporation rather than a large foreign corporation. Similarly, implicit in the SSF strategy is the objective of giving peasants a personal interest in the maintenance and management of the forest; nevertheless, if the control and ownership is seen to reside outside the cooperative members, it is unlikely that this objective can be achieved. In general, the concept of cooperativization has possibilities of being effective as a way to manage land in difficult environments, and it may represent the most viable alternative in forest management for the country. While it is clear that many mistakes have been made by both INA and COHDEFOR, these are valuable experiences which, carefully analyzed, will offer suggestions as to improvements in the design of further attempts in these directions.

The lack of coordination between government agencies also presents a major stumbling block in the development of viable strategies for the use of humid lands. In the upper Patuca area, there is virtually no coordination between COHDEFOR and INA, despite the close proximity of their work areas. Forestry cooperatives are not officially given any extension services, and agricultural cooperatives have no forestry extension recommendations, despite their obvious need for trees, for fuelwood, building materials and land protection. The inability to establish mechanisms for the control of

even the most critical watersheds in Tegucigalpa and Juticalpa are evidence of this problem of coordination. Efforts are now being made to improve institutional coordination, but it is inevitable that this question will arise repeatedly in regard to the complex problems of land management in the development of new lands. Consideration must be given to how long term land use planning decisions can be implemented and enforced within the framework of existing government institutions, so that planning obligations and enforcement responsibilities are clearly defined, and the means are provided to carry out specific policies.

5.3.2 Recommendations

Several concrete alternatives for action are suggested by the observation of colonization experiences.

1. Colonization areas should be subject to a coordinated management for improved land use and improved agricultural production. Plans should be proposed and financed sufficiently to address both sets of problems. The colonization of the Upper Patuca is a case where a combined strategy of forestry and agriculture is necessary for an economically viable development to occur.
2. Special attention should be given to the process of land use change all over Honduras. The generalized pattern of small farmer occupation of hillsides seems to be linked to some underlying policies of land use. Even in areas where small farmers are brought in specifically to be involved in schemes for improving income and productivity the same pattern occurs. The problems of management in the potable water production watersheds for the urban areas of Tegucigalpa and Juticalpa seem to be part of this same pattern. Jurisdictional problems should be investigated, not only for the purpose of determining how to remove offending small farmers, but to address underlying problems which drive them to utilize lands inappropriate for agriculture.
3. A review of the progress of activities to improve the utilization of humid lands would be extremely valuable. The experiences of FAO's land conservation activities, the Choluteca Watershed management project, the CARE-SANAA projects, to mention a few, should be analyzed for the appropriateness of different strategies for land use

improvement. The slash and mulch strategy reported for some farmers in Choluteca deserves special attention, for its obvious potential applications in other areas. Some results of these projects and investigations should be directly applicable to problems encountered in humid colonization areas.

4. An extension oriented forestry investigation should be developed to design and test techniques for improving land management within a context of commercial farming. The results should be primarily directed at private small farms, since this is the most generalized form of land management, but attention should also be given to cooperatives formed by INA. The objective of such investigations should be the presentation of land use techniques which incorporate the special advantages of colonization areas (availability of land, high rainfall) into production strategies which will meet on farm needs for forest products as well as produce marketable outputs, and also provide the possibility of improving land use without sacrificing income.

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Abbreviation:

INA	Instituto Nacional Agrario
SSF	Sistema Social Forestal
COHDEFOR	Corporacion Hondurena de Desarrollo Forestal
CONSULANE	Consejo Superior de Planificacion Economica
SANAA	Servicio Nacional de Aguas y Alcantarillado
CIDA	Canadian International Development Agency
DARNO	Direccion Agricola de la Region Nor- Occidental
MRN	Ministerio de Recursos Naturales

INA Settlements in the Patuca Valley

Name	Number of Members		Area in Cooperative		Date of Estab.	Main Activities
	Initial	Current	Adjudicated	Cultivable		
Los Almendros	11	16	273	157	1981	M,F,A
Las Brisas	23	19	252	70	1980	M,A,F,G
La Concepcion	58	44	350	84	1981	M,F,A,G
Nueva Choluteca	30	39	305	140	1979	M,F,A
Las Camelias	6	17	220	41	1981	M,F,A
Las Quebradas	14	15	424	8	1980	M,F,A
Nueva Alianza	24	31	280	143	1980	M,A,F
Las Colinas	12	16	232	106	1981	M,A,F,C
Nueva Guadalupe	24	20	375	175	1975	M,F,A
La Esperanza	12	21	105	55	1976	M,F,A,G
La Apacilagua	18	29	615	264	1976	M,F,A,G
El Esfuerzo	25	25	559	413	1978	M,F,A,Cf
El Rosario	9	16	120	53	1977	M,F,A,G
La Palestina	38	86	568	250	1980	M,F,A
La Libertad	26	26	629	112	1981	M,F,A
Union Surena	36	26	441	112	1981	M,F,A,G
Las Americas	44	25	442	154	1981	M,F,A
Aguas Preciosas	11	14	403	96	1980	M,F,A,Cf
El Encanto	18	19	700	140	1983	M,F
Aguas Calientes	14	18	126	70	1983	M,F,A
La Fraternidad	16	17	84	49	1983	M,F,A
SUBTOTAL	469	539	7,503	2,692		
<u>Poncaya</u>						
<u>Pena Blanca</u>	35	35	630	140	1982	M,A

Source: Unpublished INA data.

Chapter 6

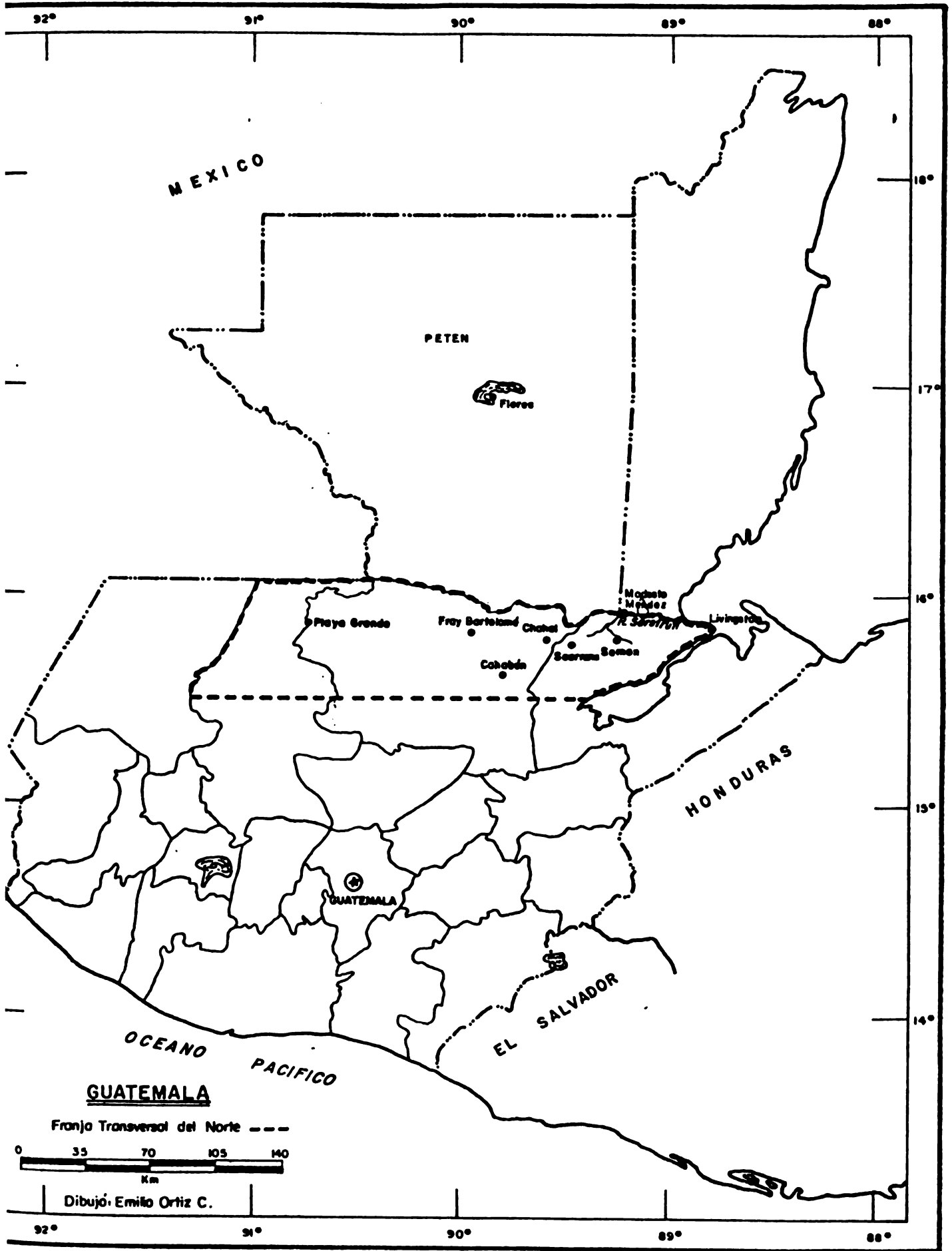
Colonization in Guatemala

The question of colonization takes on a special importance in Guatemala, since this is the second most densely populated country in Central America, with the largest absolute population. The population of the country is highly concentrated in the central highlands; government sponsored redistributions of highlanders to the southern coastal area successfully relocated populations in the 1950's, and the area has seen a growth in the development of export crops. Nevertheless, the highlands remain extremely crowded and the lowland tropical areas in the northern part of the country have been increasingly considered as an outlet for this population.

The major colonization effort in the north has been the "Franja Transversal del Norte" (FTN). Government and international institutions have made major investments in the development of the FTN, although there has been an undercurrent of environmental concern for the establishment of agricultural activities in this delicate ecological zone.

The other major colonization area in northern Guatemala is the Peten, Guatemala's largest department. Once the center of Mayan civilization, the Peten has been a marginal area in the modern economic development of Guatemala. Its humid climate and karstic soils present health and agricultural problems for which no technical solutions were known. Due to its special condition, the Peten was put under the administration of FYDEP, "Comision para el Fomento Y Desarrollo Economico Del Peten", a singular institution in the scope of its authority and the breadth of its activity. FYDEP has total and exclusive administrative control of the Peten, providing all normal government services, such as roads, agricultural technical assistance, agrarian reform and colonization. Nevertheless, the position of FYDEP is controversial, and in September of 1984 there were strong suggestions that it might cease to exist, or that the responsibility for certain aspects of the Peten might revert to other government agencies.

The focus of the Land Colonization investigation for Guatemala was



the "Bloque Chocon", the easternmost part of the FTN, and the least populated sector. Chocon has been largely left to one side in the process of development of the FTN; there has been a minimal presence of government institutions, including the agrarian reform institution, especially when compared to the areas of Ixcán and Sebol where reform activities have been most intensive. Nevertheless, there is an immediate interest in Chocon with the formulation of a new plan for development of the area, called "Desarrollo Rural Integrado - Izabal" (DRI-Izabal, or simply DRD) which has resulted in a ready availability of information regarding the area.

6.1 Government Institutions Involved in Colonization

6.1.1 INTA - Land Reform and Colonization

In Guatemala, a decision has quite clearly been taken to substitute colonization of new lands for land reform. It is widely recognized that land concentration is a major problem in Guatemalan agriculture, and that it leads to underutilization of lands and underemployment of the rural population (BID 1977; World Bank 1978). Nevertheless, effort has been concentrated on the incorporation of marginal lands into agricultural production to alleviate pressures for land reform.

In the 1940's and 1950's, reform was carried out on expropriated German farms, both on the Pacific Coast and in the highlands. Nevertheless, the considerable amounts of land affected have long since been redistributed. On the Pacific coast, it has been observed that the reform colonies have now been transformed into fairly typical examples of Guatemalan agricultural land use, with common examples of non-owner farm management (i.e. sharecropping, renting, etc.).

It is worth noting that the Agrarian Transformation Law (Ley de Transformación Agraria Decreto No. 1551, 1981) which was first enacted in 1962 is a potentially powerful law, and contains provisions for addressing the problems of land concentration and underutilization. Unutilized lands can be legally taxed and/or expropriated. Nevertheless, these dispositions have not been carried out (World Bank 1978).

In the 1960's, a national priority was put on colonization of the humid tropical lands in the north of the country. A large proposed project was called "Sebol", which affected two sections of the future FTN, one at its western end (Ixcan) and the other in the center, to the north of Fray Bartolome de las Casas (Sebol). In the area of Ixcan, religious leaders had promoted a movement into new farmlands. A voluminous report was presented (Government of Guatemala 1965?) apparently as a proposal for funding, but this project seems to have been absorbed by the much larger, subsequent FTN plan.

The scope of INTA activities is constantly changing. INTA officials feel a need to be able to attend to a broad range of colonization needs to make the process more integrated and guarantee success. Within INTA there exists an independent office of mapping, education, statistics, etc. Nevertheless, one international report (BID 1977) concluded that the process of colonization was most successful with a minimum of government support, and recommended that activities be coordinated through local organizations, and mentioned specifically four cooperatives; FENACOAC (credit), FECOAR, FEDECOCAGUA and FEDECOAG (regional coops work with commercialization and administrative support). Apparently this recommendation was accepted, because INTA officials in 1984 complained that the progress of activities in the area of Ixcan, at the western end of the FTN, had been unsatisfactory due to its being left to the local cooperatives, and that control of these activities was now being returned to INTA. INTA is conceived as a broad, inclusive institution which either executes, or provides for the execution, of services which include the development of infrastructure, technical assistance, credit, as well as land titling (INTA 1984).

A major component of INTA activity is training of farmers. When there was more emphasis on cooperatives in the institution, this training was focused on individual training for cooperative work (Villeda 1971). INTA training is now focused on preparing farmers to understand and use the agronomic recommendations made through INTA's agrolological assessment of the farm.

A contrasting view of INTA's role as coordinator comes from recent development plans (CRN 1984), and from the structure of the new "Comites Inter-Institucionales de Desarrollo" (CID). In these alternative views, either another institution (the National Reconstruction Committee) or a committee of government institutions (see discussion of the CID below) coordinates the

activities of the independent government agencies, including INTA.

6.1.2 INAFOR - National Forestry Institute

As the national forestry institution, INAFOR logically should have an important role in the process of colonization. This however is not the case. INAFOR has served principally as an advisor on forestry aspects of lands to be colonized, but their recommendations do not seem to carry much weight.

In the execution of the planning program 520-T-026, INAFOR did a forest inventory of the area, in 1979 (INAFOR 1979). At the time of the inventory there were 500 families in the area of 467 km², who had arrived in the last 3 years. The inventory discovered an alarming rate of deforestation in the area, and a large percentage of land highly susceptible to erosion. As a conclusion, it was recommended that some 30% of the area was inappropriate for agriculture and should be left in forest reserve. Nevertheless, less than 10% was left as reserve, and this only because it was too swampy to clear.

Similarly, in the recent Integrated Rural Development project for Izabal (DRI-I), less than 2% of the budget is dedicated to forestry despite the fact that 75% of all the land in the project area is on lands classified as only useable for forestry (see below). The project participation of INAFOR is foreseen as the coordination of charcoal production principally, but no mention is made of the Rio Dulce National Park and Wildlife Reserve which is partly inside the Chocon area. In conversations with DRI planners, an interest was expressed in a major forestry input to the project, but this expressed interest is not reflected in the project document.

Possibly the clearest indicator of INAFOR's status is the existence of FYDEP. FYDEP was created to manage the development of the Peten in all its aspects, and INAFOR is not included in its functioning even though the Peten was one of the major remaining forest areas in the region.

INAFOR has suffered from a lack of political respect. It is seen as a non-productive body whose principal function is to do forest inventories and control the exploitation of forest areas. INAFOR's office of ecology also does land use analyses, but these are not used by other agencies, since many

have their own offices for analyzing land use. In a more positive vein, a new administration in INAFOR promises to make the institution more dynamic, and support a more aggressive policy of conservation and forest management. At present INAFOR is taking an active part in the evaluation of the DRI-I, and in developments in the Peten; both of these activities have yet to yield concrete results.

6.1.3 ICTA, DIGESA and DIGESEPE

ICTA, DIGESA and DIGESEPE are the agricultural research and extension institutions for Guatemalan public sector agriculture. ICTA does technology development and testing, while DIGESA and DIGESEPE are in charge of extension in agriculture and animal production, respectively. These agencies do not have a specific mandate to work in colonization areas, and do so at the request of other institutions. They see their role as that of responding to requests by other government institutions for technical assistance, and they do not have a comprehensive technical plan which directs them to work in all areas of the Republic.

Of the three, DIGESA seems to be the institution most involved in the development of colonization areas. It manages nurseries at "Los Brillantes" on the Pacific slopes, and another at Playa Grande (Ixcan) in the FTN. These two nurseries are reported to be the sources of technical information for the development of new products by other institutions (specifically, DRI-I), but information was not readily available as to the status of the work in these centers.

6.2 Colonization Activities

6.2.1 The "Franja Transversal del Norte"

The FTN is the most recent agricultural region of Guatemala, formed by the division of region II into two approximately equal sized regions, II and

VIII (Table 29). After the Peten (Region III), Region VIII has the lowest population density of the country with an area of 8,809 km² and a population of 172,704[1].

6.2.1.1 Agriculture in the FTN

The FTN, climatically, is mainly composed of Very Humid Subtropical Forest, with a section of Very Humid Tropical Forest at its eastern extreme. Rainfall ranges from 2,000 to more than 4,000 mm annually. A major problem of the area is the soil, which is generally karstic and prone to erosion. Topographically, the FTN is composed of the Northeastern foothills of the Central Highlands, and the southern end of the lowlands of the Peten; most of the area is lower than 300 m.

Several preparatory studies were carried out in the FTN to create a database for the colonization process. One of these was an AID financed investigation 520-T-026 mentioned above, which was a reconnaissance of the western end of the FTN near the Mexico-Guatemala border (INAFOR 1979).

An investigation of much broader scope was the work of IICA-OAS, in which a series of community studies were carried out, along with the outlining of a general strategy for colonization (IICA-OEA 1979, Reiche and Gallegos 1980?). The communities which entered into the case studies were Caxlampon, Siguanja, Sechaac de tulia, Kaquitul, Poza del Danto and Quebrada Seca. These were fairly small communities, with a total of 456 resident families on 17,735 ha (see Table 30).

These were traditional communities economically, as seen by the crops grown. Over 90% of all the land sown in these communities was used for corn (Table 31). Permanent crops are well diversified, but their combined area is equivalent to only 2.2% of the area dedicated to maize production (Table 32).

1. Source documents did not clearly indicate the date of these figures; a comparison with other sources showed that some data from USPADA 1982 refers to 1979.

Table 29
Summary Data for Agricultural Regions of Guatemala

Region	Exten- sion	% nat'l area	Urban	Population Rural	Indigenous	Non-Indig.	TOTAL	Population Density
I	14,960	13.70	268,860	1,268,653	1,216,173	321,340	1,537,513	103.00
II	10,368	9.50	50,760	251,380	261,049	41,091	302,140	29.00
III	35,854	32.90	34,098	98,143	35,176	97,065	132,241	3.40
IV	12,921	11.90	248,276	824,828	315,493	315,493	1,073,104	83.00
V	9,057	8.30	1,039,796	770,494	458,003	1,352,287	1,810,290	198.70
VI	8,237	7.70	133,052	454,810	72,795	455,670	528,465	71.40
VII	9,268	8.50	99,384	337,358	76,867	359,875	436,742	47.12
VIII	8,809	8.10	21,070	151,634	149,216	23,488	172,704	17.27
	109,474	100.60	1,895,296	4,157,300	2,584,772	2,966,309	5,993,199	69.11

Source: DIGESA table (no typographical notes).

Table 30
Population of Six Communities in the FTN

Community	# families	# hectares
Caxlampon	108	5,344
Siquanja	64	2,883
Sechaac de Tulia	94	2,750
Kaquitul	47	2,618
Poza del Danto	93	1,234
Quebrada Seca	50	906
	456	15,735

Source: USPADA 1982.

Table 31
Area and Production of Annual Crops by Community

Crop	# producers	Units	Community									
			All	Caxlampon	Siguanja	Sechaac	Danto	Kaquitu	Q. Seca	Area Prod.	Area Prod.	Area Prod.
Corn	478	qq.	1878.0	307.5	232.0	379.1	440.7	176.4	342.3	176.4	342.3	176.4
Beans	340	qq.	108.1	38.3	13.5	15.5	14.3	8.0	18.5	8.0	18.5	8.0
Cassava	34	qq.	4.0	0.5	1.9	0.4	0.6	0.5	0.1	0.5	0.1	0.5
Malanga	29	qq.	2.3	0.3	0.7	0.5	0.6	0.1	0.1	0.1	0.1	0.1
Chile	96	qq.	11.3	2.8	3.0	1.8	1.4	1.7	0.6	1.7	0.6	1.7
Rice	9	qq.	4.2	0.4	1.9	1.8	0.1	0	0.6	0	0.6	0
Peanuts	4	qq.	0.3	0.2	0	0.1	0	0	0	0	0	0
Sweet potato	1	qq.	0.1	0	0	0	0	0	0	0	0	0
Squash	1	qq.	2.0	0	0	0	0	0.1	0	0.1	0	0
Culantro	2	bundle	0.2	0	0.1	0	0.1	0	2.0	0	2.0	0

Source: USPADA 1982.

Despite the status of the area as one of agricultural expansion, a large amount of land was concentrated in fairly few hands. Less than 5% of the population owned more than 30% of all land. The process of land allocation in the FTN seems to have followed the tradition of rewarding government supporters with land grants in underpopulated regions. Several notable clusters of small farms in peasant "parcelizations" have been established, one around Playa Grande in the western extreme of the FTN, and two more in the central area near Fray Bartolome de las Casas. At the same time, the majority of the FTN has been incorporated into large farms, many of which are privately owned. The land holding pattern is obscured slightly by the recent practice of not assigning parcels to farmers, and instead assigning a cooperative farm to a group, within which each farmer establishes his own work areas. Nevertheless, it is quite clear that a large part, and probably the great majority of land in the FTN has been divided into large hacienda type farms rather than divided among landless peasants.

Since the FTN is still an area of low population densities, there is no shortage of land for farming. An ICTA "sondeo" determined that the limiting factors in the area were shortages of capital and labor (Ruano 1981). The shortage of capital is "normal" for developing countries, but the situation of labor shortage is less common. Due to a combination of bad roads and poor prices, there is little commercial production of grains, and little use of day laborers; farmers must use a traditional labor exchange network to cultivate their corn, and reciprocate by participating in neighbors' work parties. The national marketing support institution works in the area (INDECA), but is reported to be too bureaucratic to be of use to the farmers, who most commonly sell to middlemen. As a result of the above, farmers are not motivated to intensify cropping patterns, and tend to try to replace labor and capital with land. Letting land lay fallow for several years saves both labor and capital, because of the elimination of grasses from the forest understory and the natural regeneration of soil fertility. Farmers try to maintain a reserve of secondary forest, because it is much easier to clear than primary forest, and rotate crops among their fallow plots (Carter 1969).

Cattle and cardamom are cash crops of the area. Cattle production is a preferred activity for its low demand for labor, while cardamom has commanded a good price (in recent years prices have dropped, but it is not clear if that will be permanent). There is some use of paid labor in the production of cattle and cardamom, since these do produce salable products.

Agriculture in the FTN is faced with its own special set of production

Table 32
Perennial Crops in 6 FTN Communities
Number of Producers, Area in production (mzs.) and Total Production

Crop	# Producers	Unit	All communities Area	All communities Prod.	Caxlampon Area	Caxlampon Prod.	Siguajua Area	Siguajua Prod.	Sechaac Area	Sechaac Prod.	Pozo del Danto Area	Pozo del Danto Prod.	Kaquitul Area	Kaquitul Prod.	Quebrada Seca Area	Quebrada Seca Prod.
Sugar cane	28	quintal*	3.4	375	1.6	109	0.5	68	0.3	71	0.2	32	0.1	10	0.7	85
Malanga	36	quintal	4.5	100	0	0	2.4	117	0.3	13	0.6	19	0	0	1.2	51
Coffee	177	quintal	10.9	68	2.0	11	0.8	2	1.5	10	3.7	32	0.6	1	2.3	12
Cassava	15	quintal	0.8	26	0	0	0.3	2	0.1	2	0.4	22	0	0	0	0
Achfote	18	quintal	1.4	19	0.1	4	0.6	8	0.2	1	0.1	2	0.1	1	0.3	3
Chile	19	quintal	1.7	15	0	0	0.7	6	0.5	4	0.3	2	0.1	1	0.1	2
Cardamom	68	quintal	1.7	12	0.1	1	0	0	0.9	6	0.4	3	0	0	0.3	2
Cacao	31	quintal	0.7	3	0.3	1	0.2	1	0	0	0.2	1	0	0	0	0
Plantain	61	raceme	4.7	1,823	0.9	484	0.8	310	0.7	248	0.9	435	0.2	100	1.2	246
Banana	64	raceme	4.9	1,990	0.1	80	0.3	150	1.0	251	2.3	435	0.3	65	0.9	209
Pineapple	94	hundreds	5.7	104	0.6	12	1.1	29	1.4	25	0.8	11	0.9	13	0.9	14
Oranges	10	hundreds	0.5	40	0	0	0.1	2	0	0	0	0	0	0	0.4	38
Lemon	1	hundreds	0.1	16	0	0	0	0	0	0	0.1	16	0	0	0	0
Lime	1	hundreds	0.1	2	0	0	0	0	0	0	0.1	2	0	0	0	0
Avocado	1	hundreds	0.1	2	0	0	0	0	0	0	0.1	2	0	0	0	0

Source: USPADA 1982.

problem. An underlying problem is low land fertility; corn is commonly planted at a spacing of 1.6 m between seedings, since closer spacings significantly reduce grain yield. Even with this measure, land can only be used a few years before it must be left to fallow. Finally, weeds present a major problem for FTN farmers. The high rainfall promotes vigorous weed growth, and the lack of available labor or capital for the purchase of herbicides makes weed control a major limitation in land use (Carter 1969 gives a detailed description of indigenous farming practices in the FTN).

6.2.1.2 Organization of Communities and Agricultural Production

The organization of the colonization activity has changed since the initiation of the FTN project. Initially, farmers were allocated individual parcels and were supposed to receive government organizational and technical support. This form of organization was succeeded by the Patrimonio Agrario Colectivo (PAC) under the Lucas administration, in which the farmers were supposed to form kibbutz-like cooperatives (DICA-INTA no date). Since the accession of Rios Montt in mid-1982, INTA has begun promoting Empresas Comunitarias Agricolas (ECA), which are designed to incorporate both collective and individual forms of farm management (INTA no date).

It is not entirely clear how the decisions were made to change the land allocation schemes in colonization projects, although in separate contexts comments were made as to shortcomings of the different models. For example, it was mentioned that in the initial stages of colonization of the FTN, in the western area, farmers were brought in from the Pacific Coast or from the area of Zacapa, both of which are much dryer than the FTN. Farmers suffered severe health problems, as did their families, and probably also had technical problems in farming the new environments. In informal conversations it was reported that a large proportion of the first colonists abandoned their farms.

The establishment of PAC's may have been an attempt to deal with the problems of giving assistance to a dispersed farm population, by concentrating them and making them more accessible. Nevertheless, the PAC's were not successful in their attempt to collectivize farmers; the introduction of the ECA was explicitly cited as an attempt to formalize the actual organizational structures of the agrarian colonies under the PAC.

Under PAC, certain areas were demarcated as collective, but in addition the members of the PAC were informally assigned individual "trabajaderos" (work areas) which they managed privately with the permission of the local directive bodies of the PAC's. INTA officials recognized that changes were not as dramatic on the ground as they may have seemed in a legal sense, given the informal forms of organization that had developed within the colonies.

What may be one of the most significant recent changes in the process of colonization in the FTN is the concentration of authority and decision-making embedded in a strategy of "polos de desarrollo" (poles of development). The overall conception of this strategy is to coordinate the efforts of all government institutions on a limited number of communities. The objective is to create "first order centers" which enjoy all the benefits of government support, such as health care (supplied by the Ministerio de Salud), agricultural technical assistance (DIGESA and ICTA), forestry management and assistance (INAFOR), technical assistance for animal production (DIGESEPE), sewage and water supply (UNIPAR), roads (Direccion General de Caminos y Carreteras), legal/organizational assistance (INTA), credit (BANDESA), communications (GUATEL), schools (Ministerio de Educacion) etc. Coordination is done by a hierarchy of local decision bodies. The highest order body is the CID, "Coordinador Inter-Institucional Departamental"; this body is composed of representatives of government agencies, representatives of the Departmental government (the major areal political division within Guatemala), and presided by the Commander of the Military Zone. At a lower level is the CIM, "Coordinador Inter-Institucional Municipal", which has a composition analogous to that of the CID, but which is presided by the municipal "alcalde" (mayor). Finally, at the lowest level there is the "Comite de Desarrollo Local", which is also presided by local authorities.

In a positive sense, the new structure of development has the authority to coordinate activities by obligating each governmental institution to be present and carry out its function. The justification for the new structure is that previously each government institution worked independently of, and at times in opposition to, other institutions due to personal and political competitions of members of the institutions. The absolute nature of the military authority structure makes it difficult for institutions to withhold services for petty reasons, and should enforce a coordinated planning.

In a negative sense, the success of the local development process

depends very much on the wisdom and ability of the local military commander with regard to economic, technical and development questions. In the worst of cases, a well intentioned, but poorly informed military commander would be in the position to initiate massive government activities which suffer from technical flaws of which he is not aware, or does not understand. The other major failing in this scheme may be that it does not address the fundamental question of budgetary problems. The identification of 41 "polos de desarrollo" which require complete attention within one single agricultural zone of the country may well be beyond the budgetary capacity of some of the governmental agencies.

Surprisingly, there are no formal evaluations of the colonization process in the FTN. Specific technological tests have been carried out by ICTA, as have sondeos, but no published evaluations of the overall colonization process exists. Obviously, evaluations have been done internally as a basis for decisions, especially regarding changes in overall strategy, as in the changes to PAC and ECA. No INTA documents were encountered which specifically tested or evaluated positive and negative aspects of the elements of the colonization process, although it would seem desirable that new plans could be constructed which would retain positive aspects and reject those which had not given the desired results. Several student theses evaluate INTA activities (Maldonado 1972, Mancur 1970, Villeda 1971) but all suffer from the obvious limitations of working within the framework of a student thesis. Nevertheless, some very disturbing conclusions can be drawn from the data presented, especially from Villeda (1971), which reports a pattern of mismanagement by INTA cooperative administrators, and a heavy indebtedness of cooperatives. On the basis of data from several parts of the country, some cooperatives seem to be endowed with more land resources than members which logically would tend to create patterns of land extensive use (See Tables 33 and 34). Villeda observed that in Las Cabezas cooperative the farmers had begun to work entirely on an individual basis due to their disillusion with cooperative mismanagement, and that of 24 farmers interviewed (of the 160 members of the coop), none cultivated more than 3 ha. No information is given as to patterns of land and forest management employed with the non-cultivated lands.

With the breakdown of the cooperative organization, apparently no further land use planning was done. As an indication of the failure of land use planning, the "Las Cabezas" cooperative was reported to have some 60% of its land area in forest and fallow in 1971; by 1984 the cooperative had virtually no forest and was feeling a shortage of fuelwood, and had solicited

Table 33
Size and Membership of 7 Cooperatives

Coop Name	Department	Size (Ha.)	Members	Ha/fam.
Chirripec	Alta Verapaz	607	209	2.90
Chipoip	Alta Verapaz	132	34	3.88
Campur	Alta Verapaz	3,686	53	69.55
San Vicente	Alta Verapaz	4,416	105	42.06
Saxoc	Alta Verapaz	577	77	7.49
Cacahuito	Santa Rosa	1,127	173	6.51
Las Cabezas	Santa Rosa	1,681	173	9.72

Source: Villeda 1971.

Table 34
Patterns of Land Use in 3 Cooperatives in Hectares

Land Use	Cooperative		
	Las Cabezas	Saxoc	El Cacahuito
Coffee	22.08	80.04	133.17
Grains*	331.89	132.48	105.57
Forest & fallow	1019.13	347.76	422.97
Pastures	263.58	0	377.43
Other	64.86	0	87.63

Source: Villeda 1971.

* This category includes corn, beans, rice, and the individual plots of members, which are assumed to be planted principally to grains.

the assistance of the CATIE-INAFOR Fuelwood Project to address the problem through the establishment of fuelwood plantations (Martinez 1984).

Interviews with the director of INTA's office of colonization revealed an awareness of the problem of land use planning. This was cited as a major problem in the FTN, which was reported to be aggravated by an AID project in the region (project not specified, but reported to have ended). It is felt that now there is a need to increase activities for controlling patterns of land use, to avoid "over-utilization" of fragile lands. Under the ECA organizational plan, INTA must approve annual land use plans for reform communities.

6.2.2 Population of Chocon

Chocon has been an area of spontaneous colonization for 20 to 30 years. Adams (1965) and Carter (1969) report on the colonization of lowland tropical areas by Kekchi Indians from Coban.

The area of Coban has been a center for the development of coffee production, and the competition for land has led to a spontaneous movement of the local population toward the lowlands. The migratory movement has been toward Chocon to a great extent. The towns of Chahal and Cahabon were both destinations of migrants and jumping off points to continue on into Peten. Before the 1950's the movement into Peten had primarily been by single, acculturated men who went in search of "chicle". These "chicleros" were superseded by the farmer families of monolingual Kekchies.

While Chahal and Cahabon are not within the Bloque Chocon, they were stopping off places for settlers moving into what is now the Chocon. Farmers in various communities, such as Chakdchoch and Searranx, reported that they came from these sites before 1954. These communities, then, have been occupied for many years, but only recently has road communication improved to the point of making them accessible to markets and national transportation. Members of the INAFOR forestry inventory crew reported that visits several years previously to towns such as Searranx required a journey on foot of 8 hours, after leaving the 4 wheel drive access road. Adams (1965) reports that the municipalities of Livingston and El Estor (see map) were largely occupied at the time of his investigation.

The population of Chocon is for the most part Kekchi, but in the southeastern part of the zone another migratory current of Spanish speaking "ladino" extraction occurred. Population pressures from the Zacapa Valley, and the nearness of roads connecting Puerto Barrios, Livingston, and the Peten with the capital provided access. Nevertheless, a survey of 104 communities in the Bloque Chocon found that the great majority of communities were primarily Kekchi speaking; 4 communities, on the other hand, were exclusively Spanish speaking.

6.2.3 Plans for the Development of the Bloque Chocon

Formal government participation in colonization activity has been restricted in the past to the western and central parts of the FTN ("Playa Grande" and "Fray Bartolome"), leaving the easternmost section, the Bloque Chocon, to its own devices. Only INTA and INAFOR have permanent offices in the area and other agencies send representatives on an occasional basis. Colonization of the area has been carried out in a spontaneous fashion, and has been facilitated by the presence of the only road which connects Flores (in the Peten) with the capital. For the most part, Chocon has very little infrastructure, and only in the last 5 years have roads connected many communities to paved highways. There still are many areas which are inaccessible by vehicle.

The proposed development of the Bloque Chocon (Desarrollo Rural Integrado - Izabal (DRI-I)) is structurally similar to the strategy in the rest of the FTN, but without the specification of "polos de desarrollo". Organized by the Comité de Reconstrucción Nacional (CRN, which was formed to distribute international aid to earthquake victims in 1972), its designers argue that integrated development requires the management by an organization with extraordinary authority to overcome institutional competition and jealousy. The CRN is directly responsible to the Presidency, and it is argued that this position will permit it to override inter-institutional problems. One other similarity between the DRI-I and the general INTA program is the focus on "capacitación", farmer training. INTA's explanation of the activity is that it will address "technical, social and ideological principles" to try to overcome problems of the 114 communities of "Las Verapaces" (the departments of Alta Verapaz and Baja Verapaz make up a large part of the FTN) (INTA 1983).

Much to its credit, the DRI-I plans to integrate forestry and permanent crop production into the plan for development. However, nurseries for the production of forest species are not functioning yet, and the one nursery for the production of fruit trees, cacao and rubber was operating on a limited scale. Nursery capacities will have to be greatly strengthened for the needs of the project. However, nurseries for the production of forest species are not functioning yet, and one for the production of fruit trees, cacao and rubber was operating on a limited scale. Nursery capacities will have to be greatly strengthened for the needs of the proposed project.

Charcoal production has been proven to be economically feasible in the eastern part of Guatemala. One individual in the Bahia de Amatique has begun to produce charcoal for export to Europe, and this success has been an inspiration to many institutions, although the forests of that area are quite different from those of the Chocon area. The cement factory located near Chocon has indicated an interest, and even fixed a price it would be willing to pay, for charcoal which could be used to replace petroleum, but the scale of production demanded by the cement industry will require extensive reforestation to maintain production at necessary levels. Within the DRI-I project, some communities are expected to develop an industry of charcoal production; in September of 1984, the charcoal kilns in the community of Chinacadenas had been constructed, and were in the process of testing. DRI organizers also indicated an interest in promoting fuelwood plantations, and the communal management of forests, since the forest resources of the area have been depleted, and even in the area of Chicadenas it seems that supply of wood will become a problem quite quickly.

Permanent crops are a major part of the DRI-I development plan. The production of kenaf (jute - Hibiscus sabdarifa), rubber (Hevea brasiliensis), cacao (Theobroma cacao), achiote (Bixa orellana) and coconut (Cocos nucifera) is contemplated (see Table 35). Rubber and Cacao are the crops which have been given most emphasis; project plans foresee the plantation of 350 to 450 hectares of each of these annually. Technical assistance and the production of plant material will be coordinated through DIGESA.

Table 35
Production Modules for DRI-I Development Plan

Product	Production Modules - Hectares per Community				
	1	2	3	4	5
Corn	50	50	100	75	75
Rice	25	25	25	0	0
Beans	0	0	0	0	25
Kenaf	0	0	0	0	25
Yuca (Cassava)	0	0	0	0	25
Rubber	0	50	50	0	0
Cacao	50	0	0	50	0
Achiote	25	25	0	0	0
Coconut	0	0	0	0	25
Pigs	0	0	16 sows	16 sows	0
Charcoal	0	2 ovens	0	0	0

Implementation Plan for DRI-I Modules

Year of Implementation	Production Modules					
	1	2	3	4	5	
1 # of families	212	258	212	212	153	
# communities	4	5	4	4	3	
2 # of families	212	212	258	152	212	
# communities	4	4	5	3	4	
3 # of families	212	212	152	258	212	
# communities	4	4	3	5	4	
4 # of families	212	152	212	212	212	
# communities	4	3	4	4	4	
5 # of families	200	212	212	212	256	
# communities	4	4	4	4	5	
TOTALS						
# of families	1,048	1,046	1,046	1,046	1,045	5,231
# communities	20	20	20	20	20	100

Source: CRN 1984.

6.2.4 Development Problems of the Bloque Chocon and Local Responses

Government agencies in the Chocon work out of two permanent encampments, one at Semox and another at Modesto Mendez. Semox is the center of general operations, including storehouses, guest housing, equipment storage, and some offices; Modesto Mendez is the center of INTA activities, and the site of classrooms and housing facilities used for peasant training. Both of these centers are less than 150 m. from the new asphalted highway which connects the Peten (which begins at Modesto Mendez) to the Capital by way of Morales and Zacapa. In the last five years, new roads have been opened which connect the Bloque Chocon directly with the rest of the FTN. One road follows the Sarstun river eastward from Modesto Mendez to Fray Bartolome de las Casas, and the other connects Semox with Chahal, after which it connects with the Modesto Mendez-Fray Bartolome road. The Sarstun road is presently favored over the old route through Coban as an access road to Fray Bartolome de las Casas from Guatemala, despite the longer distance covered. Nevertheless, due to rains and the transit of heavy vehicles, this road may be temporarily closed at any time, and is only transitable by large or 4 wheel vehicles during the rainy season.

The agricultural development of the Chocon area is severely limited by land quality (see Table 36). Over 75% of the land is of land class IV to VIII, and there is no class I in the area. The area of best agricultural lands, near the banks of the Rio Dulce is not likely to be available for small farm development. The area has been declared a national park, and lands surrounding the lake (which include some of the best soils in the area) will be included. Further, nearly the entire area of class III land is divided on the INTA land tenancy map into 400 ha farms which appear to be individually owned. Less than 10% of the best soils are classified as national land. More than 55% of the Chocon area is class VI or VII; for the most part these lands are limestone outcrops with a superficial layer of topsoil, and they have strong contours and large exposed rock outcrops.

INAFOR uses a land classification system divided into 8 strata, four of which are classified as "Apt for Cultivation", and four which are not. The definitions of the classes are; Class I: Cultivable, with no limitations, flat, apt for irrigation; Class II: Cultivable, apt for irrigation, slight inclination, with no severe limitations; Class III: Cultivable soils, apt for irrigation with extremely profitable crops, severe limitations with moderate production, requiring intensive conservations practices; Class IV: Cultivable with limitations, not irrigable, flat to sloping, suitable for pastures or permanent

Table 36
Land Use Potential for FTN

Land Use Class	I	II	III	IV	V	VI	VII	TOTAL
Area (km ²)	554.18	80.94	3789.78	286.67	406.44	5.42	4016.57	9140.00
% Area	6.06	0.89	41.46	3.14	4.45	0.16	43.94	100.00

Source: IICA-OEA 1979.

crops with intensive management; Class V: Apt for forestry or pastures, very severe limitations, especially drainage, but with high productive possibilities for pastures with intensive management; Class VI: Suitable for pastures or forests, very severe limitations, especially topography and rockiness; Class VII: Very severe limitations, suitable only for pastures or forests; Class VIII: Suitable only for parks or wildlife refuges.

A cursory visit to Chocon, or a glance at land use maps can be deceptive. Extensive forests can be seen, but these cover rock outcrops which for the most part do not support commercial forest species, and could only be logged with difficulty if any desirable species were encountered. Foresters familiar with the area were doubtful as to how much wood suitable even for charcoal could be extracted from these forests.

Agriculture in the Chocon is largely restricted to a long fallow production of annual crops. Some attempts have been made to introduce pineapple, cacao, etc. on a commercial scale, but these efforts have not been successful. The Kekchi cultivators of the area presently cultivate a wide range of permanent and potentially commercial crops; families have small plots of achiote, cacao, cardamom (Elettaria cardamomum) and various fruits. None of these crops has been commercially successful; achiote has no local market, since many people produce their own supply, and the poor transport facilities do not provide access to the national market. Cacao suffers from disease problems (possibly Phytophthora) which the people of the area do not know how to control. Since cacao production is for home consumption and for ritual purposes, the few fruits which reach maturity are sufficient for the families' needs. Cardamom seems to be relatively new in the area, and is produced as a cash crop. Few farmers have it, and they do not seem to know how to manage it, since they plant in direct sunlight. This crop has been successfully established in other areas of the FTN, and Chocon farmers are quite obviously interested in the profits offered by the crop.

One of the most intriguing aspects of the agriculture of the area is the use of "velvet bean" (Stylobium sp.) as a green manure crop to improve soils and cut down the necessary interval for fallowing. Farmers commented that its ability to eliminate gramineous weeds was one of its principal contributions to improving the productivity of their lands, since the elimination of weeds is one of the principal functions of fallowing. Between Semox and Chakichoch fields of more than 5 ha of "Velvet bean" were seen, and a great number of smaller plots. The use of the bean is so extensive

that in places it seems that it must be a weed, as it seems to be everywhere. Nevertheless, farmers report that it does not regenerate well on its own, and that it must be sown during the corn cropping season. Farmers recognize that corn is much more demanding of soils than is rice, so the best soils are reserved for corn production, and only these are sown to velvet beans. Using this rotation, corn can be planted annually on a single plot of land, instead of requiring the five year fallow previously necessary.

The practice of green manuring with velvet bean is relatively new in the area. It is reported to have begun at Semox between 1980 and 1982, and has slowly been passed from farm to farm. Seed must be purchased from farmers who already have the bean, and this has slowed diffusion somewhat. Farther from Semox toward Chahal the use of velvet bean dramatically decreases, and is seen only on small isolated plots of land. The use of this technique is also reported for other areas of the FTN by Ruano in 1981, and by Carter in 1965.

There is a traditional interest in forestry all over Guatemala, including in the Chocon. INAFOR employees report that they have received requests for plants and technical assistance from residents of Chocon to address the problem of a lack of construction material; the remaining naturally occurring trees of the area are distant from communities and inaccessible. In Chinacadenas, on the road to Fray Bartolome following the Sarstun River, residents reported that they collected resin ("copalpom") of copal trees (Protium copal), both for local consumption and for sale. The tradition of forest management by Guatemalan Indians has been documented by Veblen (1975). Zanotti (1984) reports communities in other parts of Guatemala where communal forests have been planted at local expense, and with no support or direction from outside institutions. INAFOR only became aware of these plantations when they received requests for assistance in the management of the already established plantations.

6.3 Conclusion

6.3.1 Organizational Problems

The process of colonization in Guatemala is complicated by the very size of the government bureaucracy. Whereas in other Central American countries government bureaucracies are held to a minimal size by budgetary limitations, in Guatemala the size and relative wealth of the country has led to a proliferation of agencies with interlocking functions. A further complication is that although a General Secretariat of Economic Planning exists to coordinate the activities of different institutions in the agricultural sector, some of the most important government institutions are not subject to this planning process, and are directly responsible to the Presidency of the Republic, including INTA, FYDEP and ICTA. Agricultural sector evaluations note the problems of coordination which arise from this condition, as do the government agencies themselves (DRI-I personnel comment that the major problems of development in humid tropical lands are not technical, but institutional.). The present solution to this problem has been the concentration of decision making within non-technical coordinating groups.

A consequence of major significance arising from the division of the government agencies into highly specialized units is that decision making with regard to long term planning tends to be done with little attention to technical development. For example, in the DRI-I project INAFOR has been incorporated to produce charcoal, advise on forest management and fuelwood production. These responsibilities are a reflection of INAFOR's past activities, and apparently are what the coordinating committee feels INAFOR is best prepared to do. Nevertheless, while there is an obvious need for innovative forestry strategies in the development of the Chocon's poor soils, there is no provision in the DRI plan for the investigation or testing of alternative strategies. INAFOR theoretically should be developing these strategies as part of its institutional development program, but it is generally recognized (within and without INAFOR) that INAFOR's limited budget permits little beyond the accomplishment of routine obligations (between 1980 and 1984, the budget of INAFOR was reduced by more than

50%, from more than \$9 million to less than \$4 million).

The fragmentation of policy and implementation capabilities has potentially devastating effects on colonization project development. For example, although the DRI-I project calls for the implementation of improved maize production practices on more than 2,000 hectares annually, ICTA (the institution in charge of technical development) had no research directly applicable to the area, and felt that 3 years of research would be necessary to establish packages for extension (DRI personnel are prepared to start with the project at any moment, as soon as funding is arranged). Similarly, little work had been done in the area with regard to cacao or rubber, although it is planned that 350 to 450 hectares annually will be planted once the project begins; DIGESA is managing cacao in the Central and Pacific regions of the country, but this experience still has not been tested or adapted for the conditions in the Izabal area.

Another major problem is the lack of evaluation of colonization experiences, although it is not clear whether this is due to the institutional fragmentation or the lack of continuity in government agencies. Policy changes correspond to changes in agency personnel, but evaluations done in these cases are internal, and possibly no more than ex post facto justifications for the changes of personnel.

The process of colonization in Guatemala illustrates the problem of distinguishing between "directed" and "non-directed" approaches to colonization. In its initial stages, colonization in the FTN was managed by INTA, and this agency was to a large degree self-sufficient and independent of other national institutions; this would be a fairly clear case of directed colonization. Nevertheless, the position of INTA has evolved to the point where it is one of many national institutions involved in the process of land colonization; specific services are provided by the appropriate government institutions, such as agricultural extension, or public works. It is difficult to say to what degree this latter condition represents "directed" colonization, since by all evaluations, the participation of government institutions had not been organized with any clear overall set of goals.

6.3.2 Recommendations

A primary need for improving the use of humid tropical lands which have been colonized is an improvement in the quality and quantity of technical advice presently available. The development of technical information requires the establishment of a long term research strategy for developing integrated land use techniques which can satisfy farmers' needs for food and income, and provide techniques for minimizing damage or even improving land quality. This research should be oriented toward the production of technical recommendation packages suitable for use with extension agencies such as DIGESA, and should include investigations into methods of improving productivity, introductions of new cropping patterns or improvements of old systems, and the introduction of new species. This should include the development of forestry and agroforestry techniques for use in the poor soils which are common in the FTN.

Research results should be installed in off-station field trials as quickly as possible, for testing performance under "normal" conditions, and to serve as demonstrations. Attention should be given to how these results can be applied within existing land tenure and land use conditions, to ensure their acceptability.

As a corollary of the need for improved research is the need for more and better prepared researchers. Of the 850 INAFOR employees, only 22 are foresters by training. The lack of preparation limits the technicians' ability to generate alternatives when better known species, and plantation patterns, are found to be deficient for widespread use.

The documentation of colonization, forestry and land use experiences in humid tropical zones may be one of the most fruitful investigations which can be done at present. The FTN now has 30 years of colonization experience, both directed and undirected. A catalogue of organizational strategies for land use and forest management, as well as the documentation of accumulated experiences of the farmers could serve as a guide for further activities. This information could be collected in large part from government employees with experience in the area, and in part through interviews with farmers. Traditions of communal forest management, community organizational strategies, etc. could be useful for the improvement of land use in humid areas, but they have not been well

documented. The collection of this data would be fairly straightforward, but with valuable and immediately useful end results.

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Abbreviations:

USPADA	Unidad Sectorial de Planificacion Agropecuaria y de Alimentacion
INTA	Instituto Nacional de Transformacion Agraria
INAFOR	Instituto Nacional Forestal
DIGESA	Direccion General de Servicios Agricolas
CEMAT	Centro de Estudios Mesoamericanos de Tecnologia Apropriada
CECON	Centro de Estudios Conservacionistas
USAC	Universidad de San Carlos

Chapter 7

Conclusion

The colonization of humid tropical areas is a difficult, and frequently unsuccessful activity. Although some short term goals can be achieved through colonization, such as relief of population pressure in older agricultural areas, new lands fairly quickly become unproductive, resulting in the a replication of the original problem; a relative of excess of labor, and an inability of the land to absorb this labor economically. While the conversion of these lands to pastures does offer some income to the country, it displaces labor, and leads to a degeneration of land quality, and a very low equilibrium level of agricultural productivity. Having made this caveat, it must also be recognized that colonization is a near universal process. While governments actively promote it in some cases, the majority of colonization takes place with a minimum of government motivation. Humid tropical lands are being continuously occupied by ill-prepared agriculturalists, who try to manage these lands with the agricultural technologies which were reasonably successful (although in many cases destructive) in their places of origin. The conclusions and recommendations made here derive from this second point, and try to suggest how the process of colonization in humid tropical lands might be improved, and its deleterious effects on the environment ameliorated.

Colonization tends to be a force for continuity in the structure of the national economy. With the opening of new frontiers, and the sudden access to resources, there is a general tendency on the part of farmers, land developers and governments to fall back on "tested" methods of land management and economic development. This general conservative tendency of colonization is sometimes obscured by the publicly declared ambitions and plans developed for new lands, but the set of social, legal, economic and political conditions which have defined the structure of a national economy tend to reproduce themselves in new areas, leaving innovative colonization plans an uphill battle. Scarcities of funds, errors in planning and administration, and the lack of trained personnel all favor the establishment

of traditional social and economic structures in new areas, and only through exceptionally successful execution are projects likely to overcome the culturally based motors which recreate traditional structures through the combination of activities of the hundreds, or thousands, of new inhabitants.

One overriding conclusion of the investigation of colonization is the importance of understanding individual decision making processes with regard to land use (this conclusion closely parallels that of DAI 1984). The breakdowns in colonization project management, the ineffectiveness of government agencies in enforcing land use legislation, the lack of funds for carrying out necessary extension and investigation activities all combine to make individual farmers the real decision makers with regard to new lands. While this may not be the most desirable state of affairs, it is a reality which will persist until levels of funding and institutional capacities of responsible institutions in each country dramatically improve. Pragmatically, policy must be oriented toward the decision making processes and decision making criteria of individual farmers to have a broad impact on the environmental questions associated with colonization.

7.1 Country Summaries

7.1.1 Panama

In Panama, the major new colonization area is the Darien. Plans have been developed for directing the process of colonization toward a rational management of the delicate, humid tropical environment, and to avoid the concentration of land in few large cattle farms, as has been the case in the "interior" agricultural provinces (Los Santos, Herrera, Chiriqui) of the country (see Heckadon 198?). Due to a lack of funding, and an apparent lack of awareness or concern with potential problems in Darien, these plans for the most part have not been implemented. Several limited attempts have been made to develop oversight agencies which would be charged with coordinating the process of colonization in both an ecological and socio-economic sense, but these have not had the desired effect.

A new attempt to oversee the process of colonization is being

generated by the National Environmental Commission. This commission enjoys strong government support, but is still largely unfinanced. Its scope of interest is very broad, and without a specific mandate to look into colonization activities, it seems likely that these could be eclipsed by other concerns more in the public eye. The environmental problems of Darien are overshadowed by other problems of national concern; the management of the Panama Canal Watershed is a primary concern for national policy makers, and the environmental degradation associated with the Cerro Colorado mining operation attracts a good part of the national environmental interest. At the present time, a very rapid spontaneous colonization is occurring along the new Cerro Colorado access roads; while this colonization is much smaller scale than that which is occurring in Darien, it is much more rapid and eye-catching, since it affects virgin forest areas. Darien on the other hand represents a long standing colonization area so its continuing colonization may not attract public attention despite the national and international implications of its colonization.

In Darien, several opposed land use practices can be seen. By far the most visible land practice is the clearing of forest land for the production of annual crops, followed by the sowing of pastures practiced by the colonists from the interior of the country in accordance with land use practices from their native provinces. Literally contiguous to the "Interiorano" clearing is the maintenance of forest areas by Choco and Kuna Indians. Reserves have been established through various means within the colonization area, and the Indians continue to practice a minimal intensity agriculture and long fallow system in the forests which cover their land. A third adaptation is that of the "black" population, mostly Colombian immigrants, who like the hispanic Darienitas (non-Indian natives of Darien) rely on fishing as a major source of income, and practice a limited agriculture which notably focuses on plantain production as a cash crop. Many of the more recent immigrants are adopting aspects of the Indian and Darienita land management strategies, but the process of land conversion from forests to other uses is still widespread.

As a complement to the land colonization activities, large lumber concessions are granted by the national Natural Resources office. Farmers clear land and sell wood to independent lumber middlemen, and at the same time the concessions are said to promote occupation of certain areas to ensure a labor force. A certain amount of tension has been generated between lumber interests and farmers over ownership of land and logs, leading to increasing pressure on forest reserves and Indian lands.

At present, the only obstacle to the conversion of Darien into large cattle ranches is the National Hoof and mouth disease Control Program, which restricts the movement of cattle from Darien to other parts of the country. The agrarian reform agency is understaffed and underfunded, and lacks a decisive support from higher level decision makers to really enforce agrarian reform objectives for the area. In general, government agencies are weakly represented in the Darien, and are the only force which attempt to apply environmental controls at present. Their activities are hampered by inadequate funding, and a lack of clear directives as to what national policy toward the development of the area is, in any given moment.

7.1.2 Costa Rica

After El Salvador, Costa Rica is the country with least opportunity for new land colonization in humid tropical areas. Agrarian reform programs have occupied much of the national territory, and a vigorous conservation program involving the formation of national parks, Indian reservations, wildlife preserves and watershed protection zones has restricted access to much of the remaining non-cultivated areas.

Land use changes in Costa Rica are now largely restricted to changes in intensity of agricultural exploitation. Politically active peasant groups take charge of identifying and occupying lands which are underutilized; in fact, some of these areas are secondary forest areas with some primary forest remnants, but there is little sense of "agricultural frontier", since these are pockets of forest which have been bypassed by the earlier colonization movement due to problems of accessibility. The area of most activity is in the Atlantic lowlands of the country, and AID has begun a major project in conjunction with the Agrarian Development Institute to consolidate the colonization process in that area. Recently, in 1984, there has also been an invasion in the Southern Pacific highlands in the Altos de Coton, near the Panamanian border. This invasion affects both private farms and forest areas under National Park Service and Forestry Directorate control. The resolution of this invasion is working its way through the courts at the time of this writing.

As a response to the unavailability of new lands, a process of agricultural intensification of humid tropical land use is seen in Costa Rica.

The production of cacao, tropical spices, palm heart, ornamental plants and especially coffee have received increasing attention from both government agencies and farmers. Costa Rican farmers have also been active in the development of agroforestry systems to intensify land use, and to protect the land under intensive use. The pressures on the limited land area, and the relatively strong position of agriculture in the national economy of the country have promoted biologically appropriate land uses which may serve as models for other areas of Central America. Nevertheless, there are also areas of serious environmental problems, especially in the newer colonization areas which will need special attention.

7.1.3 Nicaragua

Interest in colonization of humid tropical lands in Nicaragua has notably waxed and waned in the past 40 years. The establishment of the "Proyecto Rigoberto Cabezas" introduced a sweeping plan to incorporate a large part of the Atlantic zone of Nicaragua into the national economy, by settling it with farmers.

Although the project was mainly directed to small farmers in formal documents, statistical data shows the presence of large farms in the colonization area, which were unofficially reported to have been granted to government supporters. The colonization process was largely based on the assumption that the Atlantic coast could become a major production area for basic grains, to compensate for the conversion of grain production areas to commercial crops in the western coastal area. Unfortunately, the progress reports of this project and most documents were either dispersed or destroyed in the aftermath of the revolution of 1979.

The most visible outcome of the project is the colony of Nueva Guinea, which is now a large community of small grain producing farmers. Soil exhaustion is reported, and a new development plan incorporating perennial crops has been implemented, but no results can yet be seen. It is reported that there has been a tendency for farmers of Nueva Guinea to sell exhausted land and move on into the surrounding forest area. Forest occupation has been largely curtailed due to guerrilla activity, and the formerly dispersed agricultural population has now been concentrated in villages within the Nueva Guinea area. Nicaragua's humid Atlantic region is

striking for the problems suffered in the development of permanent crops; a variety have been tried, but none have been completely successful.

New colonization is taking place along roads which are being constructed to connect the Atlantic coast to the rest of the country. In the northern part of Zelaya a new road is being constructed to connect Puerto Cabezas and Managua, passing through Siuna. In the south, a new road to connect Nueva Guinea and Bluefields is under construction. Both these roads have been conduits for colonists, although in both areas new colonization seems to have been slowed by guerrilla warfare. At the present time, the Miskito population from the northern Atlantic zone has been relocated along the Siuna-Puerto Cabezas road. The road from Nueva Guinea to Bluefields has seen armed conflicts, and logging crews have been withdrawn from the area.

A major plan for the conversion of the entire Atlantic coast to permanent crop production has been outlined, but is underfinanced, and suffers from a lack of biological support and background experience (such as field trials and germplasm). Efforts have been made to consolidate the research and implementation efforts of different government agencies involved in the development of the area, but this consolidation is still far from complete.

7.1.4 Honduras

The sparsely populated parts of Eastern and Northeastern Honduras have received major influxes of colonists in recent years. The mechanization of commercial export crops in Southern Honduras combines with an already high population density to force the migration of farmers to new areas. The eastern and northeastern parts of Honduras are the areas of most intensive colonization. The most extensive area is in Olancho, but there are also colonization areas in Gracias A Dios, Colon (Aguan Valley) and in Atlantida (in the mountains near Trujillo). Several surveys have identified major unexploited areas which would be appropriate for agriculture; it is pointed out in these surveys that a major portion of the good agricultural lands in Honduras are still under forest.

Two major tendencies in Honduran colonization can be distinguished. The first is the establishment of government projects which are heavily

involved in the establishment and design of new communities and agricultural systems. This has occurred most notably in the Aguan River Valley, and similar but much less well endowed efforts are being made in areas such as the Agalta, Guayape and Patuca River Valleys. The objective in these projects is the establishment of agro-industrial enterprises for commercial products, including cotton, where possible, and banana and oil palm, among others.

The other tendency is largely spontaneous, with little attempt to control or direct production patterns. In Dulce Nombre de Culmi and the Northern Bank of the Patuca farmers have arrived before the completion of roads, and establish themselves as they see fit. Refugee settlements of Nicaraguans and Salvadoreans tend to follow this pattern, with a minimum of technical assistance or guidance. Nevertheless, government services are provided to spontaneous settlers, but not in the comprehensive manner expected of a "directed" effort.

In a certain sense, both patterns of colonization bear major similarities. Despite the attempt to promote certain crops within agroindustrial cooperatives, even in planned colonization areas an "unplanned" population establishes itself outside the recommended guidelines. This population consists of disenchanting cooperative members, previous residents of the area, or colonists attracted by the government services and improved communication associated with the agro-industrial project. In the Aguan Valley a considerable population of unincorporated farmers exists, endangering the future of the watershed through the use of traditional agricultural practices on surrounding hillsides (Van Ginneken 1981). The overall pattern in both kinds of colonization is one of some large commercial farms in a region, surrounded by small farmers in the less desirable lands; in the Aguan Valley, as in other areas, the large commercial farms may be either privately or cooperatively owned.

Honduras has what may be the most vigorous process of new land colonization in Central America, which continues into the considerable remaining forest areas of the country. Nevertheless, much of these remaining areas do not have soils or climatic conditions appropriate for traditional agriculture and will require the development of new techniques and marketing channels to permit an appropriate use of these lands. A notable aspect of colonization in Honduras is that it is well-endowed with experiments in methods for improving soil conservation, land use, forest management, etc. A major Canadian effort is experimenting with new forms

of peasant forest exploitation, and a variety of efforts to encourage improved soil management practices are being promoted by CARE, the World Food Program and Peace Corps.

7.1.5 Guatemala

The colonization efforts of Guatemala have been controversial, focusing mainly on the Franja Transversal del Norte (FTN), a strip of low lying tropical lands bordering the densely populated highlands of the center of the country. Spontaneous colonization of the area began before the establishment of the planned project, at least as early as the 1950's. The FTN project set as goals the economic integration of the new lands into the national economy, and to a certain extent tried to improve agricultural practices and encourage appropriate systems of cultivation.

The FTN is a large area, and projects first began in the Western end. At present, a new project is being planned for the eastern end of the FTN, which until now has not been greatly affected by colonization plans. Similarly to the colonization work in other parts of the FTN, the objective of this new project will be to improve communications and government services, but with a much stronger emphasis on the introduction of new production systems.

The process of colonization at one point was "directed" by INTA, in the sense that the institution was relatively self contained in the definition of strategies and implementation. A general characteristic of current colonization efforts in the FTN is the attempt to consolidate a range of government services in specifically identified "development poles". The general objective is to ensure an adequate provision of services such as education, health care, transportation and agricultural credit and extension in 44 fairly remote areas to ensure that populations can live with basic amenities. The consolidation strategy leaves it unclear whether colonization activities should be considered "directed" (since they count on large scale government support), or "undirected" since this support is merely the provision of a full range of government services by the respective agencies as would be expected in any agricultural region.

By size, the major colonization area of Guatemala is the Peten, the northern lowlands adjoining the Yucatan Peninsula. The Peten has followed a

singular history of development, where control of all activities has been exercised by FYDEP, an agency created to manage the Peten. FYDEP does not respond to or coordinate with most other government agencies, such as those in the agricultural sector. A general plan for the colonization of the Peten has been developed by FYDEP, but its focus is production rather than the settlement of population, and gives great weight to cattle ranching.

Like Honduras, Guatemala has experienced a variety of land colonization and management schemes which are of great potential value if they could be carefully analyzed. Changes in the administrative and tenancy structures of colonies, attempts to introduce new crops, and the attempt to create "development poles" are all interesting innovations whose evaluation could provide important insights both for Guatemala and other countries of the tropics.

7.2 The Process of Land Conversion

A major preoccupation with the process of colonization is the extent to which it represents a one-time exploitation of accumulated biological "capital", in the form of trees and top soil, but which gives rise to degenerative forms of land use. Given the long periods of time required for the regeneration of this biological capital, such a process leads to long term impoverishment. Nevertheless, issues are obscured by the different, and at times competing needs, of agriculture and the management of natural resources.

A commonly heard complaint of colonists is that they are land "speculators" rather than farmers. This complaint is most often heard in Costa Rica, but it is also heard in Panama and Honduras. "Speculators" are individuals who manipulate the process of agrarian reform and colonization to acquire land at very low prices, with little intention of farming. Their intention may be to harvest wood, or to merely clear the land to "improve" it (really improve its sale value). These individuals are obviously prejudicial to the rational development of agricultural resources.

Unfortunately, it is difficult to clearly differentiate land speculators

from legitimate colonist farmers, because the sale of land is a normal economic process. Colonists may be faced with any number of unexpected but legitimate conditions which require that they sell their farm, such as illness, lack of economic opportunities in farming, etc. In fact, it may well be that the sale of farms is the only alternative in many humid tropical colonization areas, due to the limited agricultural capacity of the land, and that colonists cleared land in good faith, expecting to be able to farm.

The majority of land which is now being colonized is of poor agricultural quality. Farmers are misled by the exuberance of standing vegetation, and by the observable soil quality, but do not realize that these are not conditions which will persist after land clearance. Even in cases where farmers know of the problems which lie ahead, they often do not know of alternative technologies which would permit the long term management of the land and avoid the loss of fertility. Given the current state of agricultural technological knowledge, temporary cultivation and sale of land is the only possible livelihood available to many farmers. Costa Rica is more fortunate than other countries in the quality of its agricultural land in humid tropical regions, but even in there, the best lands have now been occupied.

In both Nicaragua and Guatemala, and in the directed colonization projects of Honduras, land tenure relationships have been altered to avoid the possibility of speculation. Land is allocated to cooperative groups, and individual sales of land are not possible. This eliminates the possibility of non-farming speculators, and provides support for farmers who might be driven out of farming by short term financial problems. The experience in Nicaragua is still not developed enough to evaluate, but in both Guatemala and Honduras cooperative farming groups have suffered from administrative problems, which do not allow the realization of the planned economic and agricultural goals, and which do not seem to notably improve the quality of land management. These experiments in land tenure deserve more attention and evaluation of their environmental aspects.

One general conclusion with regard to colonization of humid areas, regardless of the tenure conditions, is the lack of information available to farmers for implementing more environmentally sound, and sustainable agricultural practices in an economically viable way. Some cooperative efforts had been designed for humid tropical conditions, but even technically designed plans were based on insufficient information to achieve desired goals. A few cases have been mentioned where farmers have developed

biologically appropriate production strategies, but these are exceptional, and should be carefully examined. One case which is controversial but promising is the Bajo Aguan, in Honduras. This is the most advanced example of agricultural cooperatives established in (relatively) humid areas, and may have important results for questions of colonization. Another valuable example is the establishment of banana cooperatives in Costa Rica. Both of these examples are from areas which were already in farmland at the time of their establishment, but they refer to humid areas and humid area crops.

The problem of "speculation" in colonized lands is fundamentally a biological problem, that lands are over utilized, and farmers are quickly put in a position of not being able to earn a living from their land. Obviously, there are individuals who abuse the colonization legislation, but the more general problem is the inability to use much of the tropical lands which are cleared for agriculture. Farmers are lured to new lands by low land prices without being completely aware of what awaits them.

7.3 Conclusions

A series of observations can be made which generally apply to the process of new land colonization in Central America.

1. A fundamental problem observed in the development of new lands for colonization was the lack of clear definition of environmental objectives for the colonization activity, and the assignation of institutional authority to implement these objectives.

- 1.1. Environmental guidelines tend to be defined and enforced within traditional institutional lines. Land use with trees is assigned to forestry, land use with crops is assigned to the ministry of agriculture, land use for protection is assigned to parks or natural resources. The diffusion of authority and the competition which ensues for control over project funds leads to a definition of project activities to conform with the administrative mandate of a national institution

rather than to the development needs of a region.

1.2. No successful methods have been developed for the regulation of environmental factors in colonization. The most usual situation is for one government agency to be assigned as an environmental "watch dog" over another agency which manages colonization. There is a tendency for this to develop into a gadfly relationship, where environmental recommendations are seen as unrealistic and a nuisance. Information flow is impeded, and new activities may even be intentionally kept from the oversight agency to avoid problems.

2. Another fundamental problem observed in the development of new lands for colonization is the lack of clear definition of social objectives for the colonization activity, and the assignation of institutional authority to implement these objectives. Clear tendencies toward land concentration and environmental degradation develop in many colonization areas because no institution has the mandate to observe and correct these tendencies, or because policies for recognizing (or not recognizing) land titles have not been sufficiently coordinated with overall social and environmental goals to ensure that they have the desired effects. The most environmentally destructive problems currently associated with the colonization of humid areas have to do with patterns of title holding.

2.1. At one extreme, land occupants who are given insufficient guarantees of tenancy have no incentive for maintaining the long-term productivity of the land. Forest cover is sold or burned, and the land is "mined" of nutrients for a few seasons with no concern for long-term effects, since the owner cannot expect to occupy the land for long. The major concern is how to extract the most benefit from the land over a short period of occupancy.

2.2. At the other extreme, the ability to clearly establish title over land leads to attempts to assert title for the purpose of resale, rather than for farming. Farm improvements are designed to improve resale value, rather than to ensure land productivity or the permanence of the farming enterprise.

2.3. The results of attempt to give clear title to land, but prevent individual alienation through cooperative arrangements have not been evaluated to analyze their efficacy. In any case, the problem is complex, and depends on the local market for land, the condition of export markets, the national demand for small farmer crops, etc. It



is likely that a number of alternative solutions must be proposed even within single countries.

3. The process of colonization seems to proceed with a minimum understanding of pre-existing patterns of land tenure and land tenancy. Areas are occupied on the assumption that they are unoccupied, on the assumption of certain patterns of land holding for occupants, etc. Insufficient effort is directed to discovering patterns of occupancy, and regularizing these to conform to the social and environmental objectives of the general colonization programs.

4. Colonies can be seen to replicate national agricultural conditions, rather than create new conditions. This was nowhere clearer than in Nicaragua, where the best roads in the colonization zone were built to service the large farms of government officials in Rama, rather than the growing colonist population of Nueva Guinea. In similar fashion, newly colonized lands tend to produce "traditional" crops, especially grains. Lands are then absorbed into larger farms as commercial elements are introduced into the new areas; these commercial elements also follow a "traditional" strategy of establishing extensive cattle ranches.

5. The expansion of national agricultural practices into newly colonized lands tends to bring along the generally accepted "solutions" to agricultural development problems.

5.1. The establishment of large scale enterprises for export crops is an explicit goal in some colonization efforts, where innovative forms of tenure or participation are proposed to ensure that these enterprises will benefit a maximum number of farmers (rather than revert to a few large land holders). In most countries, this is a generalized strategy used by agrarian reform agencies for all regions, and not only in colonization areas.

5.2. Mechanization and increased use of agro-chemicals are frequent recommendations for new cooperative enterprises. These measures are quite clearly inappropriate in humid environments, where disturbance of the thin layer of soil, or soil compaction are major problems; or where soil conditions do not permit the effective use of fertilizers by plants. These are clear examples of generalized solutions which are inappropriate for humid areas, but which are routinely recommended on the basis of experiences in other life zones.

6. Policy changes in colonization areas seem to correspond more to national political conditions than to the success or failure of programs in the field. Changes in agricultural strategies or development objectives, or the mere neglect of established programs are the product of budgetary factors or changes in high level personnel within the relevant government agencies.

The conclusions presented here are not completely compatible with those presented by Nelson (1977). One reason for this may be the difference in underlying assumptions between the two studies. Nelson seems to have assumed 1) an either/or situation, where either governments directly support colonization or not and 2) that colonization takes place in unoccupied areas where new structures of land use can be imposed without regard to existing patterns. This report found that "directed" projects were hard to see on the ground and differentiate from undirected projects; this is because similar sets of government services exist in both "directed" and "non-directed" colonization, even though these might be supplied under different administrative authorities. Since colonization was introduced into already inhabited areas, projects come to be just one of many organizations and institutions which act in the area, so the importance and influence of the projects is diluted.

Nevertheless, there is a strong coincidence in the conclusions of this report with those of Nelson, if the question of terminology can be overlooked. Nelson concluded that the least directed projects were those which were likely to be most successful. This conclusion is valid for Central America, although it may be for different reasons than those observed by Nelson. In Central America, colonization tends to be directed, when directed, toward inappropriate goals (substitution for land reform) by institutions which have a limited scope of authority for the generalized development of an area. Colonization of new lands suffers with the increased imposition of skewed and inappropriate criteria. In areas of weak institutional control of colonization, the demands of local communities and of individual farmers to specific national institutions direct attention to factors important for human settlement. In the face of the lack of information with regard to how best to use tropical lands for small farms, the lack of strong institutional control over the colonization process may actually be a positive factor for the long-term development of the new community.

The conclusions presented here should be seen as complementary to those presented by Scudder (1981). Scudder's focus is basically organizational, looking at the interaction of colonization agencies and local community

groups. His recommendations suggest how to improve communications and overcome problems which contribute to the negative effect of organized colonization activities cited above. The observations made in this report are more related to questions of land use and technical problems of agriculture in colonization areas. It would be valuable to test some of the recommendations suggested by Scudder for the improvement of the colonization process, through the observation of ongoing or completed projects in the Central American area.

7.4 Recommendations

At a regional level, several factors stand out which need attention for the technical improvement of national programs, and for the diffusion of information which is of potential use to other tropical countries.

1. More attention must be given to the definition of occupancy patterns and the legal regularization of these patterns. Title questions must be quickly settled, and attempts be made to acquire existing "latifundios" at minimal cost, possibly using declared tax values as a basis for purchase. The patterns of occupancy must then be integrated into an overall plan of land tenure objectives, with authority to impose these objectives where there are individual interests in opposition. The most environmentally destructive problems currently associated with the colonization of humid areas have to do with patterns of title holding.

1.1. At one extreme, land occupants who are given insufficient guarantees of tenancy have no incentive for maintaining the long-term productivity of the land. Forest cover is sold or burned, and the land is "mined" of nutrients for a few seasons with no concern for long-term effects, since the owner cannot expect to occupy the land for long. The major concern is how to extract the most benefit from the land over a short period of occupancy.

1.2. At the other extreme, the ability to clearly establish title over land leads to attempts to assert title for the purpose of resale, rather than for farming. Farm improvements are designed to improve resale

value, rather than to ensure land productivity or the permanence of the farming enterprise.

1.3. The results of attempt to give clear title to land, but prevent individual alienation through cooperative arrangements have not been evaluated to analyze their efficacy. In any case, the problem is complex, and depends on the local market for land, the condition of export markets, the national demand for small farmer crops, etc. It is likely that a number of alternative solutions must be proposed even within single countries.

2. Environmental objectives for colonization areas must be defined, and authority allocated for enforcing prohibitions or giving incentives to desired activities. Colonization agencies and environmental agencies tend to be put in unconstructive, antagonistic relationships. Effort must be directed into the development of new relationships which ensure closer cooperation.

2.1. The exercise of environmental controls must be associated with positive recommendations for land use, since a simple negative leaves no alternative courses of action. Environmental agencies must develop a capacity to either stimulate the investigation into ecologically appropriate agricultural (or forestry) techniques for humid areas, or be able to carry out this investigation itself.

2.2. The inclusion of environmentalists within colonizing agencies must be done with care, so positive working relationships can be developed in the same sense as mentioned above. While an environmentalist positioned within the colonizing agency has the advantage of being able to follow colonization plans more closely, care must be taken to give this individual sufficient training and technical support so recommendations can include positive alternatives, rather than prohibitions only. Whether environmentalists work within or without the colonizing agency, their problems will be the same; to provide alternatives to action, and make technical recommendations sufficiently concrete as to be translated into executable programs.

3. Farmers of humid zones now being incorporated into national "colonization" programs have developed some valuable land management strategies which have been underutilized by government programs. For example;

3.1. the use of Styrolobium spp. for weed control and soil

improvement in Guatemala is a potential low cost alternative to the use of agricultural chemicals. The acceptance and cultivation of cardamom is an example of successful adaptation of a non-traditional crop to the needs of humid land agriculture. The tradition of communal activities in general, and especially communal forests in Indian communities is an alternative which should be considered as a model for development in areas of poor soils.

3.2. In Panama, farmers of Darien have been involved in commercial plantain production for a number of years. Their experiences in site selection, and varietal selection can provide bases for decision making, or at least for further research by colonization technicians.

3.3. In Costa Rica, farmers of humid areas have experimented with a wide variety of alternative crops and strategies. Agroforestry combinations, such as Cordia alliodora with pastures, or with cacao, are production systems which address both the ecological and economic problems of humid land colonization. Small scale producers of export crops, such as banana, palm heart and spices may serve as examples for development in other areas.

3.4. There is also a need to document the general process of land use decision making by individuals in colonization areas. An understanding of which factors are in fact taken into consideration in decisions permits the development of projects or policies which address these decision criteria, and which will be more likely to have the desired effect on general patterns of land use.

4. There is a generalized need for the investigation into alternative cropping strategies and, most importantly, into the design and testing of these strategies in the field.

4.1. Due to the lack of continuity in interest in tropical areas, there are few permanent national centers of investigation in humid tropical areas. As a result, there are little data on long term outcomes of patterns of production system management, nor currently maintained programs of germplasm collection, testing and improvement. Most crop development activities in humid tropical areas must begin with the establishment of nurseries, germplasm collections, varietal trials, etc., which require years to properly establish and to produce significant levels of output, both in plant material and in scientific information. As an unfortunate result, projects must frequently rely

on inappropriate germplasm and information, either of inferior quality or from inappropriate sources for climatic reasons, to establish new crops.

4.2. Recommendations as to improved practices are most likely to be appropriate if they are based on a local testing experience, which can demonstrate the viability of the recommended production system under actual field conditions. This of course is a seldom achieved goal, but it is one toward which activity should be directed, to ensure the continued development of improved, appropriate production systems. These systems should include not only annual and perennial crops, but forestry production. In humid tropical areas, much of the soil is best suited to forestry; without the presentation of realistic alternatives, farmers are obliged to enter into degenerative annual cropping strategies which offer no possibility of sustained prosperity. Special attention must be given to the development of forestry production systems which are viable through entire production cycles, and which are manageable within the legal, organizational and economic constraints of small farmers or cooperative groups.

5. At present there exists a large body of experience with humid tropical colonization and humid tropical land use generated through the great number of national and international development projects directed to the resolution of the problems of these areas. Nevertheless, very little evaluation has surfaced. Agencies obviously do internal evaluations, but these tend to be tied to institutionally defined operational goals, such as budgetary execution, number of registered participants, etc., rather than overall evaluations or comparisons of the strategies employed; competing government agencies are unwilling to be too frank when this may result in the reallocation of their scarce budget to alternative agencies, so both intraagency and interagency evaluations inevitably will reflect the institutional bias. Nevertheless, a series of questions of extreme importance for the process of colonization have been addressed, and treated at some length, but little attempt been made to collect and analyze these experiences at a national or regional level.

5.1. A variety of organization strategies for colonization have been utilized in Central America. Cooperatives, individual parcels, and mixed farms have all been tried, but not evaluated.

5.2. Different strategies for land control have also been tested.

Outright land titling, group ownership, restricted ownership, sales restrictions, etc. may be tools of use for achieving certain goals in the establishment of certain colonization strategies, such as the avoidance of migratory agriculture and the speculation in land which leads to its concentration in large "latifundio" type farms.

5.3. Type of government support, e.g. technical support, infrastructure support, overall planning, etc. are alternatives which dramatically change the cost of implementing new lands settlements. Unfortunately, activities of different agencies overlapped in most areas, so at a program level it is difficult to distinguish patterns of government support. At a community level, it would be possible to define what support has been provided, who has benefited, and the overall effect on the community.

The lack of systematic information as to the outcome of implemented projects is a major shortcoming of colonization efforts in the past. The funds spent in promoting projects have not contributed to a development of improved practices since they have not been evaluated in a form which is impartial or replicable, to permit an improved planning and implementation for future projects. The danger of this pattern should be clear; partial evaluations by interested agencies produce self-serving conclusions, rather than hard analysis. A great deal of information exists within these agencies, which has not been used for serious evaluations, or which has been completely ignored.

The special conditions of humid areas require special attention to improve the quality and longevity of humid land colonization efforts. Humid lands are "difficult" because agricultural research has tended to concentrate in more temperate and less humid areas. This should not obscure the fact that the humid areas offer certain competitive advantages in the production of certain crops. Colonization programs should orient themselves toward the discovery of crops and production techniques which allow the competitive advantage of the tropics to be developed for the benefit of developing countries in general.

7.5 Summary of Recommendations

Three general recommendations can be derived for improving the process of colonization, and the use of tropical humid lands in Central America.

1. Serious consideration should be given to the establishment of colonization commissions or agencies, to define policy and objectives, and to allocate responsibilities, authority and resources in accordance with the overall objectives.
2. New patterns for the oversight of environmental affairs in colonization regions must be developed, which incorporate positive recommendations as to how to improve land use in humid conditions, as well as negative ones for the non-use of especially inappropriate lands.
3. It is necessary to investigate the currently used technical strategies which have been developed by farmers in these areas, so these strategies can either be used or improved upon. The investigation of these strategies must also include an understanding of individual decision making criteria which make these particular strategies the most attractive to farmers.
4. Past policies and colonization methods should be objectively analyzed to evaluate which have been successful, and unsuccessful methods.
5. Permanent research projects and research stations should be established in humid tropical areas to improve production strategies, and test them on farms under the prevailing socio-economic conditions.

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