

A PLAN FOR HUETAR ATLANTICA

volume II
Special Studies

Cal Poly Pomona/OFIPLAN

October 1981



PN/AMU-301
UN-52354

A PLAN FOR
REGION
HUETAR ATLANTICA

SPECIAL STUDIES

CAL PCI.Y/OFIPLAN

Oct. 29, 1981

This work performed under
Contract USAID 515-W-082

SPECIAL STUDIES OF THE REGION HUETAR ATLANTICA

Table of Contents

	<u>Page</u>
Individuals Who Participated in the Preparation of this Project	i
List of Abbreviations and Acronyms	ii
List of Tables	iii
List of Figures	v
Introduction to Volume II, Special Studies	1
Project Location Map	2
Appendix A: Environmental Management for the Region Huetar Atlantica	A-1
Appendix B: Agricultural Development in the Region Huetar Atlantica	B-1
Appendix C: The Settlement System and Employment in the Region Huetar Atlantica	C-1
Appendix D: Transportation in the Region Huetar Atlantica	D-1
Appendix E: Map Appendix	E-1

INDIVIDUALS WHO PARTICIPATED

IN THE PREPARATION OF THIS PROJECT

California State Polytechnic University, Pomona

Sylvia White, Regional Planning Consultant, Project Director
David E. Bess, Ph.D., Urban Planning Consultant
John Lyle, Environmental Management Consultant
Charles Stapelton, Transportation Planning Consultant
Reza Hoshmand, Ph.D., Agriculture Sector, Consultant
Rosa Laveaga, Research Associate
Gregory DeYoung, Research Associate

OFIPLAN

Elena Terán de Beck, Director, Division of Planning and
Regional Coordination
Nidia Formiga
Mario Azofeifa
Edwin Alvarado
Sigifredo Guevara
Rodrigo Gutiérrez
Oscar Ulate Fernández
Roberto Mora
Manuel Bello González
Luis Salazar
Rogellio Palomo
Alberto Borges Fallas
Jose Gutierrez and staff

LIST OF ABBREVIATIONS AND ACRONYMS

ASBANA - Association of Banana Producers of Costa Rica
BCNR - National Bank of Costa Rica
CATIE - Center for Tropical Agriculture Research and Training
CNP - National Production Council
CODESA - Costa Rican Development Corporation
FECOSA - National Railroad of the Atlantic
INVU - National Institute of Housing and Urbanization
ITCO - Institute of Land and Colonization
JAPDEVA - Atlantic Basin Port and Development Agency
MAG - Ministry of Agriculture and Livestock
MOPT - Ministry of Public Works and Transport
OFIPLAN - National Planning Office
USAID - United States Agency for International Development

LIST OF TABLES

	<u>Page</u>
<u>Appendix A: Environmental Management</u>	
Table Ia. Matrix for the Management of the Coastal Fringe	A-31
Table Ib. Matrix for the Management of the Humid Lowlands	A-32
Table Ic. Matrix for the Management of Alluvial Soils	A-33
Table Id. Matrix for the Management of the Lateritic Foothills	A-34
Table Ie. Matrix for the Management of the Steep Slopes	A-35
<u>Appendix B: Agricultural Development</u>	
Table I. Number of Farms in Area of Cultivation in Huetar Atlantica	B-18
Table II. Area and Number of Farms by Type of Product in Huetar Atlantica	B-19
Table III. Agricultural Credit Available by Type of Product and Region, Costa Rica, 1979	B-21
Table IV. Number of Legal Agricultural Loans by the National Banking System to Small Farmers, by Region, 1978-79	B-21A
Table V. "C and V" Program of the Ministry of Agriculture in Huetar Atlantica	B-23
Table VI. Number of Farms and Number Employed, by Type of Product, Huetar Atlantica	B-24A
Table VII. Proposed Agro-industries	B-39B
Table VIII. Sample of Farm Level Accounting	B-48

LIST OF TABLES (continued)		<u>Page</u>
Table IX.	Data for Analysis of Crops: Beef, Banana, Plantain, Cacao, Corn	B-50
<u>Appendix C: Settlement System and Employment</u>		
Table I.	Population Growth in Huetar Atlantica January - July, 1979	C-18
Table II.	Population of the Subregions of the Country, 1980 - 2000	C-21
Table III.	Total Population by Age Groups, Huetar Atlantica, 1979 - 2000	C-23
Table IV.	General and Infant Mortality Rates, Costa Rica and Limon Province, 1970-76	C-26
Table V.	Economically Active Population, Region Huetar Atlantica	C-31
Table VI.	The Generation of Employment in the Zona Franca, Huetar Atlantica	C-35
<u>Appendix D: Transportation</u>		
Table I.	Characteristics of the Principal Roads in Region Huetar Atlantica	D-33

LIST OF FIGURES

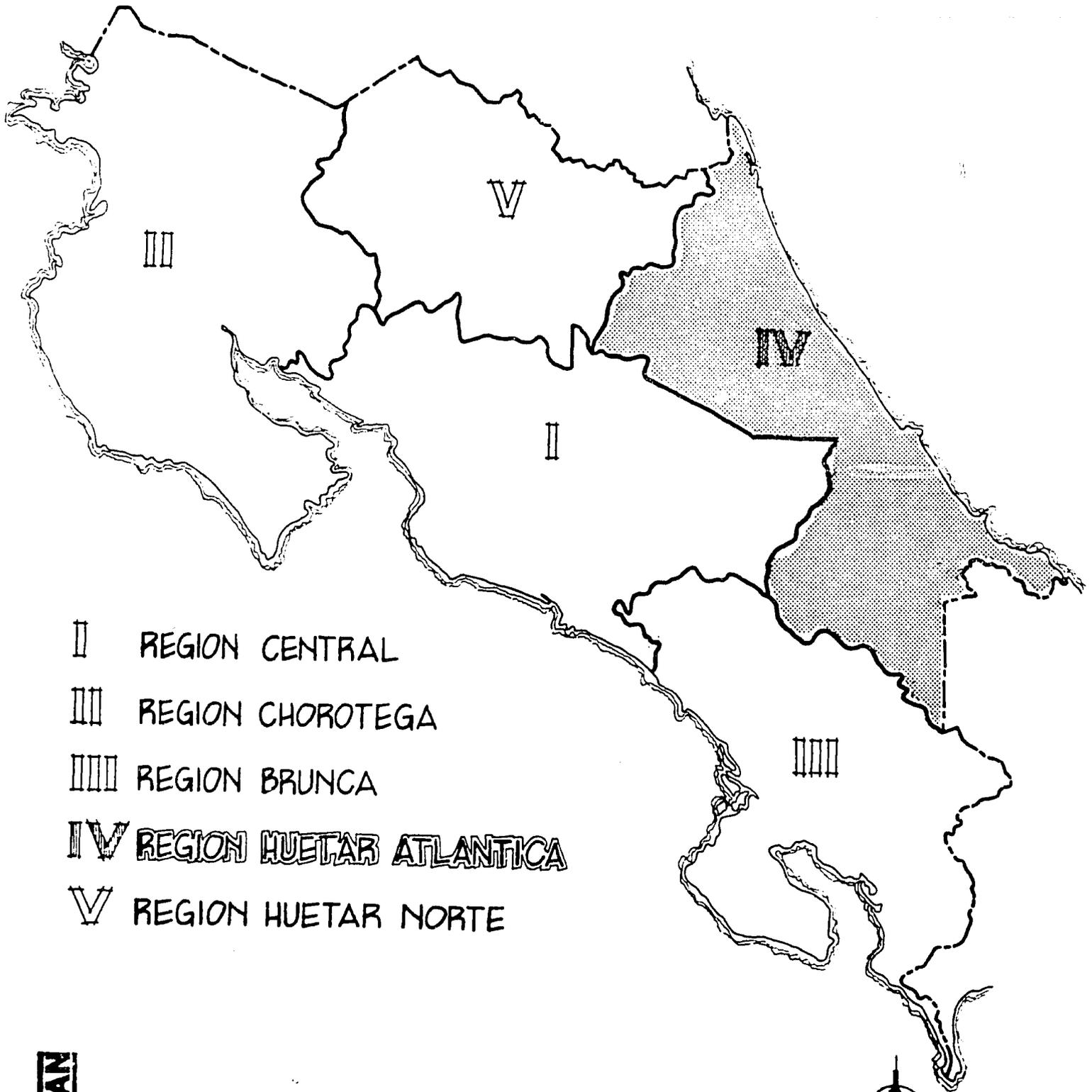
	<u>Page</u>
Figure I. Project Location Map	2
<u>Appendix A: Environmental Management</u>	
Figure I. General Land Management Zones	A-5
Figure II. Special Land Management Zones	A-15
Figure III. The Personal Environment	A-21
<u>Appendix B: Agricultural Development</u>	
Figure I. General Crop Areas	B-3
Figure II. Activities of ITCO	B-6
Figure III. Spatial Concentrations of Existing Agro-industries	B-28A
Figure IV. Recommended Locations for Agro-industries	B-39A
Figure V. Agricultural Zoning Map	B-55
<u>Appendix C: Settlement System and Employment</u>	
Figure I. The Settlement System	C-10
<u>Appendix D: Transportation</u>	
Figure I. Major Regional Transportation Routes	D-8
Figure II. Detail of Municipal-Port Relationships	D-13A
Figure III. Existing Roads	D-28
<u>Appendix E: Reference Maps</u>	

INTRODUCTION TO VOLUME II

SPECIAL STUDIES

In June 1981 the Government of Costa Rica contracted with California State Polytechnic University, Pomona to carry out a series of studies designed to contribute to the development of a regional plan for Huetar Atlantica. The information contained in this volume is the result of those studies. The project was carried out jointly by a team of five consultants and two research associates from the University and eleven members of the staff of OFIPLAN's Division of Planning and Regional Coordination.

A description of the region, a summary of the principal findings and recommendations, and a complete listing of recommended goals, policies, programs, and projects to implement a regional plan is to be found in Volume I, the summary document of the Regional Plan for Huetar Atlantica.



- I REGION CENTRAL
- II REGION CHOROTEGA
- III REGION BRUNCA
- IV REGION HUETAR ATLANTICA
- V REGION HUETAR NORTE

OFIPLAN

**Figure I: PROJECT LOCATION
 PLAN DE DESARROLLO
 DE LA REGION HUETAR ATLANTICA**

APPENDIX A

ENVIRONMENTAL MANAGEMENT FOR THE
REGION HUETAR ATLANTICA

John Lyle

Department of Landscape Architecture

School of Environmental Design

California State Polytechnic University, Pomona

with

Gregory DeYoung

and

Rosa Laveaga

Research Associates

ENVIRONMENTAL MANAGEMENT

FOR THE REGION

HUETAR ATLANTICA

The natural richness and diversity of the tropical forests in the Atlantic Coast region make them a resource of worldwide importance. But they are also very fragile. Land development in the tropical forests of Central and South America has generally been followed by serious deterioration of the soil and water regimes, often to the point where they become incapable of sustaining human life at all.

At the same time, there is a great need for development in this region. The economic situation requires cash crops for export and food crops to feed the population. These demands place increasing pressures on this fragile natural environment. As time goes on, conflicts between the need for greater productivity and the need to preserve critically important resources are likely to become greater and greater.

The problem, then, is one of achieving the best possible fit between human development and the natural environment. We can define the environmental fit as a pattern of land use that allows the greatest possible sustainable level of human productivity while at the same time preserving the integrity of the natural processes and communities.

In practice, such a fit is rarely, if ever, achieved. Rather it is a goal for ongoing environmental management. The purpose of this section is to provide a set of tools for use in working toward the goal of environmental fit in the Region Huetar Atlantica. These tools will include guidelines for immediate action and for ongoing decisions. Since they deal in a very broad perspective with the region as a whole, they are necessarily general. They define key issues, major problems, suitable land uses, probable environmental impacts, and possible mitigation measures. In applying this information to specific issues, more detailed study of the local situation will often be needed. Such studies can use the framework provided here as a point of departure.

CRITICAL ISSUES

Despite the ecological complexity of this region, the major conflicts between nature and development can be summarized as a set of six critical issues.

1. Maintaining Soil Quality

Underlying most of the other issues, and therefore probably the most fundamental ecological concern for the region, are the key processes of soil and water interaction. Failure to recognize and deal with relationships between water and soils -- especially lateritic soils, but also to some extent, alluvials -- has resulted in devastated landscapes in many parts of the tropics. Once the natural balance between water and soil has been disturbed by deforestation and changes in land use, then erosion, loss of fertility, surface hardening and water-logging almost invariably cause serious problems. Under these conditions, soils can support very little agricultural activity and usually cannot even support regeneration of the forest cover. So this is the first of the major environmental issues facing the Region Huetar Atlantica. All future development must be concerned with the conservation of soil quality.

2. Establishing a Sustainable Agriculture

As a result of problems with soils and other ecological factors, and of blights and fluctuating markets, agriculture in the area has often been marginal and sporadic, a long-term pattern of boom and bust. The region's environment is inherently capable of supporting only a limited number of crops and these only in limited areas. Cultivating unsuitable crops in marginal locations is a common cause of ecological deterioration. To develop a sustainable agriculture, it will be necessary to establish a diverse range of crops in locations where the soils can support them year after year.

3. Deforestation, Forest Preservation and the Use of Forest Resources

The tropical forests constitute an extremely important economic as well as an ecological resource. Presently, they are being exploited in a random, indiscriminate way that is depleting the resource while producing low benefits for the population. It is most important for the future of the region that random logging be controlled, that forest resources be permanently conserved, and at the same time that better economic use be made of them.

4. Water Pollution

Though there have been few detailed studies of the subject, it is almost certain that all six of the major rivers and most of the minor ones are seriously polluted by human activity. A principal source is deforestation and poor soil conservation practices in the watersheds, which bring about erosion and increased sediment loads in the rivers. Herbicides and pesticides, especially from the extensive plantations and human wastes from the towns also find their way into the waterways. There is considerable evidence of off-shore pollution as well. The deterioration of the reefs in Cahuita National Park, which is irreversible and probably impossible to halt, is one example.

Water pollution problems are certain to get worse with further development of the land and growing populations. If not controlled, they will at some point threaten domestic water supplies, fisheries, various animal populations, destroy coastal wetlands, increase flooding and siltation of the coastal canals, and bring a host of other problems.

5. Flooding

Even without further increase in river sediments, flooding is a serious problem in the coastal plains. All of the rivers overflow their banks frequently and in these very flat landscapes the waters spread far, often covering croplands and causing serious damage. On the other hand, the flooding is also beneficial because each flood deposits a new layer of silts over the soils, renewing their vitality. In fact, the agriculturally productive soils of the region are all alluvials, brought there over the centuries by the flooding of the rivers.

A related problem is the instability of the river courses which are apt to change abruptly, disrupting human activity along the way.

Dealing with the flooding and river course issue will require a complex combination of watershed management, bank design and engineering.

6. Preservation of the Personal Environment

This last issue is different in character from the first five, but no less important. Over the years, the Atlantic region has developed in its towns, buildings and cultural landscape a strong visual expression that is uniquely its own. It is appropriate to the climate and the culture, often achieving the elusive environmental fit on this smaller

scale in a way that imparts a strong sense of regional identity. It is most important for the future that this indigenous architectural expression not be lost, that it be recognized, carried on, and perhaps renewed with future development of the region.

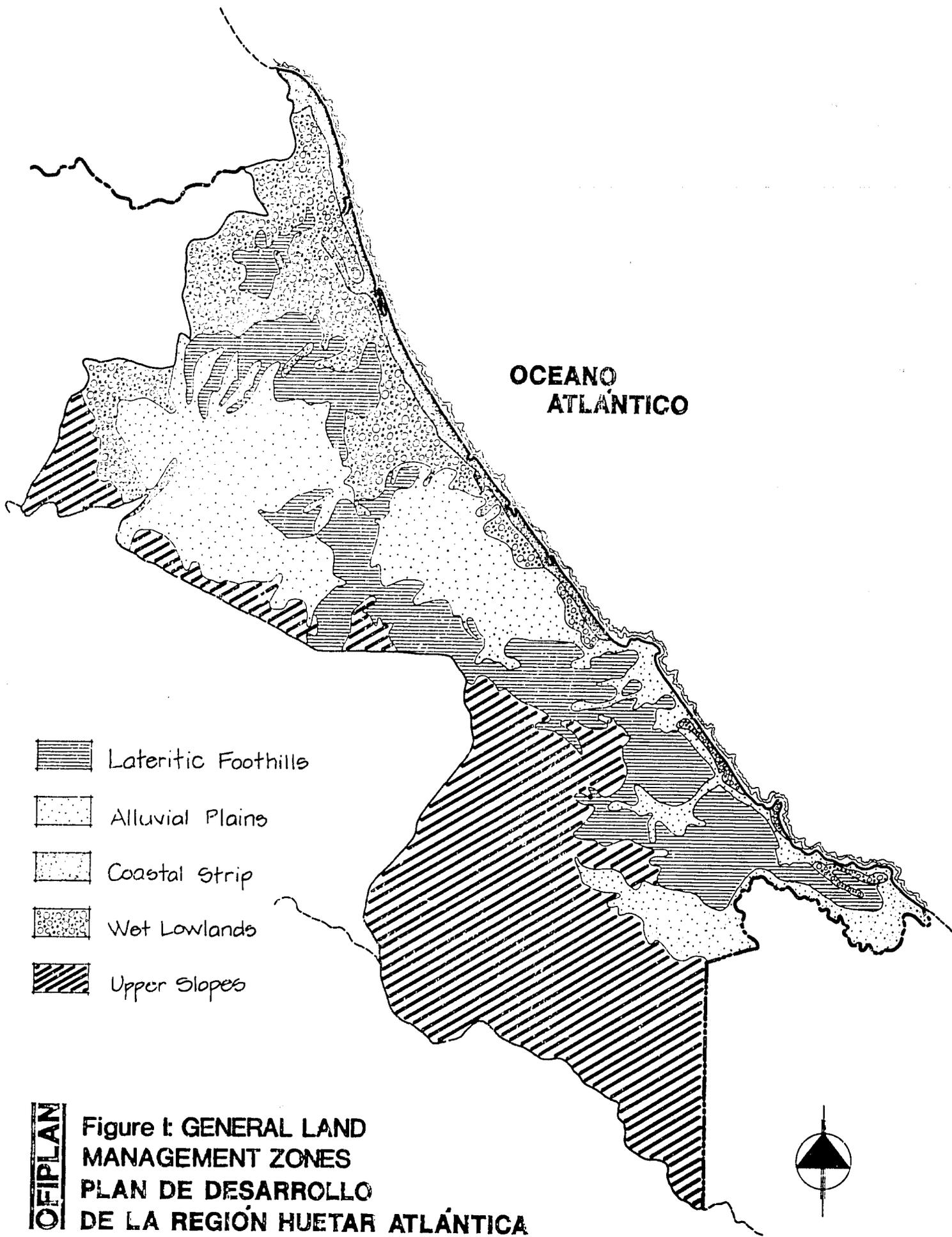
LAND MANAGEMENT ZONES

In order to deal with these issues in an inclusive way at the regional scale, we need to know where each specific potential and limitation is likely to exist. Given this information, management guidelines can be established to take advantage of potentials, avoid exceeding limitations, and institute environmental control and mitigation measures.

Within the Atlantic region, we can identify five distinct geographic zones where soil types, natural vegetation communities, steepness of topography, levels of rainfall and temperatures are reasonably uniform; that is, where all of these fall within consistent ranges. Within each of these areas, the potentials and limitations for various crops, the likely environmental impacts, and the effective control measures are generally the same. This means that land management decisions and practices within each area can be based on a uniform set of guidelines.

These five homogenous areas form the General Land Management Zones for the region. They are shown in the map in Figure I and will be explained in detail in the next section. The five matrices that appear at the end of this report in Table I a, b, c, d, e, organize and summarize this information into an overall management framework for easy reference and guidance.

Within each General Management Zone, there are smaller areas with particular potentials and limitations, not shared by the zone as a whole, which require particular attention. Examples are river courses, areas with unique soil conditions, and coastal wetlands. These areas are defined on the map on Figure II as Special Land Management Zones, and their particular potentials and limitations are discussed in the section following that on General Management Zones. The summary chart in Table I again provides a summary framework.



OFIPLAN Figure 1: GENERAL LAND MANAGEMENT ZONES
PLAN DE DESARROLLO DE LA REGIÓN HUETAR ATLÁNTICA

THE GENERAL LAND MANAGEMENT ZONES

As mentioned above, the General Zones are reasonably homogeneous with respect to soil type, natural vegetation cover, steepness of topography, rainfall and temperature. The lines delineating the zones were derived primarily by demarcations of broad soil groups. This is because soil capacities are in general the most critically limiting factors in the development of this region. The most important distinction is that between residual lateritic soils and alluvial soils, which will be explained below. The most significant attributes of the five zones are as follows:

Zone I: The Coastal Strip

Environment: Average temperature: 25^o
Annual rainfall: mostly 2.8m
Soils: Regosoles (sandy)
Natural vegetation: Coastal salt tolerant;
mostly palms

Description: This is a strip a few hundred meters wide, extending from the Panamanian to the Nicaraguan border. It does not include the extensive wetland areas that border it on the inland side in some places and which will be dealt with as a Special Management Zone. Visually, the coastal strip is a beautiful and tranquil landscape, covered mostly by palm trees, both natural and cultivated.

Land Use Potential: The economic potentials of the coastal strip fall into four general categories: agriculture, fishing, tourism and miscellaneous extractive activities.

Agriculture has long been practiced along the coastal strip, especially along the Talamanca Coast in the southern portion. Coconuts have been very successful along the ocean edge and since the natural vegetation is a combination of palms, other economic palms, including pejibaye, oil palms and palmito will do well here also. Just inland from this immediate ocean edge in the area south of Limón where there are few inland wetlands, is a stretch of land well suited for cacao production.

In the Talamanca area, settlers long grew their own fruits and vegetables on small plots near their houses. The soils and climate seem well suited to this use and the practice has been particularly important in reducing local dependence on fluctuating markets.

Local settlers have also provided a significant portion of their food by fishing. But in most of the area, the lack of harbors limits fishing to what can be done from small boats that are pulled up on shore. More extensive fishing is carried on in the extreme northern section of the coast, where the mouth of the Río Colorado provides a haven for fishing boats. This fishing activity might be much expanded, especially for sportsmen, but also probably on a commercial scale.

The third potential activity is tourism. The extent and beauty of the beaches suggests a considerable level of possible development. The Institute of Tourism has developed a plan that shows a number of future development sites. Recreational potentials will be discussed further in the section of Special Management Zones.

Environmental Impact:

Aside from the possibility of very intensive resort development that might destroy large portions of the natural landscape, the greatest sources of environmental deterioration along the coastal strip are the towns which dump both solid and liquid waste directly into the ocean. Studies are lacking, but it is likely that these wastes are damaging offshore populations. They are probably causing disintegration of the coral reefs and limiting recreational use of beaches. As populations grow in this area, the problem will certainly become much greater. Uncontrolled, it will invariably degrade the ocean resources of the region.

Mitigation:

The only effective solution for the water pollution problem is better systems of disposal for both solid and liquid wastes.

Zone II: The Wet Lowlands

Environment: Average temperature: 25°
Annual rainfall: 4m
Soils: Poorly drained alluvials
Slopes: 0-5 percent
Natural vegetation: Tropical wet forest

Description: The wet lowlands occupy the lower levels of the coastal plain adjacent to the coastal strip. They vary in width from two to three kilometers in most of the areas south of Limón to over 20 kilometers along parts of the northern coast. The land is quite flat, with poor drainage. This, in combination with the extremely high rainfall, means that the soil in most places is continuously wet. When the vegetation cover is removed, this condition becomes even worse.

There is also one portion of this zone that is located in the northwest of the region around Las Horquetas and extends to the south. This area shares the high precipitation characteristics of the zone but it is higher, slightly cooler and has a lower water table. In this area there are some steep slopes that have a high susceptibility to erosion when the vegetation cover is removed.

Potential Uses:

This waterlogged soil condition severely limits productive use of the land through most of this zone. Farmers have reported that the saturated soil will not support the roots of most field crops, and tree crops are most difficult to establish, as well. Most cattle breeds are poorly adapted to the heat and dampness of the area and are severely bothered by pests and disease. While CATIE has had some success in breeding cattle to tolerate these conditions, it seems unlikely that this will ever be more than very marginal pasture or rangeland. The soil also has difficulty supporting high quality forage grasses. In some parts of the zone, around Horquetas especially in the western area, where there are dry periods during parts of the year and where slopes are greater, it is possible to drain the soils and support some tree and field crops. But the best uses for most land in this zone

are probably those involving species naturally adapted to this extreme environment. Paddy rice cultivation might be tried on a broad scale, for example. Commercial forests might also be established in this zone, growing commercially useful species of the wet tropical forest association on a sustained yield basis. In the areas more or less permanently covered by water, it might prove economically viable to cultivate certain species of aquatic vegetation. Reed, cattails and papyrus, for example, might be grown for paper, pulp and fiber. Other aquatic species make good animal feed or fertilizer. Indigenous and adapted animal species might also be grown on a commercial scale in this environment. Ducks and geese are definite possibilities, as are a variety of game animals including the wild pig, tapir, paca, and deer. In the wetter areas, alligator, turtle and crayfish might also be considered. Experiments in Africa have shown the "game-ranching" of native species to be far more productive in weight of biomass yield per unit of land area than more conventional species such as sheep or cattle, and at the same time to require less consumption of natural resources. The extensive river network in this area seems to offer considerable possibilities for transportation of logs and other products to market and for recreational use as an extension of the boating and fishing network suggested for the coastal strip.

**Environmental
Impact:**

The two major impacts of development in this zone involve deterioration of the soil and the loss of plant and animal species. With their natural forest cover, the soils are somewhat protected from waterlogging by rapid root uptake of soil moisture and by the natural mulch of surface organic matter. When these are removed, the soils can be quickly and permanently saturated and deteriorate rapidly. The richness and extreme variety of species in the wet tropical forest means that each species exists at a relatively low density, that is, few individuals per hectare. This means that extensive land clearances can easily eliminate whole species or leave so few individuals that survival is doubtful.

Some of the larger animals in particular, such as the jaguar, need vast areas of range for their food supplies. If land clearing is done in such a way that only small islands of natural forest are left, many important species will be eliminated.

Mitigation: Given the limited number of viable land uses for this zone and the limited amount of land that is practical for any use, it is most important to study very carefully the suitability of the land before clearing the forest cover for any purpose. Only the minimum land area needed for any purpose should be cleared, and even in cleared areas, as many trees as possible should be left in place to protect the soil. A continuous network of natural forest should be left uncleared to provide for free movement of animals and the future integrity of the wet tropical forest ecosystem.

Zone III: The Alluvial Plains

Environment: Average temperature: 22.5° - 25°
Annual rainfall: mostly 2.8m - 4m
Soils: well to poorly drained alluvials
Slopes: 0-15 percent
Natural vegetation: moist tropical forest

Description: The alluvial plains reach inland and somewhat upward from the wet lowlands to the skirts of the mountains. They are relatively flat, well drained in most places, but in some areas almost as subject to saturation as the wet lowlands. The soils which are carried in by the rivers and periodically renewed by flooding, are the most productive in the Atlantic region. Most of the land in this zone is already in agriculture, including the early ITCO settlement of Bataan.

There is one area of alluvial soil in the Valle de Talamanca that is characterized by many rocks. Though this area is used for agriculture it is mainly devoted to annual and permanent crops that do not require extensive land clearing.

Potential
Uses:

The relative richness of the soil in this zone and the severe limitations in other zones suggest a high intensity of use here. Bananas have been quite successful here in the past as has cacao in the areas near the ocean. But these have both been subject to fluctuating markets and periodic blights. So in the future, more attention might be given to food crops for local consumption or for the Costa Rican market, such as the rice being grown at Bataan. Maize, beans and other field crops, as well as citrus and other tree crops, are strong possibilities. The area seems particularly well-suited to intensive mixed farming involving combinations of field and tree crops, forest products, and animals. The aquaculture experiments being carried out by ASBANA also point out a promising direction.

Given the probable intensity of agricultural production in this zone, a high level of agroindustrial development and population growth seem likely. To whatever degree it is possible, this development should be diverted to edges of the zone to areas of poorer soil quality. Major highways and other infrastructure development will ideally skirt the edges of these high quality soils rather than being built across their centers.

Environmental
Impact:

Large parts of this zone are subject to serious inundation, and clearing of land for agriculture will increase runoff levels and thereby increase areas of flooding. Where drainage is a problem, this will mean standing water for longer periods of time. It will also mean more erosion on the upland slopes.

Intensifying agricultural production in this area will also probably mean an increase in the use of fertilizers, herbicides and pesticides, which will result in increasing pollution of streams, rivers, and the ocean.

Without careful soil management, increased productivity can also lead to depletion of soil nutrients over a period of time. While these soils are periodically revitalized by sediments deposited by floodwaters, intensive agriculture might very well deplete nutrients faster than they can be replaced.

Mitigation: Some flood control works will be needed to prevent the most serious effects of flooding. A system of simple dikes and drainage channels can be used to protect settlements and vulnerable structures. These should be designed not to severely restrict flooding, but simply to guide and control it. Any extensive system of concrete channels, dams and major flood control structures would be extremely expensive and would very likely cause more problems than it solves. Since this is the Atlantic Region's most productive agricultural area, it is most important here to nourish and protect the quality of the soil. When clearing, as many trees as possible should be left in place. Where mixed farming can be practiced, nutrients should be returned to the soil through animal manure. A careful study should be made of the potentially most effective farming practices for soil conservation in this area (rotation, contour plowing, etc.) and farmers encouraged to adopt these practices.

Zone IV: The Lateritic Foothills

Environment: Average temperature: 22.5° - 25°
Annual rainfall: 2.4m - 3.8m
Soils: Laterites
Slopes: 15-45 percent
Natural vegetation: very humid forest

Description: The Lateritic Foothills slope upward from the Alluvial Plains, forming the lower skirts of the mountains. The slopes are gentle to fairly steep and heavily forested. Where they are deforested, they feature the characteristic deep red or yellow colors of residual lateritic soils.

Potential Uses: The lateritic soils have severe limitations for human development, which severely restrict the range of uses in this zone. They have high contents of aluminum and iron oxides, as evidenced by their red and yellow colors, and their capacity for holding nutrients for release to plants is extremely low. Once denuded of their forest cover and exposed directly to rainfall, they are quickly leached out. These soils may be able to support crops for two to four years, but after that

they are generally infertile. Then they begin to harden into a brick-like surface that is actually used in many parts of the world as building material. Once this hardening has taken place, the natural forest has great difficulty regenerating itself because seeds cannot find places to germinate and plants cannot find footholds. For these reasons, development in lateritic areas has often led to ecological disaster in most parts of the tropics. Given these conditions, the best long-term use of the lateritic areas is to maintain them in their natural state as forest preserves. However, this zone can also support a considerable volume of forest production and some tree crops if measures are taken to protect the soils. For some areas where better soil conditions exist, field crops can probably be sustained, but it will probably be necessary to provide continuous inputs of fertilizers, always maintain the soil cover and to manage with extreme care. Other forms of agriculture, including pasture, and grazing are not suitable in this zone.

Environmental Impact:

Any activities that remove the plant cover from the soil, even temporarily, will cause some amount of leaching, fertility loss and erosion in this zone. Eroded materials will find their way into the rivers and will eventually bring about increasing siltation and greater flooding near the river mouths. Even in their present conditions, the waters of most rivers in the Atlantic region have reddish or yellowish colors that indicate eroding upstream laterites. Preliminary studies indicate the presence of some minerals, especially copper, in the lateritic area. Mining, especially surface mining, could cause devastating erosion and loss of water quality in this zone.

Mitigation:

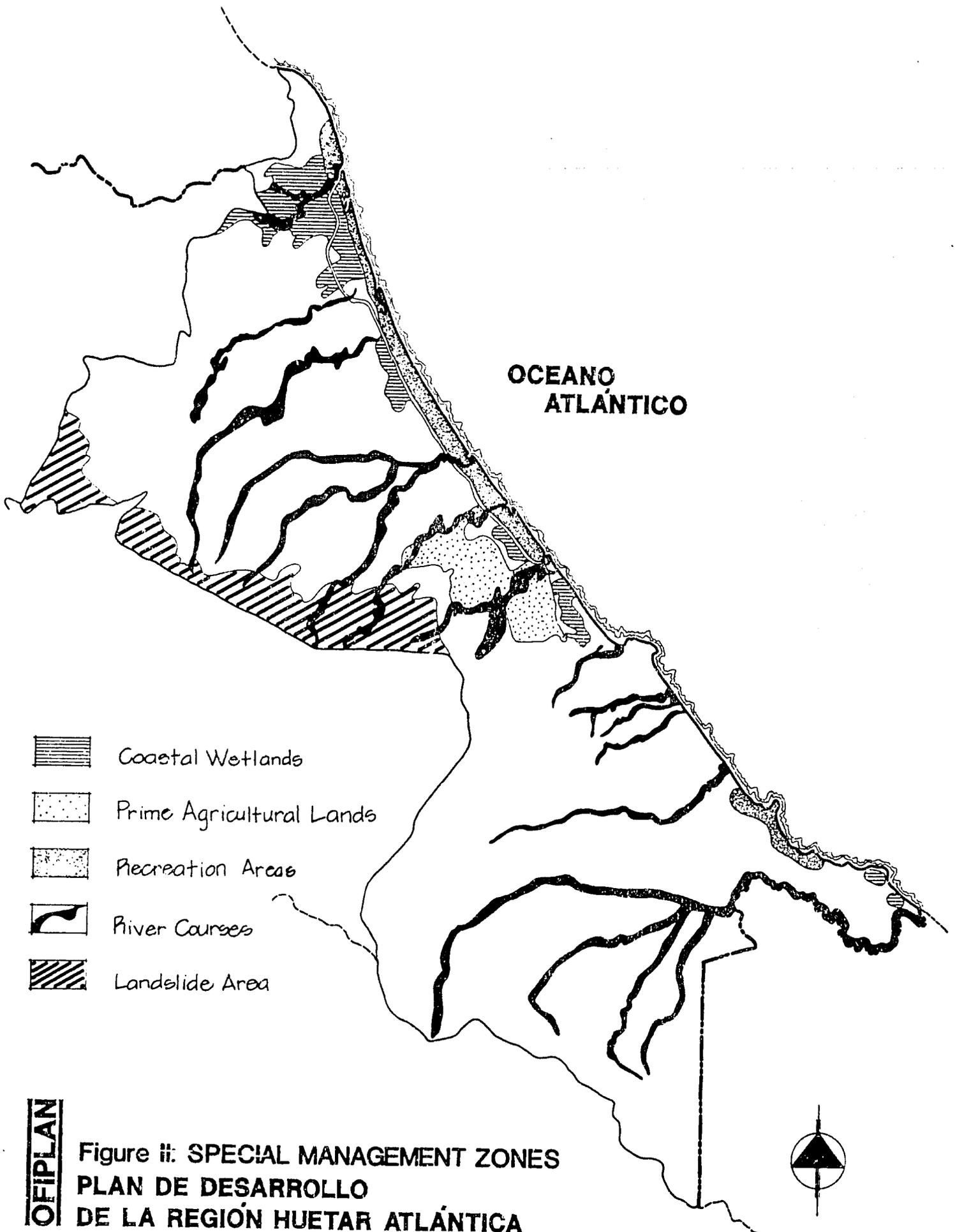
The only way of preventing damage to the lateritic soils is to maintain the vegetation cover. Where some essential activity requires barring the soil, the cover should be replaced as quickly as possible. For example, where trees are removed, reforestation should begin immediately, preferably with high density plantations that can be thinned later.

Zone V: The Upper Slopes

- Environment: Average temperature: 22.5°
Annual rainfall: 4.0m
Soils: Laterites
Slopes: 45 percent
Natural vegetation: pluvial forest
- Description: This is a rugged, steeply sloping landscape between the foothills and the highest reaches of the Cordillera de Talamanca. Most of it is covered by Indian reserves or by the new Amistad National Park.
- Potential Uses: Steep slopes combine with lateritic soil conditions in this zone to preclude almost all economic land uses. The entire zone is best maintained as a natural preserve.
- There are indications of mineral deposits, particularly copper, in some parts of this zone. It is not clear whether they are economically exploitable or not. Most of them fall within the new Amistad National Park, and are therefore probably not subject to exploitation.
- Environmental Impact: Any removal of the forest cover will bring heavy erosion and soil destruction. Surface mining would be particularly destructive, and access roads would probably cause more damage than the mines themselves. Any roads into this almost unpopulated area will open the possibility of random deforestation with the attendant destruction.
- Mitigation: There is no way of mitigating or limiting the erosion and soil destruction that will be brought about by any land development in this zone. However, it is important that, should any mining activity be permitted, a pollution control and land restoration plan be developed first.

THE SPECIAL MANAGEMENT ZONES

These are areas with particular unique conditions that either present outstanding opportunities for development or special environmental sensitivities. Their boundaries are indicated on the map in Figure II. The six zones are as follows:



1. Coastal Wetlands

These are lands near the ocean that are permanently covered by water. They include large areas of land north of the City of Limón and in the northern part of the region. They are important resources primarily for two reasons. The first is that they are very rich wildlife habitats. An enormous variety of bird species in particular roost and nest in coastal wetlands. The second is their potential productivity. Wetlands are among nature's most productive environments and they are particularly promising locations for intensive aquaculture. Some aquaculture experiments are already being conducted in these areas, and they are especially promising as a source of protein. Given these potentials, it is important that the wetlands be protected and managed as wildlife preserves and as aquaculture sites.

2. Prime Agricultural Land

One area of about 300 square kilometers within the Atlantic Region features exceptionally high quality agricultural soils. This is the area northwest of Limón, including Bataan and Matina. Since they are rare, it is most important to protect and nourish these soils. It is also economically important to coax a high level of productivity from them. This is probably a particularly appropriate area for small scale intensive mixed farming, combining tree crops, food crops, animal production and possible aquaculture. Such a combination could provide a sustainable system by protecting the soil and returning nutrients to it on a continuing basis through the use of animals.

Some parts of this area have severe flooding problems, which are limiting productivity now and which should be dealt with to permit full use of the resource. Drainage canals are probably needed to carry surface water from the Matina area to the ocean.

3. Recreation Areas

The two areas with considerable recreation potential in the region are the beaches adjacent to Cahuita National Park in the southern part and the network of rivers and canals in the northern half. The Tourism Institute has plans underway for developing tourist facilities in both of these areas. However, the major attraction of the beach areas south of Limón is tranquil beauty that could easily be overwhelmed by heavy development. The generally narrow beaches, the frequent undertows, the sudden offshore drop-off, and the distance from major transportation routes,

especially a sizable airport, all present limitations on tourist development. Given these limitations, along with the lack of infrastructure and the danger of overwhelming the local population, extensive resort development for the international trade does not seem feasible or desirable. Rather, it will be better to encourage small-scale, dispersed -- comfortable clusters of cabanas and restaurants perhaps -- catering to vacationing Costa Ricans and those visitors from other countries who want to experience the unique qualities of Costa Rica's natural environment.

The northern part of the coast has a potential for a somewhat higher level of development, though the probable clientele here, as well, is probably that relatively small number of tourists who are more interested in the unique natural environment rather than in the concentrated excitement of an Acapulco. The outstanding fishing and the network of canals and rivers which offer possibilities of cruises, houseboat colonies, isolated lodges, a rare array of flora and fauna and other unique attractions suggests that this might become an important tourist area. But as in the area south of Limón, it is important to limit development to a level that does not overwhelm the actual environment.

4. The River Courses

The major rivers play extremely important roles in the ecology of the Atlantic Region, and their functions have been considerably upset by settlement in the area. Deforestation has led to increased sediment loads and to more extensive flooding and frequent changes in courses. There are indications that the river waters are badly polluted both by pesticides and herbicides from agriculture and by human wastes.

The rivers also have considerable potentials for augmenting the resources of the region. The rivers Sixaola, Reventazón, Parismina and Pacuare have been identified as having particular potential for hydroelectric power generation. The rivers in Pococí are extensively used as a transportation network along with the intercoastal canal.

In order to maintain and develop the quality of the rivers, it is most important that they be managed as special zones. Since they are now under the administration of JAPDEVA, this agency can probably adopt the proper control measures. Management should concentrate on the following purposes:

- a. Control of forest clearing and control in each watershed.

- b. Control of agricultural pollution.
- c. Development of sewage treatment systems for riverside communities.
- d. Exploration of hydroelectric alternatives.
- e. Stabilization and control of bank areas.
- f. Flood control.
- g. Regulation of river traffic.

5. Mineral Areas

The principal mineral resources are the copper deposits in the upper Talamanca Range. Others include possible oil deposits in the Talamanca foothills and extensive bauxite in Pococí. As these resources are exploited, they might present major environmental problems if not carefully controlled. Copper, in particular, is usually strip-mined, which means the entire surface cover of the earth is removed. Further disruption is brought about in areas where the removed material is dumped. This process has left many square miles of devastated landscapes in parts of the world where it has occurred. Runoff is also increased and the sediment loads of rivers raised.

If surface mining is carried out, damage to the landscape will inevitably occur. However, it can be minimized by reshaping and replanting as soon as possible after minerals are removed.

For these reasons, it is most important to maintain strict environmental planning controls over all mining activities in this region.

6. Landslide Area

There are several major areas of unstable geology in the region. The most critical of these is located in the Talamanca Range and to the southwest of Guápiles and Siquirres. Due to the continuing danger of sliding, future development should be kept away from these areas.

THE PERSONAL ENVIRONMENT

An aspect of the physical environment of the Atlantic Coast region that is rarely given much attention, but that is most important to the inhabitants, and potentially to

visitors, is the indigenous architecture and its immediately surrounding manmade landscape. While clearly derived from Jamaican precedents, these often achieve a level of adaptation to local climatic conditions and an expression of local culture that makes them well worth carrying into the future as the region develops. In fact, there are several strong reasons for initiating a positive program to carry on this architectural heritage.

First of all, it is an important and highly visible part of the regional identity. If that identity can be preserved, it will certainly ease the pains of transition as the regional economy develops in new forms. Whatever cultural continuity can be achieved will be a considerable source of security to the local population.

Furthermore, the quality of this architecture and use of plants is unusual, enough to be of considerable interest to visitors. Though unlikely to be a major tourist attraction in itself, the architecture can be grouped with the regional music, speech, the colorful street life, and perhaps the food, to present an indigenous culture worthy of notice.

And perhaps most importantly, it is a resource conserving architecture; adapted by necessity to climatic conditions, and generally providing a more comfortable personal environment than more recent buildings designed in more internationally fashionable forms. These indigenous forms make air-conditioning unnecessary and at the same time tend to achieve the maximum living area with the least material, and therefore, save money and resources.

We can identify several particular characteristics as typifying the indigenous architecture and domestic landscape of the Atlantic Region. Of course, not every building, or even almost every building, features such characteristic. But each is common enough to stand as an example for the future.

Climatic Adaptations

In this hot, humid, rainy climate, it is important for a building to provide as much coolness as possible. Buildings in the Atlantic Region commonly do this in three ways: by cross-ventilation, by the use of roof overhangs, and by raising the structure off the ground and creating living space underneath.

Cross-ventilation is provided by keeping buildings less than one room deep with windows on both sides. Window openings can then be adjusted to the relative areas on each side that induce the greatest amount of air movement. Unfortunately, this practice is not as common, especially in more recent buildings, as it should be. Buildings without such natural ventilation in this climate are likely to be uninhabitable through a major part of each day or require air-conditioning and the expense and energy consumption that go with it.

Almost essential to cross-ventilation are overhangs. Without overhangs, windows must be closed when it rains, thus cutting off air circulation for considerable periods of time. Overhangs also reduce problems with leaky roofs.

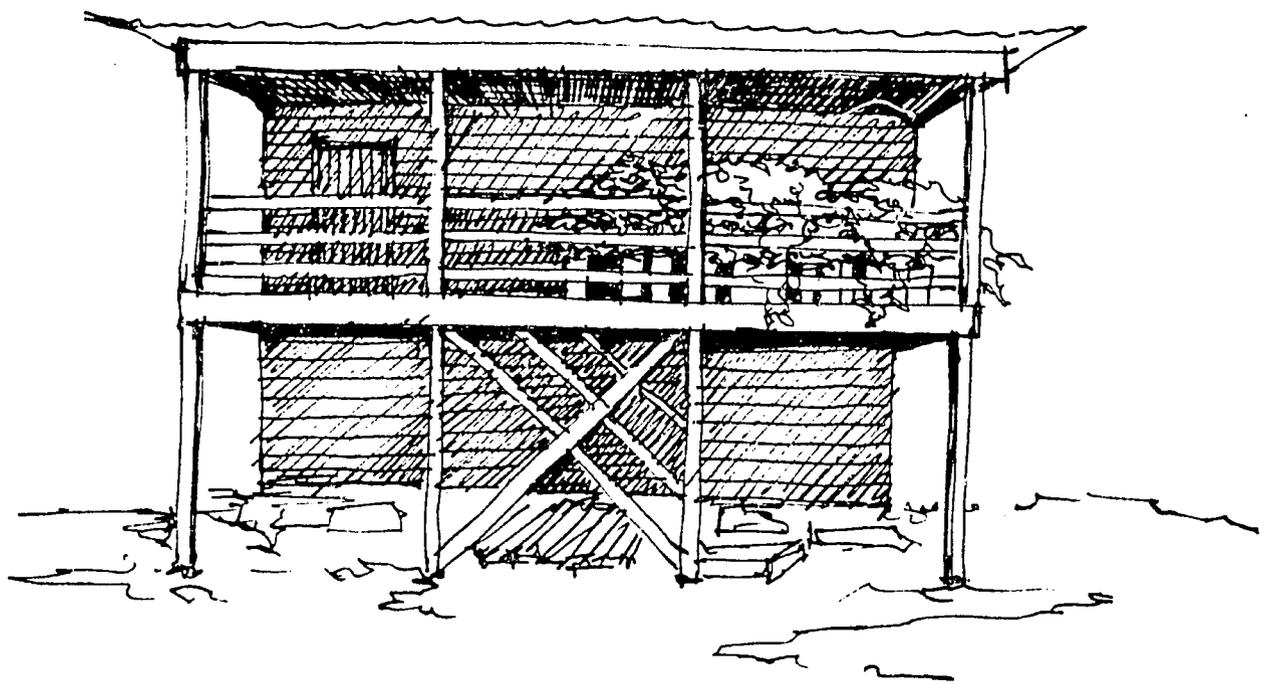
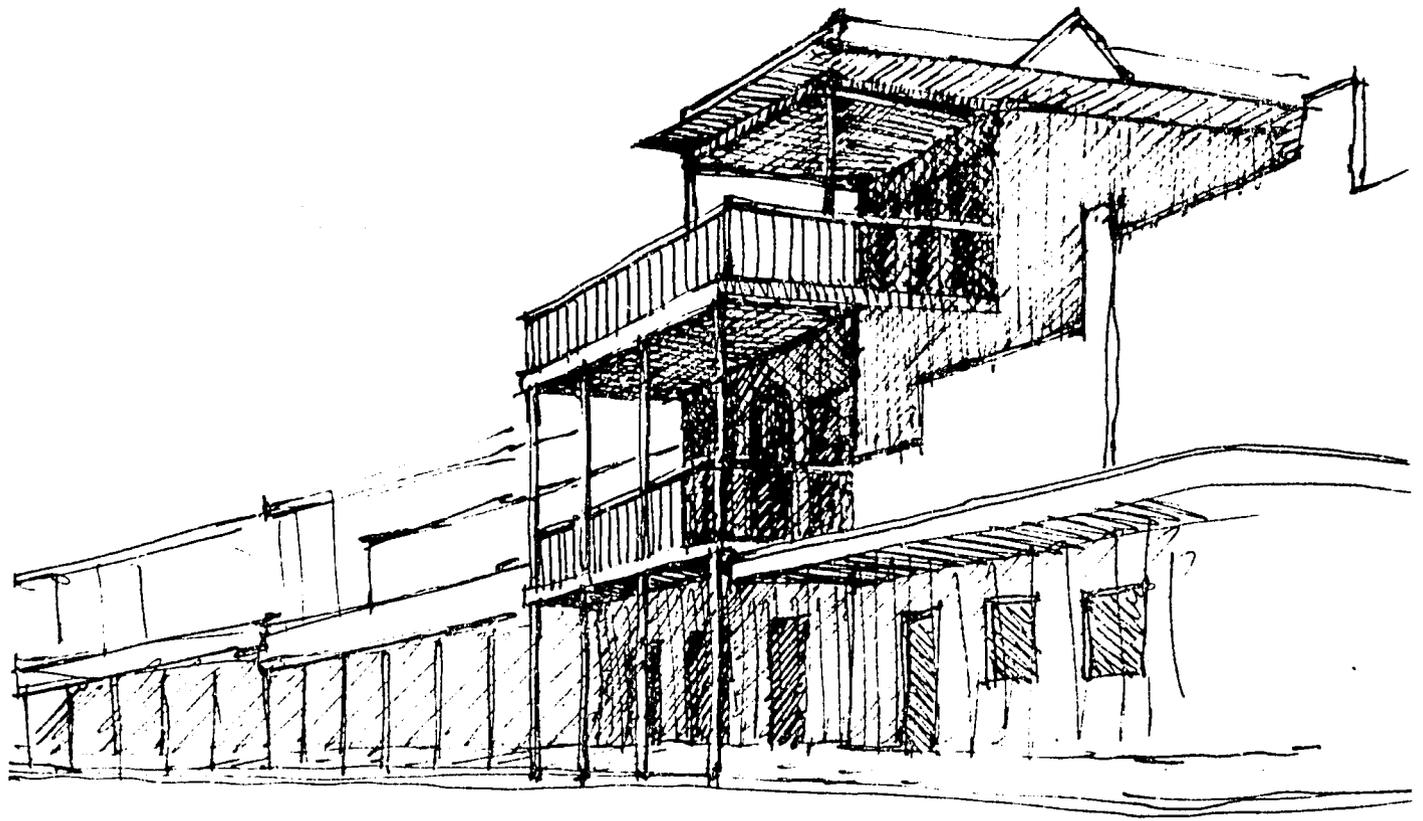
Probably the most striking to visitors of the climatic adaptations are the raised structures. All over the Atlantic Region, houses are commonly raised at least two or three feet above the ground. This provides air circulation underneath, keeps the floors relatively dry and denies access to at least some of the animal intruders. In some areas, especially in Talamanca, the height of the space underneath is commonly increased to something over head height and the space used as a daytime living area. One often sees an entire family in these areas on a warm or rainy afternoon. It is a practice that provides a considerable amount of cool, usable space, in effect doubling the size of a house at very little additional cost.

In the towns and cities, houses are rarely, if ever, built above the ground in this way, but it is a practice that should be seriously considered in future planning.

Fairly common in towns is a related adaptation -- that of providing covered sidewalks in commercial areas for protection from rain and sun. This is a common device in tropical climates, one that helps to ameliorate the climate and at the same time gives a sense of visual continuity.

Use of Color

The brilliant colors of many buildings in the towns and some of those in the countryside of the Atlantic Region give the human environment a strikingly visible sense of vitality. Sometimes the colors are subtly combined and sometimes they clash blatantly, but they are never boring, and they seem to blend beautifully with the vivid quality of the natural environment. It is most important to the visual quality of the region that this colorful tradition not be lost.



OFIPLAN

**Figure III: PERSONAL ENVIRONMENT
PLAN DE DESARROLLO
DE LA REGIÓN HUETAR ATLÁNTICA**

Use of Plants

The tropical plants that fill the front yards and cover the facades of a great many houses in the region are often even more colorful than the buildings. As with the buildings, the compositions are usually not highly sophisticated by European standards, but they express a vitality and a relationship with the native landscape that is far more important. Plants with red or gold foliage or colorful flowers are especially abundant in front yards, imparting a brilliant glow to the streetscape.

Perhaps the most interesting use of plants is the massing of containers in the facades of houses. In each village, there seems to be at least one house, and usually several, with street facades blanketed in container plants. The containers are usually tin cans nailed to the wall, and the plants are usually tropical house plants -- begonia, coleus, philodendron, etc. -- forming intricate, colorful designs.

Carrying on the Traditions

It will be difficult to maintain these traditions, valid and important as they may be, as outside influences become stronger in the Atlantic Region. It is not possible to force adherence to traditional styles. And where traditions are applied for commercial purposes, they usually take on a quality of artificiality that is far worse than simply allowing a spent tradition to die. But the vigor and the logic underlying these traditions seem strong enough to be carried on if they can be given some encouragement.

Probably the best way of giving such encouragement is by observing these few basic principles of traditional design in projects that are sponsored or financed by the government. This is likely to include a high percentage of the building in the region for some period to come and it will signal official respect for local traditions. If this is done, then private builders are reasonably likely to follow suit.

R E C O M M E N D A T I O N S

The following recommendations for action by institutions of the Costa Rican Government apply to the Atlantic Region as a whole rather than to any one management zone. For more detailed information on recommended crops for particular zones and micro-areas within zones, see Agriculture in the Region Huetar Atlantica (Hoshmand, 1981), and the report and accompanying map on Agricultural Zoning (Ulate and Mora, 1981). Some of the recommendations can be accomplished through the efforts of one agency, while others will require the coordinated efforts of several agencies. While all of these measures will involve some expense, none is overwhelmingly expensive. In fact, it is important to recognize that we emphatically recommend against major capital expenditures. It is much better to institute modest, small-scale projects that work in conjunction with the natural systems of the region than to try to solve all problems with elaborate technology.

I. MAINTAINING SOIL QUALITY

- A. There is a great need to apply the best solid conservation practices in all agricultural development. Minimum soil disturbance, crop rotation, maintaining vegetation cover, mulching, and returning nutrients to the soil through animal and green manure are extremely important to maintaining soil quality. They become more essential as agriculture moves into areas of marginal soils, especially into the lateritic soil areas. Probably the agricultural extension programs for training small farmers need to be much expanded.
- B. Especially in areas of marginal soils, it is critically important to keep as many forest trees in place as possible when clearing for agricultural use. In most cases, this is already done to some degree, but not nearly enough. An almost continuous canopy of tall trees will not unduly restrict sunlight at ground level and will provide important protection for the soil.

- C. Land with lateritic soils and slopes over 15 percent should not be used for animal grazing, and grazing should be limited in other areas. In general, the soils of the region are either too fragile or too productive for other purposes to make cattle grazing viable.

II. ESTABLISHING A SUSTAINABLE AGRICULTURE

- D. Institute agricultural policies that emphasize the need of the region to produce enough food to feed its population as a first priority. As much as possible, the best agricultural land should be devoted to this purpose. In general, marginal lands are better devoted to tree crops that follow the natural growth patterns of the forest.
- E. Especially in the alluvial soil zones, intensive small scale mixed farming should be encouraged. The combination of food crops, animals, aquaculture, tree crops and perhaps some export crops, can be an extremely productive way of using the best soils in the region while continuously protecting and renewing them. The present experiments in growing tilapia and carp on a small scale are showing promising results; these can be an excellent source of protein on a local scale. Both aquaculture and animal raising can be good ways of returning nutrients to the soil.
- F. Develop careful subdivision plans for new settlements to recognize natural features and equalize distribution of resources. Most ITCO projects now seem to subdivide into equal eight or ten hectare plots regardless of the quality of the land. It is important, for example, where terrain is steep or swampy, to have larger parcels so that each family can make a living on its own land.
- G. Begin a research program to explore possibilities of game ranching native species for food and other products. Experience in other parts of the world, especially in Africa, has shown that native species are far more productive and cause less damage to the land than those conventionally raised for meat, such as cattle. Several species of wild pig that are commonly hunted for their meat in the Atlantic Region are promising subjects, as are turtles and alligators.

III. DEFORESTATION, FOREST PRESERVATION, AND THE USE OF FOREST RESOURCES

- H. The tropical forests are the major natural resource of the region, and it is important that they be managed with extreme care. A network of checkpoints could help to stop illegal random logging. Logged areas must be reforested, which can probably be partially accomplished through better tax incentives for landowners. Productive forests, functioning on a sustained-yield basis, can become an important economic asset of the region.
- I. Many of the native hardwoods have enormous value on the world market, and some of them can grow to commercial size in as little as fifteen to twenty years. More logged areas should be reforested with hardwood of both slow and fast-growing types. In order to do this, it will be necessary to establish nurseries in the region specializing in producing seeds and seedlings of native species.
- J. Limit access roads into forest areas to those that are absolutely essential. Unnecessary roads encourage deforestation and illegal settlement.
- K. Many ITCO settlements have sizable areas of forest reserve, which are important to nature conservation in agricultural areas. However, these could be far more effective if, instead of being isolated spots, they could be organized into a continuous network of preserves. This is because many animal species require a very large range to search for food. A continuous system of natural forest running through agricultural lands would also have value in protecting the integrity of climatic and soil processes.

IV. WATER POLLUTION

- L. Establish a program of integrated pest management that restricts use of herbicides, pesticides and chemical fertilizers, using them only when less damaging techniques cannot accomplish the purpose. Prohibit aerial spraying.
- M. Develop sewage treatment facilities for all towns, especially those on rivers and bays. Consider using biological treatment systems, which use

aquatic plants to draw nutrients from sewage water, for both low cost and better use of resources.

- N. Require a pollution control and landscape rehabilitation plan before permitting any mining, especially in areas with fragile soils and steep slopes.

V. FLOODING

- O. Establish a flood control program on the coastal plains, recognizing that frequent flooding in these areas is a natural phenomenon and that to stop it completely with concrete channels and other engineering works would be extremely expensive and damaging to the natural water and soil regime. It will be much better to protect structures and settlements with dikes, diversion structures and minor canals, and to exert more control by watershed management.
- P. Protect river courses by maintaining or reestablishing forest cover in a band at least 300 meters wide on both banks of all rivers. No sewage tanks, pesticides or fertilizers should be used within this band.
- Q. At least three rivers in the region -- the Sixaola, the Reventazón, and the Pacuare -- have been identified as having potential for hydroelectric power generation. Before beginning any hydroelectric projects, a complete environmental impact analysis should be carried out. As an alternative to very large hydroelectric projects, a system of smaller dams on tributary rivers should be considered. Such smaller systems have often proven more efficient and economical, less environmentally destructive and more easily managed than major projects in the United States in recent years.

VI. PRESERVATION OF THE PERSONAL ENVIRONMENT

- R. Develop simple, small-scale tourist and recreational facilities that emphasize observing and enjoying the region's unique natural environment. Large international resort development of the Acapulco type would be extremely expensive and destructive to the region's cultural and natural resources.
- S. Encourage preservation and continuity of indigenous architecture by designing buildings in government projects according to local traditions.

B I B L I O G R A F I A

L I B R O S

Echeverría, Iván Palacios (1980). Compendio de Legislación sobre Sanidad y Conservación Ambiental, IFAM Instituto de Fomento y Asesoría Municipal, San José, Costa Rica.

El Equipo Cornell - Costa Rica (1973). El Potencial de los Recursos Naturales para el Desarrollo Regional de la Provincia de Limón. En Estudio Preliminar. Programa sobre Políticas para la Ciencia y la Tecnología en las Naciones en Vías de Desarrollo (PPSTAN) 180. Uris Hall, Universidad de Cornell, Ithaca, New York.

Nuhn, H. (1978). Atlas Preliminar de Costa Rica, Información Geográfica Regional, San José, Costa Rica.

Nuhn, H., Pérez, R.S. (1967). Estudio Geográfico Regional: Zona Atlántica Norte de Costa Rica, ITCO/ Instituto Costarricense de Tierras y Colonización.

OFIPLAN/Oficina de Planificación Nacional y Política Económica (1979). Plan Nacional de Desarrollo Forestal 1979 - 1982, San José, Costa Rica.

Convenio: OFIPLAN-INVU-IFAM-OEA, participación especial JAPDEVA-DINADECO, (1978). PIDRA/Plan Integral de Desarrollo Región Atlántica: 6. Aspectos Económicos - B, 6.7 Turismo Diagnóstico Regional Opciones de Desarrollo Integral, San José, Costa Rica.

A R T I C U L O S

Consejo Regional de Desarrollo de la Provincia de Limón, (24 de agosto de 1976). "Información básica sección Económica de la Provincia de Limón, No. 1024". Segunda Edición, Limón, Costa Rica.

Dosne, James, M. F. Consejero Forestal, OEA (1980). "Documento de Trabajo. Subcomponente Forestal, Proyecto de Desarrollo Rural Integral: Subregión Pococi". OFIPLAN-BIRF-OEA, San José, Costa Rica.

Holdridge, Leslie R. and Tosi, Joseph A. Jr. "The World Life Zone Classification System and Forestry Research", Facsimile Series No. 2, from Proceedings of the Seventh World Forestry Congress, Buenos Aires, Argentina, Octubre 1972 (in Press), Tropical Science Center, San José, Costa Rica.

Holdrige, Leslie R. and Tosi, Joseph A. Jr. (n.d.) "Report on the Ecological Adaptability of Selected Economic Plants for Small Farm Production in Six Regions of Costa Rica." Tropical Science Center, San José, Costa Rica.

Instituto Costarricense de Electricidad. "Hidrología en la Región Atlántica", San José, Costa Rica, (sin fecha, recibido en OFIPLAN 24 julio 1973).

Malavasi V. Enrique. "Geología de la Provincia de Limón", Ministerio de Industria y Comercio, San José, Costa Rica, (sin fecha, recibido en OFIPLAN 5 octubre 1971).

Naciones Unidas (1975). "Investigaciones de aguas subterráneas en zonas seleccionadas: Informe Técnico", Programa de las Naciones Unidas para el desarrollo, New York.

OFIPLAN/Oficina de Planificación Nacional y Política Económica. "Disponibilidad de agua subterránea", (N.F. anexada al informe por Naciones Unidas" Investigaciones de aguas subterráneas en zonas seleccionadas: Informe Técnico).

OFIPLAN. "Geología Económica", (sin fecha, anexada al informe por Malavasi. "Geología de la Provincia de Limón.>").

OFIPLAN. "Protección de las Cuencas Hidrográficas", (sin fecha).

OFIPLAN (sin título, informe sobre drenaje y erosión) (sin fecha).

OFIPLAN. "Suelos" (sin fecha).

Strouse, Pierre A. D. (1970). "Instability of Tropical Agriculture: the Atlantic Lowlands of Costa Rica," Economic Geography Vol 46, 78-97.

Tosi, Dr. Joseph A. "El Recurso Forestal como Base Potencial para el Desarrollo Industrial de Costa Rica", Resumen del discurso publicado en el Periódico La Nación, los días 20 y 21 de marzo de 1971, Centro Científico Tropical, San José, Costa Rica.

United States International Development Cooperation Agency (1980) "Costa Rica, Project Paper: Agrarian Settlement and Productivity", Agency for International Development, Washington, D.C.

M A P A S

Tosi, Joseph A. Jr. (1969) "República de Costa Rica: Mapa Ecológico", San José, Costa Rica.

CUADRO I.a

ZONA I	DESCRIPCIÓN AMBIENTAL					USO POTENCIAL		IMPACTO PROBABLE	MITIGACIÓN	
	SUELO	PRECIPITACIÓN	TEMPERATURA	VEGETACIÓN NATIVA	PENDIENTES	USO PREFERIBLE	USO ACEPTABLE			
FAJA COSTERA	REGOSOLE	< 2.0 m	> 25°	EN SU MAYORÍA, PLANTAS COSTERA TOLERANTES A LA SAL, EN SU MAYORÍA PALMAS	0-5%	CULTIVOS DE PALMA				
							FRUTAS Y VEGETALES			MAINTENER UN MÁXIMO COBERTURA VEGETAL
							CACAO Y OTROS CULTIVOS FORESTALES Y PESCA			
							DESARROLLO URBANO RECREACIÓN	EROSIÓN DEL SUELO CONTAMINACIÓN DEL AMBIENTE MARINO	PROVEER SISTEMAS DE TRATAMIENTO DE AGUAS NEGRAS	

CUADRO I.b

ZONA II	DESCRIPCIÓN AMBIENTAL					USO POTENCIAL		IMPACTO PROBABLE	MITIGACIÓN
TIERRAS BAJAS HUMEDAS	SUELO	PRECIPITACION	TEMPERATURA	VEGETACION NATIVA	PENDIENTES	USO PREFERIBLE	USO ACEPTABLE		
						RESERVA FORESTAL			
	ALLUVIALES CON DRENAJE DEFICIENTE	> 4m	> 25°	BOSQUE TROPICAL MUY HUMIDOS	0-5%	BOSQUES COMERCIALES		DEFORESTACION AL AZAR DONDE HAY ACESO	CONTROL DE TALA EN LAS CARRETERAS
							CULTIVO FORESTAL	SATURACION DEL SUELO CON AGUA	ESTRUCTURAS DE DRENAJE DONDE ES POSIBLE
					CULTIVO DE ESPECIES DE PLANTAS Y ANIMALES NATIVOS Y ADAPTADOS	CULTIVO DE CAMPO EN AREAS DONDE ES POSIBLE EL DRENAJE	PERDIDA DE LAS ESPECIES NATIVAS	MANTENER LA COBERATURA POR MEDIO DE LA REFORESTACION SIEMPRE QUE SE REMUEVAN ARBOLES	
							EROSION	LIMITAR EL USO DE HERBICIDAS Y PESTICIDAS AL MINIMO ESENCIAL	
							CONTAMINACION DE RIOS POR HERBICIDAS Y PESTICIDAS	DE HERBICIDAS Y PESTICIDAS AL MINIMO ESENCIAL	

CUADRO I.C

ZONA III	DESCRIPCION AMBIENTAL					USO POTENCIAL		IMPACTO PROBABLE	MITIGACIÓN
	SUELO	PRECIPITACION	TEMPERATURA	VEGETACION NATIVA	PENDIENTES	USO PREFERIBLE	USO ACEPTABLE		
PLANICIES ALLUVIALES	ALLUVIALES BIEN DRENADOS Y CON DRENAJE DEFICIENTE	2.8-4 m	22.5° - 25°	BOSQUE TROPICAL HUMIDO	0-15%	AGRICULTURA MIXTA INTENSIVA [CULTIVOS DE CAMPO, FORESTALES Y ANIMALES]		EROSION DEL SUELO Y SATURACION DEL SUELO DONDE EL DRENAJE ES DEFICIENTE	CANALES DE DRENAJE Y OTRAS ESTRUCTURAS DONDE SEA NECESARIO
								INUNDACIONES	DIQUES Y REPRESAS DE DESUACION PARA PROTEGER LOS ASENTAMIENTOS HUMANOS
						PECICULTURA			
						CULTIVOS FORESTALES CULTIVOS DE CAMPO		CONTAMINACION DE RIOS POR HERBICIDAS Y PESTICIDAS	LIMITAR EL USO DE HERBICIDAS Y PESTICIDAS NINGUNA ASPERACION AEREA
						PASTOS	PERDIDA DE ESPECIES NATURAL	DEJAR LA MAYOR CANTIDAD POSIBLE DE ARBOLES CUANDO SE LIMPIE UN AREA DEJAR AREAS EXTENSIVAS INTERCONECTADAS DE BOSQUES	

CUADRO I.d

ZONA IV	DESCRIPCION AMBIENTAL					USO POTENCIAL		IMPACTO PROBABLE	MITIGACIÓN
	SUELO	PRECIPITACION	TEMPERATURA	VEGETACION NATIVA	PENDIENTES	USO PREFERIBLE	USO ACEPTABLE		
LADERA LATERITICA	LATERITICAS	2.4-3.8m	22.5° - 25°	MUY HUMIDO BOSQUES	15-45%	BOSQUES COMERCIALES	CULTIVO FORESTAL	<p>LIXIVIACION DE LOS NUTRIENTES DEL SUELO, PERDIDA DE FERTILIDAD DEL SUELO, EVENTUAL ENDURECIMIENTO DE LA SUPERFICIE Y PERDIDA DE LA CAPACIDAD DE MANTENIMIENTO DE LA VEGETACION</p> <p>EROSION DEL SUELO</p> <p>EXTREMA EROSION Y COMPACTACION DONDE SE PERMITE PASTOREO</p>	<p>ESENCIAL MANTENER LA COBERTURA VEGETAL PARA CULTIVOS EN SUELOS LATERITICOS INSUMO CONTINUO Y CUANTIOSO DE NUTRIENTES</p>
						RESERVAS FORESTALES			

CUADRO I.e

ZONA V	DESCRIPCIÓN AMBIENTAL					USO POTENCIAL		IMPACTO PROBABLE	MITIGACIÓN
LADERAS SUPERIORES	SUELO	PRECIPITACIÓN	TEMPERATURA	VEGETACION NATIVA	PENDIENTES	USO PREFERIBLE	USO ACEPTABLE		
						RESERVA FORESTAL			
	LATERITICAS	>4.0m	<22.5°	BOSQUES PLUVIALES	>45%		BOSQUES COMERCIALES	EROSION DE SUELOS EXTREMA	REFORESTAR INMEDIATAMENTE AREAS TALADAS
						EXPLOTACIÓN MINERA	CONTAMINACIÓN DE LOS RIOS POR DESHECHOS MINEROS DESTRUCCIÓN DE TOPOGRAFIA POR EXPLOTACIÓN EN LA SUPERFICIE.	REQUERIR CONTROL DE CONTAMINACIÓN Y PLAN DE REHABILITACIÓN ANTES DE CUALQUIER EXPLOTACIÓN MINERA	

Appendix I

RECURSOS MINERALES DE LA REGIÓN HUETAR ATLÁNTICA

Exploraciones Geológicas

Alcoa llegó a controlar alrededor de 1600 Km² de concesiones mineras en la Cordillera de Talamanca en la que intervinieron \$18.7 millones. Esta compañía financió también un levantamiento aeromagnético cuyos resultados no fueron publicados.

El Instituto de Ciencias Geográficas de Gran Bretaña realizó un levantamiento de polarización inducida en el prospecto de Río Nari.

La concesión explorada de Cooper Range está ubicada en el extremo sur-oriental de la Cordillera de Talamanca en el área del Río Sukurt y próxima a la frontera con Panamá.

El proyecto SANCOSA tiene un programa de exploración determinado, ya que se contemplan estudios en Boruca Bajos de Limón, Talamanca. En Boruca se realizó el muestreo de sedimentos fluviales que cubrió un área de 14Km² con una densidad de muestra de 4 por Km². El valor normal de cobre es alto con 105 partes por millón. Se analizaron aquellos suelos donde el promedio de cobre alcanzó niveles de 280.

En Talamanca, el área que se exploró es de 1600 Km². La exploración minera se inició con muestreo geoquímico fluvial de sedimentos y levantamiento geológico. Luego, las anomalías de sedimentos han sido objeto de muestreo de suelos calicatos escarvados a mano y levantamiento geológico al detalle.

La compañía CITCO en Talamanca llevó a cabo un intenso programa de reconocimiento geoquímico fluvial de 1700 kilómetros cuadrados. Esta compañía compró toda la información de Alcoa, incluyendo la interpretación aeromagnética.

CITCO no ha entregado a la Dirección de Geología, Minas y Petróleo ninguna información sobre las exploraciones geoquímicas de Talamanca. El reconocimiento geoquímico

fluvial cubrió 1700 kilómetros cuadrados y se recolectaron 200 metros. La geología de campo y observaciones fotogeológicas fueron incorporadas en mapas topográficos 1:50.000 y las muestras fueron analizadas para Cu, Mo, Pb y Zn.

Elementos Reconocidos en la Región

En la Dirección de Geología, Mines y Petróleo no existen datos geológicos ni geoquímicos del área controlada por CIMCA. Los datos litológicos y análisis de Cu y Mo de dos perforaciones en Río Nari fueron proporcionadas por la Compañía CITCO.

Datos aislados del Instituto de Ciencias Geológicas de Gran Bretaña dicen que las rocas predominantes en Río Nari son: diorita de grano fino, tonalita, andesita, dacita, tobas y brechas andesitas, traquilas y doleritas.

CIMCA recolectó 1009 muestras de sedimentos fluviales en los que se obtuvieron cobre y zinc. La geología del área de Sukut es complicada ya que en ella afloran rocas sedimentarias de las formaciones Brito y Terraba al Norte de la falla Sukut. Al sur de la falla de Sukut una diorita cuarceífera que cambia a granodiorita y una gran masa o avalancha que cubre las rocas subyacentes. La alteración hidrotermal de algunas rocas está representada por las fases de silificación y cadinización.

La mineralización encontrada en afloramiento en el río Sukut son principalmente sulfuros de cobre y zinc.

Se ha elaborado inicialmente un mapa geológico a escala 1:100.000 de observaciones geológicas en todos los ríos y colinas recorridas durante el muestreo geoquímico de sedimentos. Hay observaciones geológicas en los siguientes lugares: Unión, Pittier, Cabagra, Kamut, Buenos Aires, Burika, Siola, Telire, Matama, Churipó, Estrella y Barbilla. Un 60% del área explorada está cubierta de tobas andesitas color verde o gris y tobas dacíticas color vino. Varias de las anomalías geoquímicas presentan alteración hidrotermal típica de los yacimientos de cobre diseminado como lo es la alteración potásica con alteraciones circundantes de silificación y propilización. Los minerales y sulfuros predominantes son: Párrita, pirrotina, y a veces calcopirita, bornita y malaquita.

El reconocimiento geoquímico de sedimentos fluvial se llevó a cabo con apoyo aéreo. Se detectaron así 12 anomalías de cobre, en las que el cobre es mayor de 150 partes por millón. También se identificó oro en estas anomalías de 0.04 partes por millón.

La Dirección de Geología, minas y petróleo realizó un estudio geológico-geoquímico con el objeto de establecer el potencial minero de cobre en áreas no cubiertas por concesiones mineras en la Cordillera de Talamanca. Este proyecto tuvo la asistencia técnica del Instituto de Ciencias Geológicas de Gran Bretaña, actualmente se encuentra suspendido el estudio.

Resultados

Las exploraciones realizadas por la Compañía CIMCA tuvieron poco criterio geológico y geoquímico y el muestreo geoquímico de suelo presenta deficiencias. Las perforaciones no definieron claramente la existencia o ausencia de un yacimiento de cobre diseminado en Río Nari.

Los minerales metálicos explotados en la Región Huetar Atlántica son: Cobre, Hierro, Carbón, Mineral, Zinc, Plomo y molibdeno, y los no metálicos son: Piedra caliza, diorita, Tonalita, Andesita, dacita, tobas, traquila y doleritas.

Solamente se ha realizado la etapa de exploración, todavía no se ha cuantificado la potencialidad de cada metal identificado en la región Huetar Atlántica. Esos estudios son muy costosos y requieren de una tecnología muy sofisticada.

La exploración más avanzada para evaluar un yacimiento de cobre diseminado en Talamanca ha sido realizada por ALCOA. Las demás compañías lo han hecho e nivel de estudios geoquímicos y por lo tanto no se cuenta con la suficiente información para considerar este prospecto como yacimiento que pueda pertenecer al estrato de gran minería.

La Compañía SAMCOSA está en condiciones de seguir en las exploraciones con perforaciones muy costosas, lo que es un buen indicador de la geología de campo y la exploración geoquímica han delimitado áreas, que justifican la inversión tan alta en esta exploración.

La actividad minera en la Región Huetar Atlántica se ha desarrollado muy poco no se explota ningún mineral.

La región potencialmente es muy rica, ya que en ella se localizan ciertos minerales importantes económicamente.

1. Arenas magnéticas, ubicada en las playas de Cahuita y Puerto Viejo, cerca de 1.000.000 toneladas.
2. Calizas y sulfuros

3. Yacimientos de carbón en el área de Zent, Matina, Bataán
4. Esquistes y carbón
5. Calizas: hay millones de toneladas de este mineral, pero no se explota
6. Minerales metálicos
7. Petróleo

Las investigaciones realizadas en las faldas de la Cordillera de Talamanca por Costa Rica y las Naciones Unidas para conocer las posibilidades mineras de la región, indican que el cobre está desplazado hacia el Atlántico. Por lo tanto se recomienda profundizar en las investigaciones desde el cerro Matama hasta el sur-este con la frontera con Panamá. Se han encontrado yacimientos de carbón en el area de Zent, Matina y Bataán. Se realizó un estudio de esquistes y carbón en la zona de Zent.

En relación al petróleo, las investigaciones realizadas en busca de este mineral en la Bahía de Moín, dieron resultados negativos. Se recomienda continuar los estudios aunque las posibilidades sean pequeñas.

Recientemente se estableció una empresa estatal para la exploración de petróleo de la región, que depende de Recope y recibe asistencia técnica de Petróleos Mexicanos S.A. (PEMEX) y también financiamiento de parte de la misma empresa mexicana y Venezuela.

Durante varias oportunidades las perforaciones realizadas en diferentes puntos en la Región, han dado resultados negativos. Sin embargo, el área de cicales parece presentar alguna posibilidad.

No se tiene conocimiento exacto de cuál es el potencial minero de Costa Rica, aunque se han iniciado muchas investigaciones para determinar las posibilidades mineras del país.

Recursos Minerales de la Región Hueta Atlántica

<u>Mineral</u>	<u>Localización</u>	<u>Estado de Investigación</u>	<u>Compañía e Institución</u>	<u>Inversión</u>
Cobre	Cuenca de Limón	Exploración	--	--
Cobre	Cerro Boruca Talamanca	"	SAMCOSA	Ø1 millón
Cobre	Liberia de Talamanca	Exploró	SAMCOSA	Ø2 millones
Cobre	Matama de Talamanca	Exploró	SAMCOSA	Ø5 millones
Cobre	Yuani de Talamanca	Exploró	CIMCA, CITCO	Ø3 millones
Cobre	Sukut de Talamanca	Exploró	Cooper Range	Ø2 millones
Hierro	Puerto Viejo	Exploró	SAMCOSA	--
Carbón mineral	Baja Talamanca	Exploró	--	--

FUENTE: Dirección de Geología, Minas y Petróleo
Ministerio de Economía, Industria y Comercio

BIBLIOGRAFIA

Organización de los Estados Americanos (OEA),
Diagnóstico del Sector Minero de Costa Rica, Imprenta Nacional
San José, Costa Rica, 1978.

APPENDIX B

AGRICULTURAL DEVELOPMENT
IN THE REGION HUETAR ATLANTICA

Reza Hoshmand, Ph.D.

School of Agriculture

and

Sylvia White

School of Environmental Design

California State Polytechnic University, Pomona

with

Edwin Alvarado

Oscar Ulate Fernández

Roberto Mora

Sigifredo Guevara

Manuel Bello González

Luis Salazar

OFIPLAN

AGRICULTURAL DEVELOPMENT
IN THE REGION HUETAR ATLANTICA
AN OVERVIEW OF THE EXISTING SITUATION

Between the years of 1963 and 1973 agricultural production in Huetar Atlantica changed dramatically; in 1963 the region contributed approximately 8% of the total agricultural production of the country, but ten years later this contribution had grown to 21% (OPSA, 1979). This extraordinary growth was induced during the 1960's primarily by the rapid expansion of banana production and by the development of platano for the export market. In addition there was rapid growth in the cattle raising industry.

Despite this rise in production, in 1973 only 28% of the total land in the region was classed as farms. (That is, of the 979.8 thousand hectares in the region, only 278.2 thousand hectares were in farms.) Of the land in farms, only 18% was actually dedicated to the cultivation of crops, another 25.7% was in pasture, 37.5% was in forest and 18.7% was in charrales, pantanos and tacotales (Census de Agropecuario, 1973).

This situation has undoubtedly changed greatly. Since 1973 thousands of people have migrated to the region, particularly to the Pococí Subregion, attracted by the expansion of employment with banana companies and by the availability of land for farms. Projections estimate that the population will grow from 122.3 thousand in 1973 to 157.9 thousand in 1978, and then to 203.8 thousand in 1983 (Bogan & Raabe, 1976). Of this number it is estimated that some 60% will be living in rural areas. Many migrants will probably remain in the Pococí Subregion. Though official figures are unavailable, it is known that many migrants have cleared and claimed land for farms (though most have no official title to the land), while others have been given titles or are in the process of obtaining titles to land under the administration of ITCO's titling program. In any event, there is probably more land devoted to the cultivation of various products now (1981) than there was in 1973. Many new migrants have settled on land which is marginal because of its susceptibility to flooding (See Environmental Management in Huetar Atlantica, Lyle, 1981).

Even with the vast influx of migrants there is still a substantial amount of land in the region that is unused

either because it is subject to flooding, because it is too rocky or mountainous, or because it is in forest reserve. (See Plate I in Map Appendix and Fig. 1 in Appendix A.)

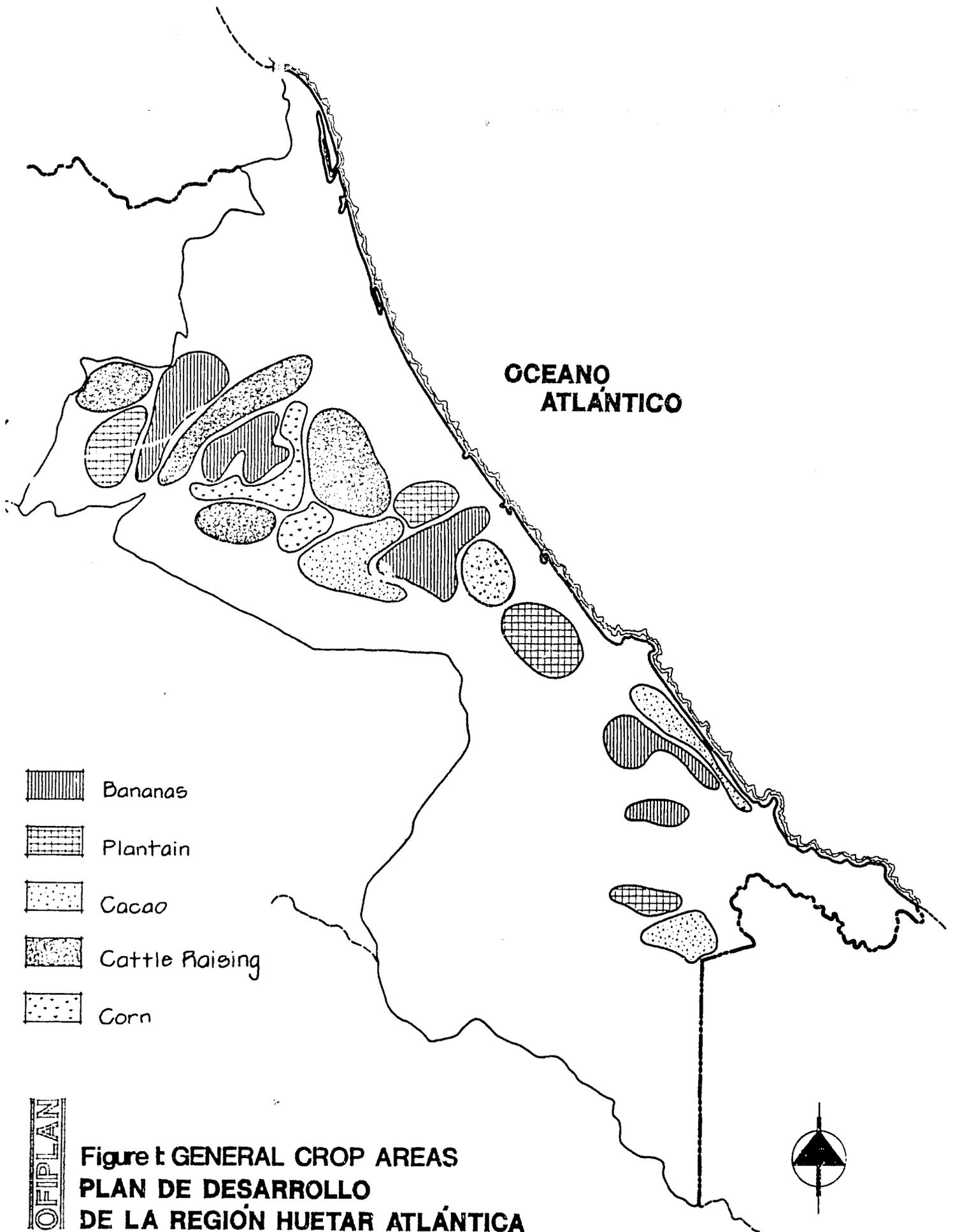
Bananas are, by far, the principle product of the region. In 1973 they accounted for 81% of the value of agricultural production. Other products in order of their importance were: cacao (5.9%), cattle (4.4%), platano (2.9%) and maize (2.9%). In all probability this situation has also changed radically because cacao has been severely affected since 1979 by the rapid spread of *Monillia Roreri*, an airborne fungus which has caused tremendous losses to cacao producers. On the other hand, cattle raising and platano production have increased in importance, though once again, exact figures are unavailable. Other products (yuca, beans and specialty crops) constitute only a minor portion of the total value of the region's production.

The Spatial Pattern of Agricultural Production

As can be seen in Figure I below, major agricultural production stretches from Sixaola near the Panamanian border into the northwestern part of the region. In general, the following crops are predominant in the areas of the region described below. For a more detailed description of crop locations, see Plate I in the Map Appendix.

Banana Production: In the zone around Guápiles (Roxana) one encounters the most important area of banana production in the region, though banana plantations are also found near Siquirres, Valle de la Estrella and Sixaola. As indicated earlier, banana is the most important crop of the region. It is estimated that during 1980 there were approximately 18,000 ha. in production of which almost half were directly under the ownership of three major transnational companies (Bandeco, Standard Fruit, Chiriquí Land Company). The other half was in the hands of independent growers and a few cooperatives.

Cacao: In the coastal fringe between Puerto Limón and Puerto Viejo there are many small producers (less than 10 ha.) of cacao. The area of cacao cultivation extends on both sides of the railway line and widens somewhat in its extent around Matina and Siquirres. Most of the cacao plantations are more than 40 years old and many have not been cared for properly. It is believed that improper care (especially failure to remove vines and overgrowth)



OFIPLAN

**Figure 1 GENERAL CROP AREAS
PLAN DE DESARROLLO
DE LA REGIÓN HUETAR ATLÁNTICA**

have contributed to the conditions favorable for the onset of the Monillia fungus. It is estimated that production levels have fallen from 220 Kg/ha. in 1973 to 100 Kg/ha. in 1980 (FAO/World Bank, 1981). Although exact figures are not available, it is thought that the amount of land under production has also decreased from approximately 26,000 ha. in 1973 to 20,000 ha. in 1980. It is believed that this amount of land will continue to decrease at least until measures are taken to clear and replant the crop. Because it takes three to five years after planting to harvest a profitable crop, the next five to ten years present grave problems for the farmers of Subregion Limón.

Coco: Coconut palms are also grown along the coastal strip mainly in the area north of Limon, though there are considerable stands of trees along the southern coastal strip as well. In 1973 there were almost 1000 ha. in coco production, however, the amount of coco produced has been quite low. There are several projects which hope to increase production substantially; these are discussed in more detail in the specific studies that follow this report.

Cattle: In the northern part of the Pococi' Subregion around Astua Pirie, Rio Frio and Cariari, one finds the major portions of land that are devoted to cattle raising, though there are areas of pastureland scattered throughout the region. The development of cattle raising in the region has been relatively recent - between 1963 and 1973 the amount of land in pastures increased from 40,000 ha. to almost 72,000 ha. In addition to raising cattle for beef, dairy farming was begun during the late 1960's mainly as part of ITCO's development strategy. ITCO, with the help of CATIE, has encouraged dairy farming in its Rio Frio Colony, and ITCO is also encouraging dairying in its other colonies as well. Problems and potentials for beef and dairy industries will be discussed at greater length later.

Plantain: Platano is dispersed throughout most of the region. It is frequently used as a secondary crop by many small and medium sized farms. However, in the last ten years platano has been developed as an export crop in larger commercial stands principally in Rio Frio, Talamanca and near Matina.

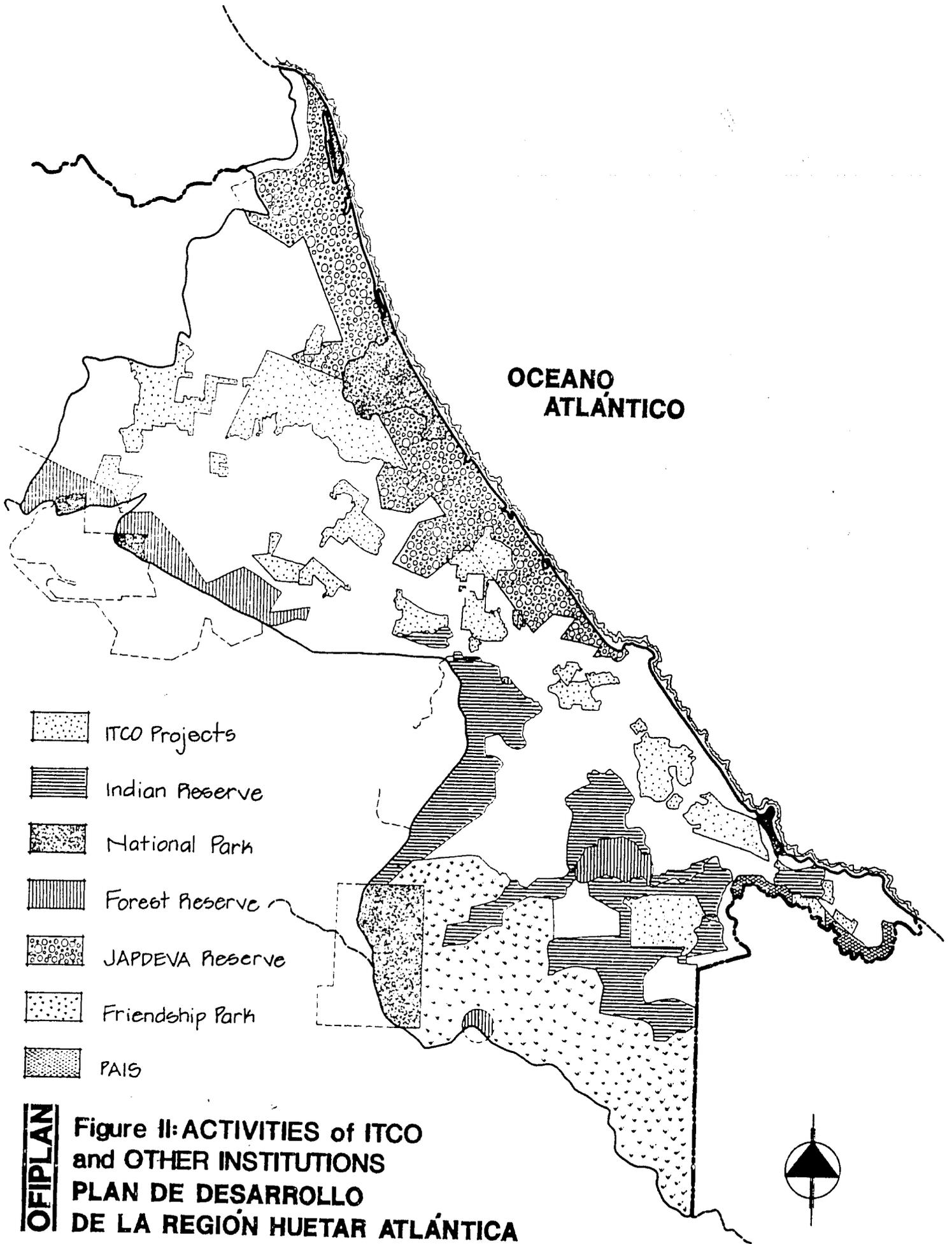
Maize: Maize crops are scattered throughout the region because it is grown by many farmers as part of their subsistence production. In parts of the Pococi' Subregion where it is flat, maize is cultivated in larger parcels with mechanized equipment as a cash crop. In other parts

of the region one frequently sees small stands of maize on slopes where it is clearly cultivated by hand and is part of a subsistence crop. Because of the heavy rains in the region, maize is generally considered to be a high risk crop. It is cultivated because it is part of the traditional diet and because there is little knowledge about the cultivation practices for alternative, higher value crops.

Other crops: Other types of crops are relatively minor in terms of their production values and the area in which they are grown. One finds beans, yuca and a variety of other tubers, vegetables and fruits grown widely in the region, but they are usually part of a subsistence crop. In the last few years there has been a surge of interest in the production of special high value crops for the export market. Pejibaye, several types of spices (hot chilies, nutmeg, ginger) and flowering plants are all crops established on relatively limited amounts of area as yet. Many of these crops are still at the experimental stage, or if established, they have yet to produce significant amounts. An exception to this is the production of macadamia nuts. Costa Rica is the second largest producer of this commodity in the world, and almost all of this product comes from a 300 ha. plantation in the Pococí Subregion. In addition, there are new experimental plantations of pineapple and oil palm in the region; more will be discussed about these experiments in the following section.

Relationship Between Crop and Farm Size

In general, cacao, platano and maize are crops found most frequently on small farms of less than 20 ha. As the size of farm enlarges, the relative importance of these crops tends to diminish. Banana production begins to predominate on farms of between 50 and 200 has. Farms in this size range also tend to divide their lands between the production of crops like bananas and pasture for cattle. The largest farms, those of more than 200 has., are almost exclusively devoted to the production of banana and its associated crop of bamboo, or to the raising of cattle (FAO/World Bank, 1981). It is worthwhile noting that some crops currently in the trial stages of palm and coco are examples of these types of crops. On the other hand, spices and chili peppers can be grown profitably on quite small farms.



Pococi' Subregion: ITCO Activities

ITCO has five separate programs and many diverse activities in the area, but the programs can be divided into two basic types of effort. The first is the Programa de Asentamientos Campesinos (Peasant Settlement Program) which provides a full range of social economic and technical assistance and infrastructure to campesinos who are settled on ITCO lands, including their colonies, collectives and individual parcels. The second type of program concentrates on giving titles to undocumented landholders. As can be seen in Figure II there are many ITCO settlements in the subregion, and the titling area occupies a large portion of the subregion as well.

The Rio Frio Settlement occupies 28,000 has., of which part is a forest reserve. Agricultural activities are diverse and include: (1) Dairy farming - there are 21 farms with a daily production of 2,800 bottles which are sold to Plasa through the Dos Pinos Cooperative. Against all odds, ITCO, with the help of CATIE, has fought for 12 years to establish this dairy industry. The climate is inhospitable, the market is relatively small and until recently, cooperation from banks in giving credit to dairy farmers has been poor. Nevertheless, ITCO now believes it has achieved a modicum of success in selecting and training farmers and adapting the breed of cow to the area. In addition, there are impressive efforts to utilize appropriate technology for cooling systems and to train farmers in the need for consistent sanitation. ITCO representatives appear ready to try to promote dairy ventures in their other settlements. (2) Palmito de Pejibaye - About 25 has. have been planted and ITCO has a nursery with enough plants for another 200 has. The problem is that there is no credit available for farmers who wish to undertake production of this crop. At this time (1981), the project seems paralyzed. (3) Cacao - About 85 has. are under cultivation, but this project too is stagnant because of the need for credit and the need for improved seed from CATIE. (4) Platano - There are about 50 has. planted, but the bank has stopped giving credit, in part, because of the appearance of "Sigatoka Negra", a disease which affects the plants and makes them unfit for market. (5) Pineapple - There are about 140 has. planted. There are problems with the market price for this product and there is also a need for credit to sustain interested farmers. (6) Other crops - Yuca is widely cultivated and has a good yield, but the price for the product is low. There are many other types of subsistence crops grown, including maize, vegetables, citrus and spices.

Colonia Cariari is one of the oldest ITCO settlements having been established in 1965. It has approximately 1,000 has. and some 350 families. Bananas are produced for export in part of the colony; another area is given over to pastures for cattle, and maize is grown as well. The colony is divided into "projects" which emphasize one particular crop. Other subsistence crops account for the remainder of the production.

Astua Pirie, located to the east of Cariari, is a large area principally known for its cattle raising, however, part of the area is in forest. Maize and tubers are also being grown. There are plans for the production of Ramio on 500 has. Ramio is a plant that produces a fibre used in textiles.

Finca Neguev has an area of 5,340 has. Part of the finca has improved pastures, and based on the experience with Rio Frio, the team of ITCO-CATIE hopes to begin dairy and beef modules with the intent of taking advantage of the internal market. ITCO also proposed to develop new cacao stands where old cacao plantings still exist. About 100 farmers will participate in this. There are also plans for several hundred ha. of pejibaye for palm hearts. About 100 "precaristas" already occupy the property; they are farming maize, tubers and other subsistence crops. Finally, the northeast portion of the finca is characterized by poor soils and steep slopes. This part, about 1,000 to 2,000 has., will not be included in farming activities as it is virgin forest. It will be necessary to protect this land. (See Environmental Management Report.)

La Florida and Tierra Grande are two adjoining ITCO settlement areas. Ginger is grown on the ITCO parcels and also on private plots around La Florida. Tubers, a small area of new cacao plantings, and subsistence crops are also found in this area. There are also larger scale cultivations of coffee and yuca. ITCO has also rehabilitated a sawmill in the area of La Florida.

Finca El Indio has an area of 4,240 has. and is located in Canton Pococi in the District of La Rita. About 20 precarista families currently occupy the farm and are awaiting distribution of the land by ITCO. Projects planned to begin are pejibaye for palmito, cacao and banana. There is an area of about 800 has. which is characterized by rolling terrain and poor drainage. This land is not apt for agriculture and will be used for forestry.

Pococi' Subregion: Private Activities

On the southern edge of ITCO's Rio Frio settlement is the Standard Fruit Banana plantation which has 6,000 to 8,000 has. in addition to an extensive bamboo plantation. In Horquetas, the Haciendas Cubujuqui and El Rio Chirrip6 have extensive lands devoted to cattle raising and forest. There also exists near Horquetas a pejibaye plantation for palmito that is the property of Del Campo Company. There are about 750 has. of which about 500 are producing. In the District of Guápiles, the Agro-Palmito enterprise has 220 has. of pejibaye for palmito already planted. They are prepared to plant a total of 500 has. We have already mentioned the 300 has. plantation of macadamis nut trees belonging to Hacienda Bremen. There are plans there to plant another 500 has.

Pococi' Subregion: Experimental Stations

A variety of experimental projects and pilot projects are situated in the Pococi' Subregion: (1) "Los Diamantes" is part of MAG and is located in Guápiles. It has experiments in maize, rice, tubers, spices, fruits, coco, cattle and African oil palm (palma africana). The work is carried out in collaboration with the Faculty of Agronomy of the University of Costa Rica. (2) Finca "La Lola" is part of CATIE and has been experimenting for 20 years with cacao. The program is oriented to the production of seeds, hybrid varieties, to the control of various maladies that afflict cacao and to advise on the density of plantations, fertilization and control of growing conditions. (3) ASBANA maintains a demonstration farm at "28 Millas" a short distance from Siquirres. In the main they are concerned with the introduction of new products that are apt for the zone. They have experimental plots in palma de pejibaye, hybrid 'coco', "Enceno Malasio", citrus and spices. They have been experimenting in the last few years in aguaculture, specifically in the development of Tilapia (Nile Perch) for commercial production.

Limón Subregion: ITCO Activities

ITCO's titling program extends into the Subregion of Limón. There are active programs to give title to undocumented landholders in the Canton of Matina (near Zent), and in several areas of the Canton of Limón (Penshurst, Petroleo, Westfalia). Agricultural production in these areas is primarily cacao, platano, banana and small herds of cattle, with additional subsistence crops (USAID, 1981). There are

currently some appeals to ITCO from cacao farmers near Cahuita and Puerto Viejo who, never having established legal title to their holdings, now need official titles to their property in order to obtain credit from the bank with which to renew their plantations. There are also some 8,000 has. in Sixaola between Bribri and Sixaola that are under the jurisdiction of ITCO. Many of these plots are devoted to banana production, but numbers of them appear to be abandoned or badly overgrown. ITCO also has a titling program in the Talamanca highlands among the residents of the National Indian Reservation.

Colonia Bataan is another of the old settlements of ITCO. It was founded about the same time as Cariari. It has about 12,500 has., and approximately 480 families live there. There are two cooperatives at Bataan which produce bananas for export, Coopecinco and Coopebataan. Coopebataan owns all its own equipment except the trucks which take the crop to market. There are 49 associates in this cooperative, all of whom were given titles to their land by ITCO. There are also about 300 has. of rice at this colony. One of the problems with this product is that there is not enough machinery for harvesting the crop. There are also parcels devoted to cacao, platano, yuca and other fruits and vegetables. They expect to be producing milk soon.

The Finca Von Storren is located in the canton of Matina bordering both the main highway and the railway between Siquirres and Limón. It has only 300 has. Approximately 70% of this farm is currently under cacao but the trees are very old and infested with monillia. The remainder of the farm is in pasture and charrales. The farm is to be divided into 10 ha. parcels with the intent that the settlers devote themselves to the production of cacao. ITCO proposes to replace the old cacao with new hybrid trees using a special system developed by CATIE. About 2 has. of each parcel is to be left for the cultivation of subsistence crops.

Limón Subregion: Private Activities

Much of the land in Subregion Limon is in the hands of small holders, many of whom are cacao farmers. They have been hit especially hard by the spread of the monillia fungus. Other crops are coco, plantano and other subsistence crops. In Canton Matina there are some extensive pastures that are over 50 has. devoted to cattle raising, and the same is true of a few areas in the Canton of Limón. It should be noted that the

area around the settlement of Petroleo has a number of landholders who are extending their lands into forest reserves in a haphazard and destructive manner. In the Sixaola area near Gandeka, Chiriqui Land Company has extensive banana plantations and also has a large experimental plantation of Palma Africana.

Limón Subregion: Experimental Activities:

The experimental activities in the subregion are as follows: (1) At Bataán a Taiwanese Mission has been working with ITCO on an investigation of the cultivation of irrigated rice and on soy beans, tubers and other vegetables. (2) JAPDEVA has a farm near Puerto Limón on which it has introduced water buffalo with the intent of using this animal which is already adapted to the climate of the region for farm work, milk and meat production. (3) MAG has a large experimental station at Bribri where it is investigating the response of such crops as sugar cane and various types of banana and platano.

The Fishing Industry

On the whole the production of the fishing industry on the Atlantic coast is far less than on the Pacific coast (see "A General Plan For The Puntarenas Subregion" Cal Poly/OFIPLAN, 1981). This is due to the fact that the Atlantic coast forms a straight line and has few harbors for boats. The major fishing is done at the mouths of the rivers and at ocean sandbars such as the Parismina, Pacuare and Matina rivers north of Limón and the Rio Banano and Westfalia Rivers to the south. The best ocean fishing areas are found around Moin, Isla Pajaros, Isla Uvita and the Limón Estuary. The catch on the coast is comprised mainly of lobster, turtle and escama. The catching of turtle presents somewhat of a problem because it is a species close to extinction and therefore the numbers which can be caught are severely restricted. Nevertheless, many fishermen catch them illegally and this practice, of course, has severe negative impacts for the loss of this species. (See "Environmental Management In Huetar Atlantica".) The lobster is a migratory species which is fished seasonally when it comes from the Coast of Honduras. It is also found in the deep waters off the coast of Limón but because of the muddy conditions there the catch is minor.

There are several fish cultivation projects throughout the region (in both Pococí and Limón Subregions) that

are being carried out with the objective of improving the diet of the population by means of increasing the production of low cost protein. In addition, it is hoped that these aquaculture projects will provide an additional source of diversification in productive activities of the region and will increase the incomes of those who engage in the raising of fish for commercial purposes. We will have more to say about the problems and potentials connected with these ventures later. The following is a listing of the various aquaculture projects in the region:

1. The Moín Pilot Project.

This is a joint project between JAPDEVA and MAG. The site has 20 cages for intensive cultivation. Two cages have been used for herbivorous carp, one for silver carp and the rest for tilapia. The hybrids of this last mentioned species have been sown at a rate of 200 per cubic meter. The fish are nourished with food produced in the area. Ten tanks are being built with the objective of initiating a program of production of seed. To this end, 400 fertile pairs have been brought to this area. Plans are to build a laboratory and administration center and two houses for laborers. Short term goal is to make an experimental exportation of 1,000 pounds of smoked fish to New Orleans with the objective of analyzing the international market.

2. "28 Miles" Station (Batan and Limón) Asbana.

This site works with the selection of strains. Experiments in "Policultura" have been done with considerable success. The site has a total of 32 tanks of which three are for the maintenance of pure strains, three are for the research and development of pure strains, 14 are for the production of hybrids and development of "alevines" (reproduction), the rest being used for technological research and development. In addition, there is being prepared a large area for fish processing as well as an area for the controlled reproduction of fish and shrimp.

3. La Rita Station (Guápiles) Asbana.

This site has 17 tanks, a processing area and an area which has water currents for the purpose of directing the fish. Four tanks are for the maintenance of pure strains, four for research and development of pure strains, four for the production of

hybrids and five are for technological research and development.

4. Los Diamantes Station.

This site has 22 tanks. It is planned to build a model project for exhibition which would combine pig production with the production of fish. Five additional tanks have been built for the production of fish for the commercial market.

5. There is also a fish cultivation project connected with the Lagunas Litorales del Atlantica (Atlantic Coastal Lagoons) and at the Rio Blanco Fish Cultivation Station which is a private project.

The region now has approximately 32 persons involved in the cultivation of fish. The market is oriented toward restaurants and supermarkets in order to create an awareness of the quality of the product and to accelerate the demand for it. Work is also being done in the processing of smoked tilapia partly to supply the national market as well as seeking out prospects for exportation such as the canning of tilapia and carp.

Conclusions

What generalizations, if any, can we make from this overview of the existing agricultural production and activities in the region? Can we make any comparisons between agricultural activities in the two subregions?

1. Though one product (bananas) is clearly dominant in the production of the region, there are many diverse areas within the region that are suitable for growing a wider variety of products.
2. Of the five leading products produced in the region, one product - cacao - has been virtually devastated by disease. Of the two subregions, the Limón subregion is more heavily dependent on this product. The loss presents the heretofore relatively well off farmers of Limón with grave problems. But it may also present farmers with the opportunity to diversify production. To do so they must have technical assistance and crops that will produce over the short term.
3. In general the Pococi' Subregion appears to have more diversified agriculture and more potential for agricultural development (in terms of area available, soil,

physical features) than does the Limón Subregion.

4. Of the two subregions, Pococi' is the major focus for major in-migration and a concomitant pressure to obtain land titles and to open new land to farming. As a consequence of this pressure, and perhaps adding to it, ITCO is more active in Pococi' Subregion than in Limón. ITCO has aimed a good deal of effort at agricultural diversification, with varying degrees of success, in the Pococi' Subregion. Seemingly less effort has been directed to the Limón Subregion.
5. On the one hand, public and private institutions seem to be more active in their efforts to diversify agricultural production in the Pococi' Subregion. On the other hand, Pococi' is also more the focus of large transnational landholdings that tend to monoculture.

With this overview of existing agricultural production in mind we can move on to discuss some of the major factors in the development of agriculture in Huetar Atlantica.

FACTORS IN THE DEVELOPMENT OF THE AGRICULTURAL SECTOR

In this section we will focus our discussion on agriculture only and on the key factors which influence the productivity and income of farmers and their families. We recognize that this focus is somewhat narrow and represents only one part of what is really a broader concern - that of achieving the integrated development of the rural areas of the region. The discussion of agriculture here is integrated into a broader discussion of rural and regional development which is contained in the summary document of the Regional Plan for Huetar Atlantica.

The Environmental Base

The environmental system determines more than any man-made system what the agricultural productivity of the region will be. Large areas in Huetar Atlantica contain environmental systems that are fragile, easily disturbed or destroyed. Fortunately, there are also ample areas in the region where successful, indeed intensive, agriculture can be carried on provided that there is continuing maintenance of the soil quality. (See Environmental Management for Huetar Atlantica, Lyle, 1981.)

As we have noted earlier, the region is being subjected to increasing pressure from in-migrating population and from their desire to open new lands on the agricultural frontier. This pressure is pushing farming into increasingly marginal lands. For example, the lands in the Pococi Subregion classed as the Wet Lowlands (Lyle, 1981) are being cleared increasingly for pastures or for certain types of crops which farmers find deteriorate quickly in the water-logged soil. Other farms are pushing into the lateritic soils of the foothills where they find that the soil is quickly leached of its nutrients necessitating massive doses of fertilizer or that the soils harden rapidly when they are cleared for use. Both types of soil are marginal. If agriculture is to expand into either type of area (see Figure 1, Appendix A and Plate in the Map Appendix), then it is of extreme importance to do everything necessary to maintain the soil quality (see Environmental Management in Huetar Atlantica, Lyle, 1981). Not only productivity but

survival for some farmers will depend on this.

Cultivating unsuitable crops or animals in marginal locations not only can cause ecological damage, it also leads to inferior crops. The raising of beef and dairy cattle in the very tropical, wet lowlands is a case in point. Though cattle raising has been encouraged by ITCO and other agencies, there are clearly many problems with this type of farming. Parasite problems and diseases affect the quality of the meat and the quantity of milk production as well as the quality of hides and other by-products. In addition, some land is being used for grazing that is considered to have soils suitable for raising higher value crops. The opportunity cost of struggling to raise cattle under these conditions is considerable.

Finally, it is evident that the government is aware and concerned about continuing deforestation in this and other regions of the country. Exploitation of forest areas on a commercial basis to provide pulp for paper industries or other wood products must be planned very carefully. Commercial logging in one area can adversely affect agriculture in surrounding areas and even in areas seemingly far removed. Heavy erosion, soil destruction, siltation of rivers and the loss of the natural prey predator balance which leads to pests that attack crops are all possible effects. This is not to say that commercial harvesting in forest areas is not possible, but rather that it must be planned carefully from the beginning to provide for ecological stability as well as a sustained yield for commercial purposes.

The Nature of Land Distribution and Land Tenure

Encouraging production on adequate size parcels of land and securing legal title to land are two key factors that induce a series of positive, related changes in the agricultural sector. Among these changes are increased income for the landowner and increased agricultural production which generates new opportunities for agro-industries, transport and marketing. Higher incomes in rural areas generate new demands for the products of both urban and rural areas. The increased demand can stimulate all the sectors of the economy within the region and in the nation.

Unfortunately, access to adequate size parcels and to an assurance of secure ownership are becoming increasingly difficult for landless and near landless (those who hold less than two has.) people, many of whom are

migrating to the Atlantic Region from Guanacaste, Turrialba and Puntarenas (CSUCA, 1978). In the past, people claimed land through the process of spontaneous colonization of public land on which they established "rights of possession" (derechos posesorios) by clearing forests and raising a few products. But the agricultural frontier is virtually closed. All that remains are unused and under-utilized lands that are already in private hands. In general, these are only on large latifundia where they are used as pasture or not at all (USAID, 1981).

In the Atlantic Region the distribution of landholdings is still quite unequal. 1973 data reveals that large landholders (those with 200 has. or more) represented only 3.4% of all landholders in the region but occupied 60% of the farmland. This contrasts with the percentage of landowners in the region who had less than 50 has. and who represented 87% of the landholders, but who occupied only 23% of the farmland in the region. Tables I and II show the trends to larger landholdings and fewer farms that occurred during the decade of 1963 to 1973. Table I shows that three cantons, Limón, Matina and Siquirres, experienced a decrease in the number of farms and an increase in the size of farm. Though the data does not show this trend in the case of canton Pococi (because the district boundary changes), it is known that large banana plantations came into being during the decade in the canton. Table II shows a similar trend toward larger landholdings by type of product. On the large farms much of the land is under-utilized or unused, and it is being sought by the migrants from other areas of the country. Some of this land is being acquired and redistributed by ITCO; other lands are simply being invaded.

Clearly, distribution of land into adequate size parcels (and "adequate" depends upon the type of product being raised and on soil and other environmental conditions) and bringing under-utilized and unused land into useful production are key elements in the agricultural development of the Atlantic Basin.

Securing legal title to land is also linked strongly to the achievement of positive changes in agricultural production and to increased farm income. Because Costa Rica has no national cadastre (that is, no public record, survey or map indicating property ownership), many residents of rural areas in the Atlantic Region have no legal way of proving that they own the particular parcel to which they lay claim. Estimates are that 70% to 90% of farm families in the region lack legal title to the land they farm (ITCO, n.d., FAO/World Bank, 1981). Even though many holders

TABLE: I

NUMBER OF FARMS AND AREA IN CULTIVATION IN HUETAR
ATLANTICA: 1963 AND 1973

Canton	1 9 6 3		1 9 7 3	
	No. of farms	Total area in cultivation has.	No. of farms	Total area in cultivation has.
Limón	1,115	38,420	641	50,240
Matina	977	26,404	916	27,223
Talamánca	378	14,920	673	17,213
Siquirres	1,037	39,214	1,002	53,768
Pococí ²	1,774	89,231	1,363	56,962
Guácimo	-	-	695	40,668
TOTAL	5,281	208,120	5,290 (5,462)	244,530 (278.20)

Source: Censo Agropecuario 1963 and 1973.

1. Information for one district (Horquetas) in Canton Sarapiquí which is included in Huetar Atlantica missing.
2. The composition of the districts and boundaries was changed between the 1963 and 1973 census making comparison difficult. Undoubtedly some of the impetus for boundary changes came from the influx of people into the Pococí area and from the opening of new farmlands (large banana plantations as well as smaller holdings in the area). Guácimo Canton was created in 1973 from lands in the Pococí Canton - this accounts, in part, for the diminished number of farms and parcels under cultivation. On the other hand, large tracts of land in the districts of La Rita, Roxana, Cariari and Colorado were added to Pococí Canton.

TABLE: II

AREA AND NUMBER OF FARMS BY TYPE OF PRODUCT IN HUETAR
ATLANTICA, 1963 and 1973

	Area (Has)		Number of Farms	
	1963	1973	1963	1973
1. Banana	2,997	23,138	1,301	802
2. Cacao	24,400	26,634	3,388	1,935
3. Plátano	958	1,557	853	664
4. Maíz	13,202	5,219	4,520	1,951
5. Rice	800	766	666	474

Source: Censo de Agropecuaria, 1963 and 1973

have lived on their land for decades, they do not have legal title (Escritura). For example, many families have occupied land left by the United Fruit Company since the 1930's, but they have no title to the land. The situation leads to conflicts over property claims and to insecurity about the future of landholdings. More recently, there have been incidents of illegal land invasion in the region, a situation which also leads to conflict.

Apart from conflict over property rights, not having secure title to land can also keep untitled holders from taking advantage of most of the major sources of banking and credit. In addition, farmers who feel insecure about whether they will be evicted from their land are much less likely to plant permanent, high value crops (Saenz, P. & Knight, 1981). On the other hand, secure title to land production, give impetus to the planting of permanent crops, extend the interest of farms in using technical assistance and raise the level of income among farm families. It should be noted that the existence of legal title may also give impetus to land sales and land speculation and possibly to the further agglomeration of parcels (Seligson, 1980).

Given the importance of land distribution and land titling in the region and the impetus it can give to agricultural development, and given the prominence of ITCO's activities in land reform and in crop diversification for commercial purposes, it seems imperative that OFIPLAN establish close working relationships and coordination of activities with ITCO.

Agricultural Credit

An essential part of the production system is the amount of capital available to a farmer. To enjoy higher income streams, farms need a significant injection of credit by the banking system. Informal sources of credit are completely inadequate to the task of financing agricultural investment.

Normally*, four banks promote agricultural credit throughout the country. The major volume of agricultural credit is handled by the Banco Nacional de Costa Rica (BNCR). BNCR has established a special system of offices in order to direct

* Because of economic conditions in the country, credit for agriculture, indeed for all investments, has been severely curtailed or completely cut off since early in 1981.

credit to medium and small holders. They have formed an organization called the Juntas Rurales de Credito Agricola (JRCA) consisting of some 72 decentralized organizations located in the principal agricultural zones of the country. During the last three years the other three banks have established similar types of offices in order to direct credit to medium and small agriculturalists (FAO/World Bank, 1981).

Table III gives a comparison of the amount of credit available to the various regions of the country in 1979. While the total amount of credit available to the agricultural section increased over 1978, we can see that the distribution of credit between the regions of the country is uneven. In terms of the percentage of total credit available to the agricultural sector in the country, the Atlantic Region was among the lowest with 8.14%.

The total amount of credit available to small holders in the country in 1978-79 is shown in Table IV. In 1978 there were 21,166 small holders who received credit from the banking institutions. The Atlantic Region represented 7.6% of this total. This is the smallest number of farmers in the country who received credit. The number rose by 40% in 1979, but the small holders of the Atlantic Region still constituted the lowest number to receive credit in the country. Yet this is the region with the fastest rising numbers of small holders. The link between the availability of agricultural credit and increased production is clear; the implications of the lack of credit for this group for future agricultural development of the region are negative.

Another important aspect of the credit situation occurs at the local level; that is, to whom and on what basis credit is given in the various localities. According to a recent study conducted in the Atlantic Region (Boyer, 1980), bankers in each area have evolved informal policies for granting loans to farms. Access to credit is not dependent on the size of farms or on whether the land is titled (which is frequently is not), but rather on the basis of crops grown, individual farming capability and repayment record. Small and large farms in each locality vary in their ability to attract loan capital. Overall, banks in the region have extended credit since the mid-1960's to small holders in a variety of enterprises. Credit for cattle and maize production around Guácimo has long been available. Credit for loans to cacao producers in the Limón subregion has a much more recent history. In general, ". . . enterprising mestizo small farmers are not denied access to credit. It appears that Jamaicans have not been able to get credit as easily" (Boyer, 1980). As a result Jamaican farms are

TABLE: III

AGRICULTURAL CREDIT AVAILABLE BY TYPE OF PRODUCT AND REGION, COSTA RICA, 1979.

Product	Total ¢ Costa Rica 1979	Pacífico seco 1979	Zona Norte 1979	Pacífico Sur 1979	Atlántico 1979	Meseta Central Oriente 1979	Meseta Central Occidente 1979	Pacífico Central 1979
Permanent Crops	54,689,448	2,878,472	5,931,142	9,959,025	13,011,035	9,656,433	109,188,23	2,334,518
Annual crops	123,127,232	26,289,766	10,985,142	32,200,373	5,406,591	32,126,779	2,402,710	13,715,865
Hortalizas	9,077,801	1,014,317	447,000	92,500	---	1,841,760	4,447,824	1,234,400
Cattle and Birds	337,259,839	114,848,786	80,112,059	57,973,618	26,211,771	17,707,505	22,266,982	18,139,117
Other Products	161,141,148	21,279,089	36,904,100	41,204,762	8,940,427	29,583,047	14,467,512	876,221,1
TOTAL	658,295,467	166,310,430	134,379,443	141,430,284	53,569,824	90,915,524	54,503,851	44,186,111
%	100%	25.26	20.40	21.43	8.14	13.80	8.28	6.71

Source: Boletín Estadístico del M. A. G. (1979 - 1980).

TABLE: IV

NUMBER OF LEGAL AGRICULTURAL LOANS BY THE NATIONAL BANKING SYSTEM TO SMALL FARMERS, BY REGION OF THE COUNTRY, 1978 AND 1979.

Región	Number 1978	%	Number 1979	%
Pacífico seco	4.231	20.0	5.469	18.7
Zona Norte	2.760	13.0	4.962	16.8
Pacífico Sur	4.593	21.7	6.553	22.4
Atlántico	1.610	7.6	2.261	7.7
M.C. Oriental	3.141	14.8	4.099	14.0
M.C. Occidental	2.868	13.6	2.885	9.8
Pacífico Central	1.963	9.3	3.057	10.5
Total for Country	21.166	100.0	29.236	100.0

Source: Derived from Resumen de los Boletines N^os 30, 31, 32 y 33 D. E. E. A. - M. A. G.

typically under-capitalized and this ultimately affects their productivity.

The Use and Availability of Mechanization and Other Technical Inputs

Another important factor in raising agricultural production is whether farmers have access to necessary inputs. These include the right variety of seed, fertilizer, veterinary care, mechanization (when needed and if appropriate to the crop), pesticides and herbicides, and access to technical advise.

In the Atlantic Region, access and use of these types of inputs varies considerably depending on the type of crop, the size of holding, the farmers capital or credit position and the efficiency of services offered by private and public institutions. The highest level of technology is found on the largest and medium sized farms, especially the large banana plantations. There they obtain the highest productivity through the extensive use of fertilizer, pesticides and herbicides, and mechanical devices, though these plantations are also highly labor intensive. On the other hand, most of the small farms that are dedicated to subsistence production like maize, plantano and tubers, use very few technical inputs. Most use pesticides and herbicides and fertilizers, but with very little or no control on the amounts used. Cattle raising is conducted on natural pastures which frequently do not have the best grasses for fattening and raising beef, and there is little control of the animals as well. There are many problems with the invasion of bad weeds and there are no programs to prevent this. Veterinary care is infrequent.

Within the region there are a number of institutions which render technical assistance to farmers. Some of these institutions and their services form part of a national system, like the extension services of MAG, ITCO or the banks. Other institutions are more local in character like JAPDEVA, LA LOLA of CATIE and ASBANA.

Four institutions give technical assistance to farmers in the Atlantic Region. MAG administers its activities from the Centro Agricola Regional office in Siquirres and through five other offices. Early in 1981 MAG began to introduce a program of "Capacitación y Vistas" (C y V) which is partly financed by the World Bank. The region is divided into five micro-zones in which extension workers can concentrate their labor. Table V shows the number of farmers and amount of land in cultivation by type of crop in each zone and the respective number of contacts in each zone.

TABLE: V

MINISTERIO DE AGRICULTURA Y GANADERIA
CENTRO AGRICOLA REGIONAL DEL ATLANTICO

REGION ATLANTICA: Número de agricultores y Extensión de cultivos por zonas de trabajo.

ZONA	#Agricult.	Banano	Cacao	Plátano	Maíz	Frijol	CUADRO GENERAL					Coco	Hort.	Pasto	Animales	Otros	Total Has.	Enlaces
							Arroz	Raíces	Esp.	Café	Frut.							
Talamanca	1.023	A 232 Ha 273	A 699 Ha 5052,25	A 566 ha 1286	A 207 ha 353,71	A 104 ha 83,40	A 93 ha 77,8	A 231 ha 103,84	A 4 ha 1	A 30 ha 24,75	A 338 ha 8,86	A 120 ha 21,12	A 13 ha 1	A 211 ha 3160,95	3.964 ha -	Caña A 17 ha 5,86	A 2855 ha 10453,54	212
Limon	1.300	A 237 ha 470,85	A 525 ha 8673,7	A 395 ha 2193,9	A 94 ha 131,12	A 71 ha 152,74	A 13 ha 100	A 134 ha 137,1	A 7 ha 33,5	A - ha -	A 213 ha ?	A 201 ha 397,4	A 28 ha ?	A 243 ha 8139,8	4.801 -	-- ha 239,8+ 9.117arb+9117arb	42161 ha 20669,91	219
Dacón	1.000	A - ha -	A 701 ha 4949,44	A 483 ha 1813,25	A 101 ha 169,75	A 69 ha 47,66	A 51 ha 323,31	A 54 ha 47,13	A -- ha --	A -- ha -	A 163 ha 41,54	A 139 ha 86,95	A -- ha --	A 294 ha 4175,2	3837 ha --	A 107 ha 129,25	A 2150 ha 11753,48	200
Biquires	1.003	A 182 ha 222,15	A 404 ha 183	A 246 ha 433,70	A 200 ha 391,75	A 66 ha 33,57	A 7 ha 25,75	A 110 ha 45,97	A - 50 ha - 35	A 138 ha 389,10	A 176 ha 200,3	A 111 ha 9	A 13 ha 6	A 309 ha 10242,70	9253 --	caña A 9 ha 25,25	A 2021 ha 12208,74	212
Pocoí	1.446	A 10 ha 7	A 222 ha 561,5	A 63 ha 55,75	A 380 ha 1655,25	A 104 ha 77,5	A 15- ha 117,75	A 196 ha 152,05	A 13 ha 16,25	A 3 ha 4375	A 19 ha 8,67	A 9 ha 28	A 1 ha 1	A 920 ha 15334	A -- ha 27215 --	caña A 25 ha 48	A 1981 ha 22467,72	373
TOTAL	5.777	A 661 ha 973	A 2551 ha 19419,83	A 1758 ha 57326	A 982 ha 2701,58	A 405 ha 394,87	A 179 ha 644,61	A 725 ha 486,09	A 60 ha 50,75	A 221 ha 4788,85	A 909 ha 259,87	A 580 ha 542,47	A 55 ha 8	A 1877 ha 41052,65	22614 animales	A 159 ha 448,16	A 11222 ha 77553,39	1.185

A - Número de agricultores

Fuente - Encuesta de población, Centro Agrícola Regional del Atlántico 1981.

ITCO provides technical assistance from its offices in Bataan and Cariari to farmers in projects under its jurisdiction. JAPDEVA provides assistance to farmers mainly along the coastal fringe north of Puerto Limón. ASBANA's technical assistants emphasize the introduction of new crops into the area. Other institutions, like the Consejo Nacional de Producción and the banking system also offer specific technical advice. Unfortunately, each of these institutions operates independently of one another with the expected result: duplication and conflicting advice. The unexpected result is that, with all these institutions giving help, transference of new technologies and newly developed products to the farmers of the area is very poor. Experiments with new products which are meant to help diversify production in the region frequently remain as experiments. There are few, if any, adopters. Coordination of the activities is needed so that duplication can be avoided and so that new crops and technologies can be effectively disseminated.

Labor

Labor, of course, is the other critical input into agricultural production. Unfortunately, there are almost no data available at the regional or local level on the labor force. The one bit of data we have been able to generate shows the number of patrons and the number of salaried workers by product for the two subregions. This data gives some idea of the products that generate employment, but the information must be interpreted very cautiously for three reasons: (1) because it is from the Caja Costarricense de Seguro Social (CCSS), it only covers salaried employees covered by the CCSS system; (2) some employees are listed as being paid from outside of the region (this is true of some larger multi-national concerns); (3) it appears that small scale self-employed farmers and possibly casual labor are omitted from the list or they only appear seasonally. If anything, the numbers in the table below are probably an underestimate.

A comparison of average income for agricultural employees in the two subregions with the average income of agricultural workers for the country as a whole reveals that salaried workers in both the Pococi' and Limón subregions are considerably above the national average of \$1,200 per month. Pococi's agricultural employees are paid slightly higher wages on the average than those in Limón (CCSS, 1981). The average for Pococi' is about \$2,280 per month; the average for Limón is \$2,150 per month (CCSS; Encuesta, 1980). We attribute this to the influence of strong unions

TABLE: VI

NUMBER OF FARMS AND NUMBER EMPLOYED, BY TYPE OF
PRODUCT IN HUETAR ATLANTICA, APRIL, 1981

<u>Subregion</u>	<u>Type of Product</u>	<u>No. Patrons</u>	<u>No. of workers</u>
Limón	Banana	16	2,691
	Cacao	64	246
	Frutas	6	15
	Cereales, grains	3	87
	Hortalizas	3	7
	Caña	1	1
	Flores	1	11
	Other	1	3
	Ganado vacuno	20	89
	Potrero	3	5
	Lechería	1	1
	Selvicultura	10	109
	Pesca	1	1
	Other	1	1
Pococí	Banana	39	3,806
	Cacao	2	123
	Fibras	2	6
	Frutas	2	2
	Hortalizas	1	31
	Cereales, grains	1	1
	Ganado vacuno	26	435
	Potrero	38	90
	Ganado, Horse, Pork	5	20
	Lechería	4	14
	Selvicultura	<u>6</u>	<u>15</u>
	LIMON TOTAL	132	3,271
POCOCI TOTAL	<u>126</u>	<u>4,554</u>	
	<u>258</u>	<u>7,825</u>	

Source: Computer Printout from Caja Costarricense de Seguro Social, April 1981. San José, Costa Rica.

among the banana workers and to the large numbers of banana company employees in the region.

Finally, with the large influx of migrants to the region it is worth considering the possibility of future labor surpluses and the need to begin planning for labor absorption. Many of the in-migrants have family sizes considerably above the norm for the nation. At least one study estimates average family size among landless and near landless migrants (who compose the majority of the migrant population) as between 6.58 and 6.82 (Carvajal, Geithman & Armstrong, 1977). Many of the children of these families will be entering the labor force of the region within the next 10 to 15 years. If historic experience in other parts of the country is any precedent for the future, the labor absorptive capacity of major export crops (coffee & bananas) will diminish in future years.

"Costa Rica has developed a strong cattle industry in recent years but unfortunately it is an industry which is highly capital and land intensive and labor extensive. As a result, land values continue to rise but employment opportunities stagnate. Finally, the automation of many tasks which had previously been labor intensive (spraying of fungicides, for instance) has diminished the need for labor on coffee haciendas and banana plantations." (Seligson, 1980)

Coupled with the increasing shortage of land in the nation, it seems clear that planning for non-farm rural and urban employment in the region must begin quickly. We will have more to say about this in the discussion of agro-industry.

The Post-Harvest System

The main purpose of producing food, fibre or other raw materials is to fulfill the needs of consumers. The ability to produce, however, is only one part of the system. If what is produced does not reach the consumer or the consumer is unwilling or unable to buy the product, then the farmer is no better off and may even be worse off than before production began. What happens to a product from the time it is harvested to the time it is consumed is clearly very important to the farmer and the consumer.

The post-harvest system begins with the (1) handling of the product during the harvest and (2) its on farm storage; (3) the product may be prepared or graded on the

farm and then it might be (4) packaged for transport. Next, it may be (5) sold to an intermediary and (6) transported to a place where it is (7) processed and packaged for sale; alternatively, it may be (4a) transported and sold in its raw form to consumers by either a (5a) intermediary or by the producer. If the product has undergone processing it probably will be (8) transported again for distribution; finally, the product will be (9) sold by its final distributor.

If one of the steps in this system fails or operates poorly there may be damage to the producer, the consumer and the product. Space does not permit the enumeration of possible failures in the system for the details of the various steps differ with each product. We present here, however, a sampling of post production problems mentioned during the course of the research in the Atlantic Region:

- Rice - "There are not enough harvesting machines available and consequently the rice crop is damaged by high winds or heavy rains before it can be harvested." (Bataán)
- Rice - "The rice travels to San José for processing and packaging and then returns to us at a higher price than we sold it for." (Near Matina)
- Maize - "We are not able to transport our maize to the CNP mill in Guácimo." (Near Siquerres)
- Maize - "The CNP does not offer a fair price for our grains." (Near Guápiles)
- Milk - "The milk must travel a long way first to Puerto Viejo and then to San José because the roads to closer markets are so very poor." (Rio Frio)
- Pineapple,
Yuca - "The intermediaries do not offer a good price but we are dependent on them because we have no means of transport to market." (Near Rio Frio)
- Vegetables,
Fruits - "Many times the vegetables and fruits are too damaged or old when they arrive at the market." (Limón)

Fish - "We would like to eat more fish but there is no way to keep it fresh here".
(Near Rio Frio)

The Role of Agro-Industries

The presence of agro-industries generally leads to a series of developmental events.

1. They provide incentives for farmers to increase the production of certain products because they provide an assured market for those products.
2. They provide direct employment and generate indirect employment on farms and in other industries and services with which they have linkages.
3. They induce the nearby location and growth of other industries and services with which they have relationships.
4. Finally, the above effects usually induce higher incomes and increased multiplier effects in the local, regional and national economy.

We list these developmental occurrences because in a development planning context it is important to remember why agro-industries ought to be encouraged. The benefits (and costs) of their development must be calculated on the basis of the achievement of public goals and objectives as well as on the basis of private accounts. Put simply, agro-industries can give impetus to development; they can be used to help solve developmental problems (i.e., employment creation), but they may also present problems with respect to their profitability (especially in the initial stages of development), and in terms of their environmental impacts. Considerations of the type of agro-industry to be encouraged, where it is to be located, how it is to be financed and why, must all be calculated with these broader considerations in mind.

Perhaps the hardest matter to reconcile when promoting agro-industries is the timing of their construction. If they are built before there is enough raw material to allow them to operate at full capacity, they limp along, frequently requiring government subsidies in order to continue production. Farmers, however, are unlikely to produce much of the raw materials the industry requires unless they are assured of a market for their product. One solution to this dilemma

has been for the industry to begin a plantation of its own before the plant is constructed. The industry conducts research on the raw material and either promotes the cultivation of the product among the farmers itself or asks the help of the government (usually the Ministry of Agriculture) to help in promoting the product among farmers. In this way an industry can begin operation and gradually expand its production as raw material becomes increasingly available. This type of productive enterprise is already taking place in the Atlantic Basin as Del Campo has its own plantation of palmito and is encouraging cultivation of palmito among farmers in the area.

Once again, data on existing agro-industries is hard to find. In our search we defined agro-industries as those which processed raw materials from the agricultural sector and those which manufactured materials used by the agricultural sector (e.g. fertilizers, tools). Figure III shows the spatial concentrations of existing agro-industrial producers in the region. Finally, Table VII shows the agro-industries that have been proposed by various development institutions at the time of this writing (1981).

The recommendations for agro-industries which appear in the next section are based on six major considerations: (1) the recommendations for the optimal location of specific crops (see Figure V on Recommended Agricultural Zoning in Huetar Atlantica and the accompanying report by Ulate & Mora, 1981); (2) availability of raw materials and the possibility of creating forward and backward linkages in the economy; (3) existence of infrastructure and services; (4) feasibility studies; (5) environmental impacts where it was possible to assess them; and (6) the need for employment creation and priorities for import substitution.

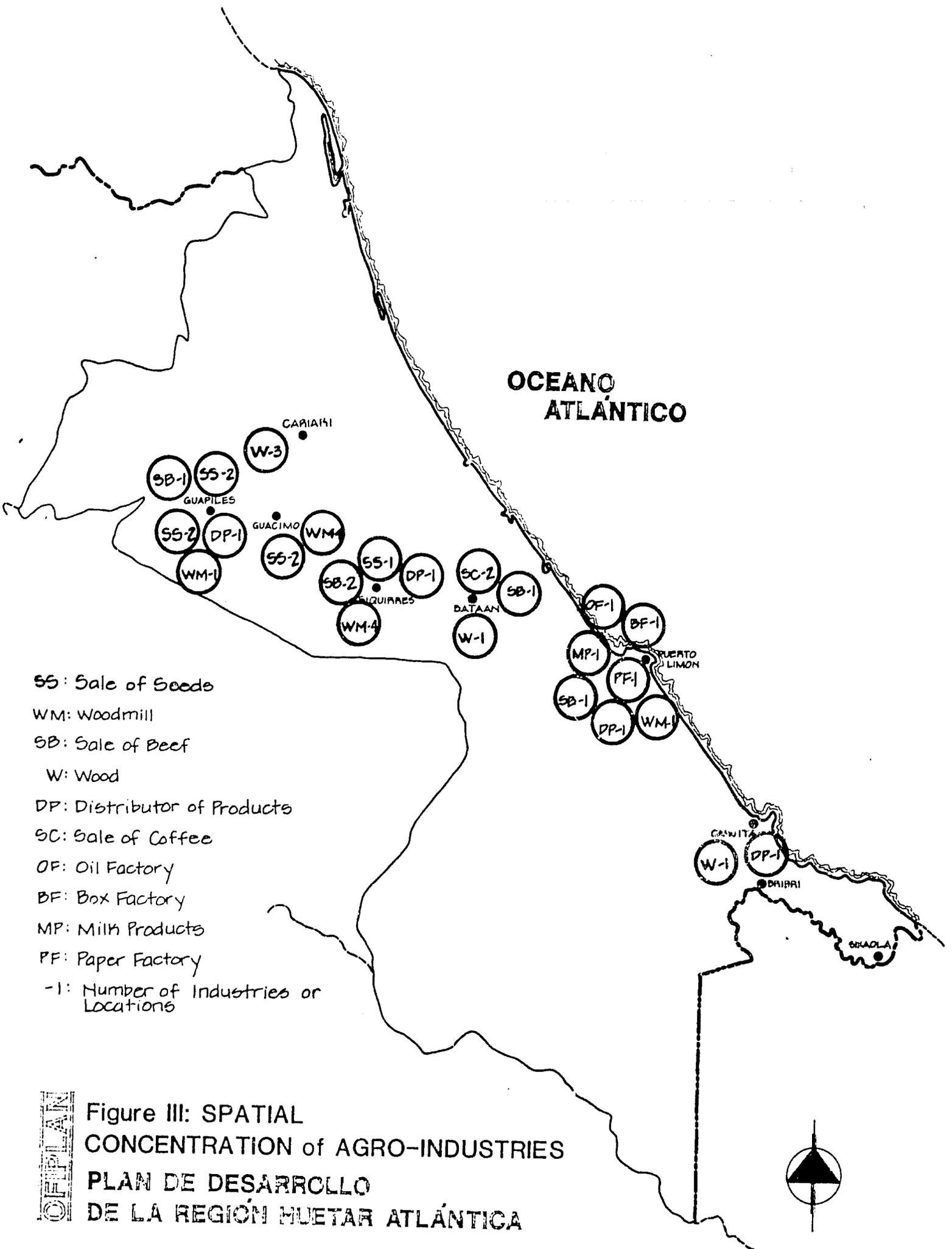


Figure III: SPATIAL CONCENTRATION of AGRO-INDUSTRIES
PLAN DE DESARROLLO DE LA REGIÓN HUETAR ATLÁNTICA

RECOMMENDATIONS

The recommendations which follow are divided into two parts: the first eight recommendations are suggested as the basis for agricultural development policies which apply to the Atlantic Region as a whole. Some of these recommendations will require coordinated effort by several institutions in the government, but others can be effectuated by one institution alone. The last two recommendations each have multiple parts and are more specific in terms of their location within the region.

1. The Spatial Extent of Agricultural Development:

Agricultural production should be encouraged first in those areas of the region that have the best soils, climatic conditions, environmental conditions and supporting services and infrastructure. Intensive, mixed farming can be encouraged in the areas with the best soils, and more intensive cultivation of high value crops can be encouraged in suitable zones. (See Map Appendix for the map of soil capacity and Figure for recommended agricultural zones and the accompanying report by Ulate & Mora, 1981). Farmers should be discouraged from trying to bring the least productive, marginal or environmentally sensitive lands under cultivation until the land most apt for production is fully utilized. MAG and ITCO will need to work together on this.

2. Diversification of Agricultural Production:

A more diversified agriculture is needed in both subregions, but the aims and priorities of diversification in each subregion must be carefully planned. One reason to diversify is to remove the region from its current dependence on the exportation of one crop, the fortunes of which are controlled by external market forces. Another reason to diversify is to better serve internal markets by producing food and materials which substitute for current imports and which generate new employment and income for Costa Ricans in the processing, transport and marketing sectors of the economy.

A. Pococi' Subregion: The strategy here is to promote the cultivation of additional crops that will feed the local and the national population without curtailing the production and export of the leading crop, bananas. (See recommendation No. 10 for specific crops for promotion.) In addition, new rural activities, like agro-industries, should be promoted that utilize existing raw materials. In this way, forward linkages are created that lead to new employment and enhanced

multiplier effects which benefit the region and the nation. (See Recommendation No. 9 for agro-industries to be established.)

B. Limón Subregion: The demise of the cacao crop in Limón may actually present opportunities for diversification that have been overlooked before. Attempts to diversify agriculture in this area will need intensive efforts of technical assistance and careful consideration of suitable crops for the zone. Some diversification, especially of short term producing crops can be achieved while the cacao-tales are being rehabilitated.

C. Both Subregions: One of the best ways the government can help itself out of its current financial dilemma is to use the agricultural potential of both subregions to provide foods and raw materials for Costa Ricans, and thereby cut down on the outflow of foreign exchange while providing new employment and income which is retained in the country. (See, for example, the need for production of oils from palm oil under Recommendations No. 9 and No. 10.)

3. Utilization and Protection of the Environmental Base:

Parts of the Atlantic Region have good potential for intensive agricultural production but these areas will soon be exhausted unless the ecological relationships are respected.

A. Soils: All soils, even the best alluvial soil, must be maintained, replenished and protected from unsuitable uses. Training new settlers as well as present landholders in soil conservation must be a focus of technical assistance in the region. MAG and ITCO must emphasize this in all areas under their jurisdiction.

B. Suitable Crops: Though technological advances and experimentation for the purpose of diversification are important, the best answer to high production levels and stability of production for the region is to cultivate crops in which the region has a natural comparative advantage because of their environmental suitability. Forcing cultivation of unsuitable crops leads to inferior quality products and to environmental degradation. Recommendations for specific crops appear in Recommendation No. 10, and their locations appear in Figure v.)

C. Tree Farming: The commercial cultivation of forests is possible, but it must be carefully coordinated

with the establishment of nurseries (for indigenous species of high value and for other exploitable species) and with continuous reforestation programs.

D. Chemical Inputs: The use of fertilizers, pesticides and herbicides must be carefully monitored. Small and medium size landholders frequently do not know how to use proper amounts of these chemicals, and commercial large scale growers generally use excessive amounts. The result is that exports are sometimes tainted and rejected (as happened recently with a shipment of bananas to the U.S.), rivers and the water table are polluted and fish, livestock and humans may be endangered. Consider the introduction of an integrated pest management program in some areas of the region.

4. Coordination of Land Distribution, Agricultural Planning and Regional Development:

The efforts of ITCO to distribute and title land and to promote a variety of agricultural products in the region are extremely important. However, ITCO's activities cannot proceed in a vacuum. Priorities for infrastructural connections, for the location of agro-industries, for the promotion of certain crops and for the generation of employment must all be more closely coordinated. OFIPLAN, ITCO, MOPT, MAG, the public corporations (Expresas estatales) like CODESA and DAISA, and private investors must find a way to more closely coordinate their plans and their current activities.

5. Credit:

Even though credit is unavailable at this time, the situation will change in the future. When credit is once again extended, efforts must be made to increase the total amount directed to the Atlantic Region. Efforts should also be made to increase the amount of credit extended to small holders in the region. Over the next decade at least, small landholders will form the agricultural base of the region and their production must be stimulated. Efforts to diversify production in the region require that the basis for extending credit, which has been according to traditional crops (cattle, maize, bananas) will have to change in favor of newer, high value crops (ginger, ramio, oil palm) and crops given priority for development.

6. Transmitting Technology and Inputs to Farmers:

The number of different institutions engaged in offering technical assistance to farmers in the region represents

a wealth of resources. Unfortunately, these resources are being wasted because they duplicate activities and lack coordination. Meanwhile, important information about new products is not being effectively transmitted to the farmers. The result is that experiments remain as experiments; few, if any, farmers adopt new crops or new techniques.

A. Establish one regional authority to coordinate technical assistance and extension services to farmers in the region.

B. Coordinate the introduction of new crops with the activities of this regional authority and intensify efforts to transmit information to potential adopters.

7. Resolving Gaps in the Post-Harvest System:

There is a great need for information about the specific post-harvest needs of each crop and about the potential of each crop to be integrated vertically into a productive system. (See Appendix of this report, "A Note on the Availability of Information for Agricultural Development", for further discussion of this point.) Based on limited information, the following recommendations are made for specific crops and areas.

A. Establish central buying cooperatives for producers of the following crops:

Platano, tubers - Siquirres
Milk - Guápiles, Siquirres, Limón
Maize - Enlarge the CNP mill in Guacimo

B. Coordinate priorities for repair and construction of the transport system with priorities for product development and location of agro-industries. Milk produced at Rio Frio should not have to travel all the way to Puerto Viejo and then to San José for processing and sale when Guápiles is so close!

C. Consider the establishment of small, private "cold stores" throughout the region to store fresh fish or other seasonal products for wider distribution and sale. These need not be large or elaborate markets; they may consist only of a freezer and small storage house, and they can easily be owned by private, small scale entrepreneurs. Alternatively, they can be financed by public corporations as a means of increasing the production and consumption of protein throughout the region.

D. Consider the future establishment of a rice mill near Bataan. Current rice production levels in the area do not warrant the immediate establishment of a mill but five to seven years of increasing production will. (See Recommendation No. 9 on the establishment of agro-industries.)

8. Planning for Future Employment Needs:

Increasing numbers of persons will be entering the labor force in the Atlantic Region over the next 10 to 15 years. (See Population and Employment in Huetar Atlantica, Bess, 1981.) Access to productive land and to employment connected with major export crops is becoming increasingly limited. There is already a problem with unemployment in Limón and there is expected to be more unemployment there in the future. Planning for rural, non-farm and urban employment in the region must begin immediately if the expected contribution to the labor force is to be absorbed. Clearly, the need to generate employment will influence choices about the types of crops to be promoted and the way in which they are cultivated (i.e., some consideration may have to be given to the promotion of labor intensive crops and to the use of labor rather than machines as a means of cultivation). The need for employment will influence agro-industrial development as well.

9. Establishing Agro-industries:

The specific recommendations which follow take into consideration the six factors mentioned in the section on agro-industries earlier. In many cases, more information about the details of processing and about the uses of by-products is needed. In each recommendation we try to indicate what type of additional information is needed in order to make a final decision on each project. Table VII summarizes the information available for each project. The recommendations below are divided into three groups which represent general priorities according to availability of material and potential to develop raw materials, and the need for new industries and services related to agriculture.

Group A: The first priority is to develop agro-industries based on those materials which are already in surplus in the region. For example, there are three agro-industries proposed for the region that use rejected bananas for their raw material. These industries can create forward linkages to other sectors of the economy and backward linkages to agriculture as well. It is estimated that the banana plantations reject some 60

thousand tons of bananas each year; they dispose of them primarily by dumping them into rivers or simply allowing them to decompose near the plantations. The utilization of the waste product is therefore quite attractive from an environmental and economic viewpoint. Each of the industries discussed below is in varying stages of investigation. We urge that studies be completed as soon as possible, and that attention be given to potential for employment creative in each and to justification of each product on the basis of import substitution. The possibility of establishing linkages with other industries ought to be investigated, and the question of whether there are efficiencies to be derived in production (since all three use the same raw material) by agglomeration should be addressed too.

A-1. First priority: Establish the banana flour industry in Guápiles: This product is to be used for animal feed (cows and pigs), and there is an existing market for the product in the surrounding area as well as in other areas of the country. For example, there is a pig farm and slaughtering house very near Guápiles on the road to Rio Frio. Transportation from the banana plantations surrounding Guápiles will have to be upgraded. (See Transportation in Huetar Atlantica, Stapleton, 1981.)

A-2. Second priority: Establish a factory to produce glue from bananas: There are three possible locations for the industry; in priority order they are Limón, Guápiles or Siquirres. The glue produced by this industry will be used, presumably, for the production of boxes and other paper containers. There is an existing paper box factory in Limón, and there are plans to locate a paper pulp mill in the region. Clearly, there is a natural linkage between these industries. We recommend three potential sites for this industry depending on the ultimate location of the paper pulp mill and on the possibility of creating linkages with an existing or new paper box factory. Limón seems a logical first choice because of its need for immediate employment creation and because it has potential (through the development of the Zona Franca) to install the necessary pollution control and waste water facilities that are important in the development of a paper pulp mill. On the other hand, location in Guápiles or Siquirres can be justified on the basis of access to the raw material for the industry and on the basis of possible location of a carton manufacturing industry near the source of demand by the banana companies. Demand for cartons by the banana companies may not be sufficient to justify carton production in these latter two locations, whereas an existing carton manufacturer in Limón might expand pro-

duction to include many different types of boxes and containers to serve projected industries in the Zona Franca. We do not recommend Matina either for the glue factory or for the pulp mill because of existing environmental hazards (flooding), and because this area has the best alluvial soils in the region and should not be used for urban settlement or industry, but for intensive agricultural production. Moreover, wastes from the pulp mill will add significantly to environmental hazards in the area and destroy the fertile land there.

A-3. Third priority: Establish an industry to produce alcohol from bananas: The recommended locations for this industry are also in priority order, Limón, Bataan or Siquirres. More specific information is needed about the processing requirements and possible linkages for this industry. It would be helpful to know, for example, if the industry uses or makes waste products that can be used by either of the other two banana-using industries. Since this industry draws on the same sources of material as the other two, it is important to know whether raw materials will be sufficient for all three and whether there is any advantage in agglomeration.

A-4. Fourth priority: Establish industries to produce milk products to supply local subregional demand. Enough milk is available in either subregion to support an industry and the industry's presence would give impetus to increased production. Recommended locations for establishment are Guápiles and Limón.

Group B: The second group of agro-industries is composed of those processing plants which are currently undersupplied with raw materials, but for which there are short term (within two to five years) prospects for the development of sufficient material to support industrial production.

B-1. First priority: Increase production of palmito pejibave for existing processing plants which are currently undersupplied with raw material: For example, Del Campo in Horquetas has need of more material. Palmito is ready to be harvested within 18 - 25 months after planting. If production increases rapidly, there may be enough new raw material available to supply a second plant proposed by DAISA in Guapiles within the next five years.

B-2. Second priority: Consider the establishment of a palm oil processing plant: Two possible locations are recommended; in priority order they are Limon and Sixaola. Palm oil production can lead to many forward linkages to

other industries, among them the bottling of cooking oil and the production of soaps. This industry would significantly reduce imports of fats and oils into the country and the subsequent outflow of foreign exchange. Production of palm oil and other industries linked to its production are good employment generators but they require access to transportation and to other production inputs (bottles, lablis, tins, cartons), and they require good transportation for distribution. The establishment of an oil palm processing plant in Limón where it has access to other industries and to good transportation will mean that the transportation route between Limón and Sixaola (where primary material is currently produced) will have to be significantly improved during the time that the production of oil palm is being increased (an estimated five year period). There is the possibility of establishing a processing plant in Sixaola and other small plants along the coastal fringe where oil palm can be grown. These plants would generate employment in local areas but transportation for the oil for use in other products would still have to be improved. The alternative, transportation of the product through banana, risks the leakage of potential multiplier effects.

B-3. Third priority: Establishment of a plant for the processing of coconut oil. The rationale for the establishment of these plants is the same as for the palm oil processing plants. The location of several smaller plants along the coastal fringe where coconuts are grown should be investigated because the raw material is both bulky and heavy. More information is needed on possible linkages with producers that utilize the by-product (coconut husks) of the process. Possible locations are Limón, Cahuita or Sixaola.

B-4. Fourth priority: Establishment of a plant to process ginger: Siquirres is the area around which ginger is grown, and it seems logical to establish a plant in this town. Unfortunately, there is little data on the exact amount of ginger now being produced. Also there is some question about the exact nature of the product of the plant whether it is to be dried ginger or bottled ginger root, both of which are used as spices in cooking. There are evidently good prospects for the export of ginger and for other spices as well. Some thought might be given to using the same plant for production and export of other spices that can be grown in the same area.

B-5. Fifth priority: Establishment of a rice mill in Bataan: We have discussed this briefly in Recommendation No. 7 above. Apart from generating a good deal of employment, the rice mill also may create a demand for

closely woven fibre bags and it may produce other types of foods for humans and animals using rice bran, rice cereals and rice hulls.

Group C: The third group of agro-industries consists of those industries that directly supply the agricultural sector with needed products and services. During the course of our research we have noted the need for some of the industries suggested here.

C-1. First priority: Encourage the establishment of enterprises that fabricate, repair and sell agricultural equipment and tools: All the tools, machines and spare parts used by farmers need not be imported. Many simple machines, like the on-farm cacao dryers, can be locally made using a minimum of imported materials. Facilities for the repair of farm machinery were conspicuous by their absence throughout the region. Provision of these facilities presents a fine opportunity to promote special programs to train youth and unemployed persons as machinists and mechanics to specialize in the fabrication and repair of farm equipment. Recommended locations are Rio Frio, Guápiles, Siquirres, Bataan, Limón, Cahuita, Bribri and Sixaola. No locational priority is recommended as these industries should be located in many places.

C-2. Second priority: Encourage the establishment of small firms that fabricate fibre bags, other containers for agricultural products: We have already discussed the possibilities for the fabrication of boxes and cartons, however, fibre from local plants (sisal, coconut, etc.) can be used for bags. At the present time one sees the woven plastic bags being used everywhere. These bags are made from imported fibres and because they use a petroleum based product their price will eventually climb. While the plastic bags have some advantages, they are not biodegradable; that is, they are never reabsorbed in a natural form into the environment. One sees bits and pieces and shreds of these bags everywhere - and they will never disappear. Local fibre bags can be manufactured in several locations in the region; Limón and Cahuita are two possible locations.

C-3. Third priority: Encourage the establishment of small firms that process by-products from other crops or animals into fertilizers and mulches: We have discussed earlier the need to conserve soil quality and the use of mulches has been discussed elsewhere (see Environmental Management in Huetar Atlantica, Lyle, 1981). Many by-products of crops (rice straw, husks of cacao, etc.) can be processed and used as mulches; some of these are even

used in ornamental plantings and can be sold outside the region for use in landscape design. Fertilizers can also be locally produced from local materials; they need not be composed entirely of imported chemicals. Guápiles and Bataan are two possible locations for production.

C-4. Fourth priority: Encourage the establishment of firms that specialize in the construction, repair and sale of storage facilities and barns for livestock:

Different types of crops and livestock require different types of storage and living accommodations. Design and construction of large scale poultry units can be quite specialized, for example. Design of storage units for other types of crops grown in the region may require specialized design as well. Some of these units and special sorting and grading equipment may be needed fairly soon by newly established central buying cooperatives. Guápiles and Limón are two possible locations for this activity but there is need for it in other towns as well.

Group D: The last group of agro-industries consists of those industries that need a long lead-time to develop either because the industry requires large amounts of money to finance or because the raw material it uses takes a long time to be developed or possibly because more study on the exact nature of the product or processing is needed. Generally, these are industries which in our judgment will take five to ten years to develop.

D-1. Establishment of a plant to produce textiles and animal feed from ramio: Small amounts of ramio are being produced in the Pococi Subregion. Unfortunately there is little information on the amount of time needed to produce plants that will yield sufficient amounts of fibre for textile production. There is also little information on the exact nature of the processing, although it is believed that the ramio fibre will have to be combined with another fibre in order to produce the textiles. The plant is being promoted on the basis of supplying an export product, however, competition for a place in the world textile market is extreme, and the market for this product as an export is far from assured. On the other hand, the establishment of the plant might decrease the amount of textiles now imported into the country, and the employment generated from the textile mill and proposed animal feed processing operation would be substantial. Guápiles or Siquirres are possible locations for the industry, but much more information is needed about the processing and transportation requirements and about the production of ramio before a specific determination as to location can be made.

TABLE: VII

RECOMMENDED PRIORITIES FOR AGRO-INDUSTRIAL PROJECTS

Group & Priority	Project	Antecedents	Product	Market	Location	Services & Infrastructure	Direct em- ploy- ment	Environmental impact (positive negative none or unknown)	Name of promoter	(\$1-15) Million C investment
GROUP A:										
A-1	Harina de banano	Materia prima disponible. Existen estudios elaborados	Alimentación animal	Internal	Guápiles	Exist 12 different services; carretera lastrada, ferrocarril, campo aterrizaje	26	Positive-uses Waste material	OPIPLAN SEPSEIC COOP.	11.00
A-2	Almidón	Materia prima disponible; existen estudios; existe planta piloto en Coto 47	Almidón para pegamento cajas cartón	Internal	Limón Bataán Siquirres	Existen servicios carreteras y ferrocarriles	20	Positive-uses Waste material	SEPSEIC OPIPLAN COOP.	5.23
A-3	Alcohol de banano	Materia prima disponible; existen estudios. Hay empresas particulares interesadas	Alcohol 96GL ser usado como combustible	Internal	Limón Bataán Siquirres	(same as above)	35	Positive-uses Waste material	SEPSEIC Privado	13.08
A-4	Fabricación de productos lácteos	Materia prima disponible	Productos de leche	Internal	Guápiles Limón	(same as above)	?	Unknown	?	?
GROUP B:										
B-1	Palmito de peji-baye	Materia prima existen pero se necesita aumentar. Existen procesadoras y posibilidades para más procesadoras	Corazón de palmito enlatado	Export Europe (France) U.S.A.	Horquetas	Existen 12 servicios, carreteras etc.	80	Unknown	SEPSEIC DAISA	15.00
B-2	Aceite de palma africana	Materia prima; existen, pero se necesita aumentar. Existen.	Aceite para jabón, cosméticos, cocinar	Internal	Limón Sixaola	Existen servicios carretera Existen 6 servicios La condición de las carreteras no es muy buena	?	Unknown	Chiriquí Land Co.	?
B-3	Aceite de coco	Materia prima existe, pero se necesita aumentar	Aceite de coco; raspadura de coco	Internal Export	Limón Cahuita Sixaola	Existe en Limón. Se necesita aumentar en Cahuita y Sixaola	31	Unknown, but likely to produce waste product unless husks are utilized	OPIPLAN BID ASBANA	7.32
B-4	Procesadora de jenjibre	Materia prima existe, pero se necesita aumentar. Existen estudios.	Jenjibre deshidratado	Export, pero se requiere más investigación	Siquirres	Existen pocos servicios (6). Carreteras necesitan reparación y extensión	20	None	SEPSEIC	2.09
B-5	Piladora de arroz	No existe suficiente materia prima	Arroz	Internal	Bataán	Existen	?	None	?	
GROUP C: (More information is needed for all the following:										
C-1	Fabrication repair and sale of agric. tools and mach.	Few if any establishments of this type exist in the region	Agricultural Machinery & tools	Internal	Guápiles Siquirres Bataán Río Frio Limón Cahuita Bibri & Sixaola		5-10 (estimate)	Unknown	?	
C-2	Fabrication of fibre bags	Raw material from coco ramio available	Bags	Internal	Limón Cahuita		?	Unknown	?	
C-3	Production of fertilizers and pulches	?	Fertilizer mulch	Internal	Guápiles Limón		?	Unknown	?	
C-4	Construction, design, repair of storage	No firms in region specifically dedicated to this	Storage and livestock facilities	Internal	Guápiles Bataán		?	Unknown	?	
GROUP D:										
D-1	Planta industrializadora de Ramio	No existe suficiente materia prima	Fibra y materia prima para concentrados animales	Internal (Export no es muy competitivo)	Guápiles Siquirres	Existen	101	Unknown	SEPSEIC	97.97

D-2. Establishment of a paper pulp plant. We have no information on this proposed industry at this time. However, paper pulp plants are generally quite costly to establish and require huge amounts of wood products to operate efficiently. In view of these factors, and the severe environmental impacts of both the deforestation and the discharge of waste products, establishment of this type of industry appears to be best put off until a definite plan for commercial tree production can be established and until adequate waste disposal or treatment facilities can be built. (We have discussed this briefly in conjunction with the establishment of a glue industry.)

10. Recommendations for specific crops:

It is suggested that attention be directed to the development of the following crops first. Research needed for the development of alternative crops can proceed simultaneously. (For recommendations as to the best location for cultivation, see Figure V on Agricultural Zoning and the accompanying report by Ulate and Mora, 1981.)

- A. Bananas: Continue research and production techniques to maintain and expand exports to other parts of the world. Bananas produced in Sixaola are shipped through Panama; remedy this economic leakage by improving the transport linkages between Sixaola and Limón. Begin immediately the necessary steps to establish industries that utilize bananas.
- B. Palmito Pejibaye: This crop has strong potential as a lucrative export commodity. There is strong demand in Europe, especially France, and growing demand in the U.S.A. The only significant competition in production of this crop comes from Brazil, but it is generally agreed that Costa Rica has better stock and a comparative advantage with respect to transport. Promotion of this crop is especially important because it generates substantial direct employment both in the processing plant and on the farm.
- C. Palma Africana: The perfect combination of conditions for growing this crop exists in the Atlantic Region, especially along the coastal fringe and most especially in the Limón Subregion. This crop has significant potential to create forward linkages to other industries, especially to the production of cooking oils, soaps, and cosmetics. Costa Rica is presently heavily dependent on the

importation of oils and fats; placing an immediate priority on production of this commodity for use in internal consumption will significantly reduce the outflow of foreign exchange in this area and generate employment and internal multiplier effects as well.

- D. Coconuts: Another crop for which good conditions exist in the Atlantic Region. Many of the same potentials for use exist with this crop as with Palma Africana. More information is needed as to the exact type of coconut that will produce the best results.
- E. Ginger: This crop combines high productivity with high value. In addition, it can be grown on relatively small parcels with a high return to the producer and this crop is productive in a very short time. Better marketing procedures for producers need to be established; it may be necessary to encourage formation of a buying cooperative. Attention needs to be directed to the development of a local agro-industry to assure a market for this crop, and to the development of the export market for the processed product. The possibility of developing farms that specialize in ginger and other spice crops ought to be explored.
- F. Cacao: This crop needs immediate attention to bring about its restoration as a primary crop in the region. The best prospects for its sale lie in the internal market where all that can be produced will be bought by processors at a good price. This will reduce the amount presently spent on imported cacao and will enable existing producers to increase production and employment.
- G. Ramio: Production of this crop should be encouraged in order to reduce the country's dependence on imported cotton textiles. Information about the production of other fibres used for blending with ramio and other processing needs must be forthcoming immediately in order to assure that this product can be used successfully in textile production.
- H. Rice: Areas now dedicated to the production of rice should maintain and increase their production in order to assure that Costa Rica maintains self-sufficiency in this widely consumed product.

- I. Cattle and other livestock: In order to meet the protein needs of the region's population, the raising of dairy cattle, beef cattle, pigs, and other livestock has been recommended. With respect to the development of dairy and beef cattle, we recommend that in addition to pastures, a stable, year-round feeding program be introduced. This will help to increase the return on the investment in the cattle and lessen the adverse effects of exposure to parasites and poor pasturing conditions. Banana by-products, rice straw and hulls, and other crop by-products can be effectively used as feed. Use of these feeds will hasten the fattening process and improve the overall quality of the animal and its products.
- J. Corn: It is recommended that this crop be raised on a commercial basis for animal feed and not simply as a subsistence crop. Because of the climate, large scale commercial production of maize may not be possible; nevertheless, the establishment of agro-industries that produce animal feed from various by-products in the area will provide a market for increased production of this crop.

APPENDIX 1-B

A NOTE ON THE AVAILABILITY OF DATA FOR AGRICULTURAL DEVELOPMENT PLANNING

In order to develop national, regional or sectoral plans, planning staffs must have information which permits analysis of the historic trends and the existing situations in a given economic sector or in a specific geographic area. They must also have information on expenditures for, and the results of specific programs and projects. Unfortunately, this type of information in Costa Rica is virtually non-existent; what exists is completely inadequate for the task at hand. Much of the information needed for planning in the agricultural sector is not available on a timely basis, nor is it in usable analytic form. The information that does exist is insufficient on such crucial factors as size of farms, technology and input use, credit availability, access to technical assistance, current land use, labor and employment rates, and the type and amount of crops being grown. Yet such information is indispensable for sound program and project planning in the agricultural sector. Below are some suggestions for data collection and for the use of that data in future agricultural planning.

1. Data are needed to analyze national policy alternatives.

Data needs to be collected on specific products in a consistent manner over a long period of time. This type of data enables the government to analyze production patterns for specific crops and to forecast the impact of national policies with respect to those crops. For example, raising trade barriers and tariffs on certain inputs in order to protect "infant industries" that will supply agricultural inputs; the effect of placing priorities on certain transportation routes or of placing priorities on the development of certain crops meant to develop self-sufficiency. Because this type of data is lacking, it is difficult to determine with any degree of certainty what impact national level decisions will have on production and prices, on the producer and the consumer. Below we see one example of the way data like this might be used.

In order to determine the price elasticity of demand, and to recognize the role that exports, transportation, and marketing channels have on the production process, a regression equation of the following form was developed.

$$Y_j = A + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + U$$

Where: Y_j = the price of commodity j

X_1 = Consumption of commodity j in the domestic market

X_2 = Quantity of export of commodity j

X_3 = Cost of transportation of commodity j

X_4 = Marketing channels

U = Other factors not accounted for, the disturbance term.

We attempted to collect data for at least five leading products: banana, platano, maize, beef, and cacao. Below, are the results of this model for beef production. The raw data used appear at the end of this "note".

$$\text{Beef: } Y = -7648 + 1.71X_1 + 0.27X_2 + 1217.4X_3$$

(1.939.7) (3.69) (0.54) (924.5)

$$R^2 = 89.2 \quad n = 11$$

In this model, it is observed that the domestic consumption and export factors (X_1 and X_2) have a negligible effect on prices. The transport cost coefficient (X_3) appears to be significant at the 5% probability level. The cost of transportation has a significant effect on the price of beef.

A second analysis was performed where quantity produced was examined as a function of price in the domestic and export market as well as the transportation cost and marketing channels. The results are summarized below.

$$\text{Beef: } Y = -147.7 + 1.28X_1 + -0.02X_2 + 0.96X_3 + 0.01X_4$$

(336.6) (0.48) (0.05) (0.69) (0.03)

$$R^2 = 99.9 \quad n = 11$$

Once again, we see that transportation costs are the most important factor in relation to quantity produced. Though we need to use a great deal of caution in interpreting the results of this very preliminary model, we might say that insofar as national policy is concerned, if beef production was given high priority, than an associated high priority must be given the development of adequate transportation for that commodity.

2. Data are needed to analyze the efficiency of the internal commodity system:

(MAG, with the help of USAID, currently has a program that is investigating the use of the following approach.) The data collected for this type of analysis describes a vertically integrated system that includes the total production, processing and marketing system of each individual commodity. Each and every element in the total production system is described, usually in chronological order. This approach highlights segments of the production chain which can be improved. If it is a new commodity, the analysis indicates the elements which must be established before the anticipated benefits can be realized by the producer. Each of the steps identified in the continuum of production is evaluated to determine what inadequacies exist. Examples of the integrated commodities system approach are already found in Costa Rica in such products as bananas, coffee, sugar and beef. Below is a list of 23 points that might be examined for each specific commodity and on which data might be collected in order to perform this type of analysis (USAID, 1979).

1. Develop a farm.
2. Obtain technical information.
3. Develop a plan for the farm.
4. Obtain credit for inputs.
5. Purchase or provide inputs.
6. Obtain labor.
7. Clear land; prepare soil.
8. Plant the crop or crop mix.
9. Weed crops.
10. Fertilize crops.
11. Control insects and diseases.
12. Perform other miscellaneous practices.
13. Harvest the crop.
14. Handling and transport from the field.
15. Post-harvest handling.
16. On-farm storage.
17. Assembly-preparation-grading.

18. Preprocessing-grading-packaging.
19. Transport.
20. Storage.
21. Assembly-processing-packaging.
22. Transport-distribution.
23. Sales to consumers.

While the above system describes a vertically integrated system, the steps within it for a given commodity will vary because of social, economic or technical reasons. Nevertheless, the commodity systems approach provides the comprehensive view and framework for identifying the relevant and important factors at an early stage of product development and for the design and implementation of responsive programs and projects.

It should be pointed out that the type of data collected for this type of study is very special to each of the crops that is being investigated. On the other hand, since it outlines the structure and essential elements of production for each, it provides a basis for establishing inter-relationships between the elements of the system and for insuring that all the important links of the system are in place at appropriate times. Obviously with respect to the planning of specific crops, whether they are new or existing crops, this type of information is essential.

3. Producers and potential investors need information at the farm level:

Farmers' decisions on production are based on economic incentives, i.e., the income they earn from their land. To be able to reach a higher level of productivity, it is essential for farmers to have information on the output of crops and animals and on the costs of production. It is also necessary for agricultural planners in the region to have similar information at the local and regional level. At the present time, exact information like this is not available; farmers' and government agencies make decisions about what to grow on an arbitrary basis. A simple approach to calculating farm production and income is suggested below. It can be adopted by extension agents and it can be taught to farmers in various areas and used as the basis for collection of farm level data.

Production figures in the Table shown should be determined on the basis of crop areas and yields; and these figures multiplied by the corresponding prices, give the existing

product of the area. The prices and level of consumption of non-agricultural goods and services (fertilizers or veterinary services) are calculated under the heading of variable costs. The difference between the gross product and the costs (both fixed and variable) gives the gross value-added at the farm level. Net value added is obtained by deducting depreciation costs from the gross value-added figure. Net value-added consists of the income from factors of production and consequently includes all financial and rental expenses, the cost of wage earning of family labor, and taxes. By deducting taxes from the net value-added, farm income can be obtained. To calculate profitability in real terms, output and costs should be evaluated on the basis of supporting prices. The "opportunity cost" of farm labor would have to be deducted from the value added to obtain the real farm profits of the region. This type of calculation will be helpful in determining the profitability of various crops for each farmer. In addition, it may be especially helpful on a regional and district basis for MAG technicians; they can then recommend various ways to increase each farm's productivity to the farmer.

TABLE VIII.
FARM LEVEL ACCOUNTING

B-48

I. CROP PRODUCTION	AREA		AVERAGE YIELD (Ton/ha)	OUTPUT (t)	PRICE (per.t)	GROSS PRODUCT	VARIABLE COSTS		TOTALS
	Ha.	%					FERT. AND PEST.	OTHER per ha.	
BASIC GRAINS Cereals									
1.									
2.									
TOTAL									
COMMERCIAL CROPS (EXPORT)									
1.									
2.									
TOTAL									
FIELD VEGETABLES Ornamental Horticultural									
1.									
2.									
3.									
TOTAL									
FALLOW LAND YOUNG PLANTS									
OTHER									
1.									
2.									
TOTAL									
TOTAL CROP PRODUCTION									
II. LIVESTOCK PRODUCTION	HEAD	TON/HEAD	OUTPUT (t)	PRICE Per t	GROSS PRODUCT	VARIABLE COSTS		TOTAL	
						CONCENTRATES	VETERINARY SER. MISC.		
CATTLE									
{ milk									
{ meat									
{ other									
Pigs									
{ meat									
{ other									
OTHER ANIMAL PRO- DUCTION									
TOTAL ANIMAL PRODUCTION									
FIXED COSTS	Colones					Per ha	TOTAL		
ENERGY									
MAINTENANCE OF F- MACHS									
DEP. OF MACHIN- BUILDING									
...									
TOTAL (Fixed Costs)									
							TOTAL GROSS PRODUCT (Crop + Animal Product)		
							TOTAL EXPENDITURE (FIXED + VARIABLE COSTS)		
							VALUE ADDED		
							- OPPORTUNITY COST OF MANPOWER		
							FARM PROFIT		

BIBLIOGRAFIA

- Bogan, M. Raabe, C. (1976) "Proyecciones Regionales de la Población de Costa Rica," IDEPSA: Informe 5, San Jose, Costa Rica.
- Boyer, J. C. (1980) "Análisis de Factibilidad Social para la Vertiente Atlántica. Programa de Reestructuración La Titulación del Area," USAID: San José, Costa Rica.
- Carvajal, M. Geithman, D. T. y Armstrong, P. R. (1977) "Pobreza en Costa Rica". Dirección General de Estadística y Censos, San José, Costa Rica.
- C.C.S.S. CAJA COSTARRICENSE DE SEGURO SOCIAL (1981) Lista de Empleados Contribuyentes (Informe de computadora).
- Censo Agropecuario, 1963.
- Censo Agropecuario, 1973.
- CSUCA, (1979) "Estructura Demográfica y Migraciones Internas en Centroamérica". EDUCA: San José, Costa Rica.
- OPSA (1979). "Diagnóstico del Sector Agropecuario de Costa Rica, 1962-1976", San José, Costa Rica.
- Sáenz P. y Knight, C. F. (1971). "Seguridad de Posesión, Titulación y Desarrollo Agrícola en Costa Rica." San José, Costa Rica.
- Seligson, M. (1980). "El Impacto del Programa de Titulación en Costa Rica: Análisis basado en un estudio piloto." San José, Costa Rica.
- USAID, (1981) Asentamiento Agrario y Productividad. Proyecto (mimeo) USAID, Washington, D. C.

BEEF

Years	Production		Consumption		Price Colon/MT	Exports		Transportation Cost Colon/MT-Km
	Vol. (MT)	1000 Value (Colon)	Vol. (MT)	1000 Value (Colon)		Vol. (MT)	1000 Value (Colon)	
1970	20,734	56,666.0	2,592	6,583.7	2,733	18,142	54,661.8	0.40
1971	21,598	60,971.2	2,699	7,152.4	2,823	18,899	57,604.2	0.42
1972	22,498	73,613.5	2,812	8,014.2	3,272	19,686	73,487.8	0.43
1973	23,435	99,575.3	2,929	11,452.4	4,249	20,506	96,152.6	0.45
1974	24,335	103,642.8	3,042	12,746.0	4,259	21,293	92,198.7	0.56
1975	25,020	108,511.7	3,128	11,730.0	4,337	21,892	102,753.2	0.59
1976	26,053	117,551.2	3,257	12,601.3	4,512	22,796	113,615.3	0.62
1977	26,954	129,271.4	3,369	13,621.9	4,796	23,585	125,637.3	0.64
1978	28,067	176,204.6	3,508	18,487.2	6,278	24,559	173,042.7	0.67
1979	29,251	261,767.2	3,816	27,173.3	8,949	25,435	266,126.4	0.90
1980	30,478	272,686.7	3,739	29,698.9	8,947	26,739	280,759.5	1.12

SOURCE: Consejo Nacional de La Producción.
Dirección General de Estadística y Censos, 1981

BANANA

Years	Production		Consumption		Price Colon/MT	Exports		Transportation Cost Colon/MT-Km
	Vol. (MT)	Value (Colon) 1000	Vol. (MT)	Value (Colon) 1000		Vol. (MT)	Value (Colon) 1000	
1970	563,997	266,126.0	60,427	6,083	101	503,570	260,043.0	0.85
1971	628,201	266,876.0	64,424	7,948	123	563,777	258,928.0	0.89
1972	758,151	359,044.0	69,186	8,547	124	688,964	350,497.0	0.92
1973	891,879	431,956.0	76,703	9,094	119	315,176	422,362.0	0.95
1974	828,459	586,064.0	81,836	12,864	157	746,623	573,200.0	0.97
1975	908,193	936,432.0	85,986	21,101	245	822,208	915,331.0	0.99
1976	852,371	931,709.0	85,179	20,173	237	767,192	911,536.0	1.01
1977	803,367	937,330.0	86,984	20,341	234	716,383	916,989.0	1.02
1978	586,583	1,075,224.0	90,469	24,779	274	766,114	1,050,445.0	1.04
1979	859,510	1,238,824.0	96,549	27,386	284	762,969	1,211,437.0	1.07
1980	814,843	1,494,012.0	98,345	28,901	294	716,498	1,465,112.0	1.12

SOURCE: Cifras de producción Agropecuaria del Banco Central y Departamento de Estadística de ASBANA., 1981

PLATANO

Years	Production		Consumption		Price Colon/MT	Exports		Transportation Cost Colon/MT-Km
	Vol. (MT)	1000 Value (Colon)	Vol. (MT)	1000 Value (Colon)		Vol. (MT)	1000 Value (Colon)	
1970	60,002	34,500.9	49,343	27,075.7	575	10,659	5,610.8	0.85
1971	56,755	33,315.1	50,715	27,929.2	587	6,040	3,610.4	0.89
1972	58,300	38,827.5	52,336	30,096.9	666	5,964	3,596.1	0.92
1973	66,863	41,053.9	53,470	33,248.3	614	13,393	4,875.5	0.95
1974	64,748	50,827.0	54,857	43,217.4	785	9,891	5,367.1	0.97
1975	66,782	86,148.4	56,244	72,352.4	1,290	10,538	7,877.3	0.99
1976	65,408	98,047.1	57,708	84,126.1	1,499	7,700	8,632.9	1.01
1977	69,369	98,573.7	59,206	82,284.6	1,421	10,163	11,767.1	1.02
1978	76,306	101,796.1	57,431	74,904.3	1,334	15,276	21,017.5	1.04
1979	81,385	114,426.8	62,510	86,132.8	1,406	18,875	32,831.4	1.07
1980	94,560	167,465.8	68,526	178,051.1	1,771	26,034	59,926.5	1.12

SOURCE: Cifra de producción agropecuaria Banco Central de Costa Rica; Comercio Exterior de Costa Rica: Dirección General de Estadístico y Censos; FECOSA., 1981

CACAO

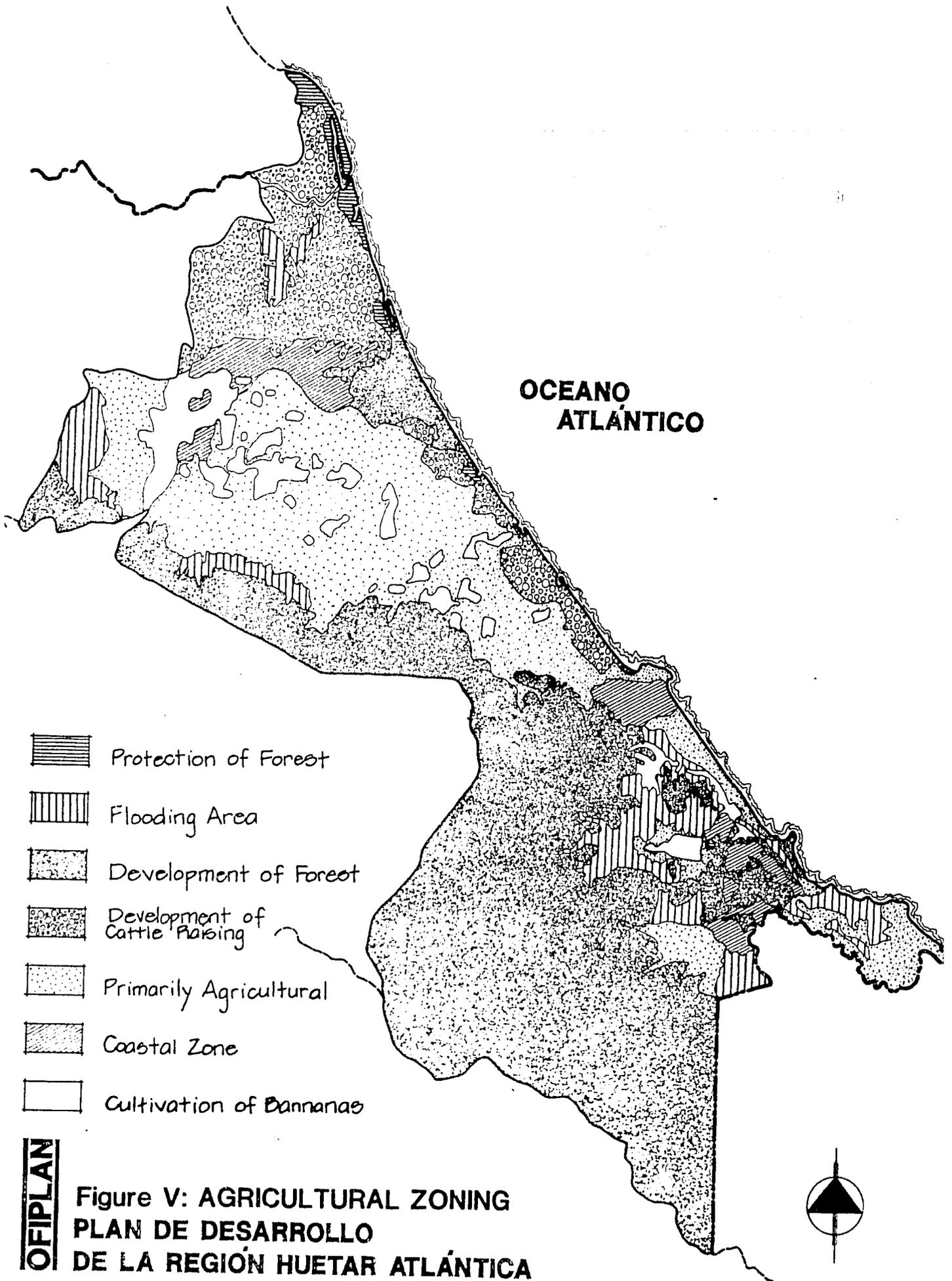
Years	Production		Consumption		Price Colon/MT	Exports		Transportation Cost Colon/MT-Km
	Vol. (MT)	1000 Value (Colon)	Vol. (MT)	1000 Value (Colon)		Vol. (MT)	1000 Value (Colon)	
1970	3,757	14,834.8	818	3,334.2	3,949	2,939	11,501.9	0.42
1971	3,980	11,708.6	779	2,488.1	2,942	3,200	9,220.4	0.43
1972	6,750	20,591.4	900	2,815.2	3,243	5,449	33,127.5	0.45
1973	5,056	30,893.4	782	4,906.3	6,110	4,274	25,986.5	0.56
1974	5,327	57,266.3	1,394	13,866.1	10,750	3,933	43,400.7	0.59
1975	5,948	53,615.3	1,367	12,714.8	9,014	4,581	40,876.3	0.62
1976	5,270	73,964.5	1,508	20,543.5	14,035	3,762	53,420.4	0.64
1977	6,925	182,529.2	1,860	50,874.7	26,358	5,064	131,628.6	0.67
1978	9,343	214,400.8	4,085	98,524.4	22,948	5,258	115,875.8	0.81
1979	9,329	195,843.7	5,517	121,169.9	20,993	3,812	74,673.3	0.90
1980	4,728	91,444.3	2,791	57,687.2	19,341	1,937	33,754.2	1.00

SOURCE: Banco Central de Costa Rica.
Consejo Nacional de Producción., 1981

CORN

Years	Production		Consumption		Price Colon/MT	Exports		Transportation Cost Colon/MT-Km
	Vol. (MT)	1000 Value (Colon)	Vol. (MT)	1000 Value (Colon)		Vol. (MT)	1000 Value (Colon)	
1970	15,865	8,302.0	15,865	8,302.0	529.3	-	-	0.40
1971	15,416	9,015.3	15,416	9,015.3	584.8	-	-	0.42
1972	16,700	9,953.2	16,700	9,953.2	596.0	-	-	0.43
1973	14,405	9,680.2	14,405	9,680.2	672.0	-	-	0.45
1974	13,314	14,264.6	13,314	14,264.6	1,071.4	-	-	0.56
1975	14,909	22,080.2	14,909	22,080.2	1,481.0	-	-	0.59
1976	17,459	27,323.3	17,459	27,323.3	1,565.2	-	-	0.62
1977	14,225	22,575.1	14,225	22,575.1	1,587.0	-	-	0.64
1978	15,671	27,941.4	15,671	27,941.4	1,783.0	-	-	0.67
1979	19,328	39,496.8	19,328	39,496.8	2,043.5	-	-	0.90
1980	18,131	55,181.7	18,131	55,181.7	3,043.5	-	-	1.12

SOURCE. Consejo Nacional de la Producción.
Dirección General de Estadístico y Censos, 1981



OFIPLAN

**Figure V: AGRICULTURAL ZONING
 PLAN DE DESARROLLO
 DE LA REGIÓN HUETAR ATLÁNTICA**

APPENDIX C

THE SETTLEMENT SYSTEM AND EMPLOYMENT IN THE
REGION HUETAR ATLANTICA

David Bess, Ph.D.

Department of Urban Planning

School of Environmental Design

California State Polytechnic University, Pomona

with

Nidia Formiga

Alberto Borges

Mario Azofeifa

Rogellio Palomo

OFIPLAN

THE SETTLEMENT SYSTEM IN THE
REGION HUETAR ATLANTICA

Although the region is primarily agricultural in both its economic base and its settlement pattern, there are a large number of concentrations of population in various parts of the area. The majority of these are found in the northern part of the region where they are distributed throughout the rich agricultural system. Limón is the largest city in the area and it offers the broadest range of services. Its situation is unique, and its problems will demand special attention.

The more typical population concentration, however, is rather small and offers only a few services to its inhabitants. Of the 165 population centers listed in 1980 statistics from the Ministry of Health, 131 or 84% have populations of 500 or less. This sort of center is usually located along a transportation route so that it can provide access to market for goods produced in the surrounding area. It also serves as a distribution point for products brought into the area. Many centers exist along the railroad line which provided the first transportation through the region, while more recent settlements tend to be related to the development of the road system.

In terms of service levels, these smallest centers typically feature the existence of a single school and/or health center. Some may also provide public access to a telephone. There are generally no public water or sewer facilities and the streets are not paved. Housing may be concentrated in a single cluster or dispersed in a low density pattern. A brief review of public facilities indicates that such centers serve relatively small complementary areas, and that there is a relatively low level of investment in infrastructure. Existing populations must look to larger centers for a broad range of specialized services.

In medium sized centers there is a somewhat higher quality of services offered. There are 22 centers with populations between 500 and 1,000. Accessibility to the surrounding countryside permits development of those services and facilities which depend upon a larger population base to make them feasible. Thus, in the medium centers

we may find such things as medical dispensaries. They typically serve more than just the place in which they are located. Occasionally they include a collezio as well. While the lack of data prevents a complete analysis, it is also clear that such settlements feature some specialization in private services both in terms of retailing and consumer services and in agro-based processing. Growth for these centers will demand investment in additional infrastructure.

There are only three large population centers in the region. There are Limón, Siquirres and Guapiles. A "large" center in Huetar Atlantica is one with a population more than 2,000. These places offer enough services to act as magnets for people in fairly large surrounding areas, and they represent large investments in existing infrastructure. While on the basis of present populations they do not achieve sufficient scale to make them attractive as locations for much large investment, they have potential to be places where the costs of future development may be spread among several enterprises. They already serve as the location for collection and processing of agricultural products from the surrounding area. By exploiting such opportunities, additional agro-based industries may evolve where feasible. Their existing housing and labor supplies and infrastructure make these centers attractive for encouraging such growth.

An anomaly exists in the large scale banana developments of the area around Guapiles. Concentrated settlements are apparent, but relatively few public facilities are listed. The level of service actually appears to be comparatively high in such areas, but the potential for growth of independent towns appears limited because the large plantation pattern precludes the assembly of land for urban uses. The result is that residents must travel long distances to existing centers or remain dependent upon company operated facilities. This may create additional opportunities for growth in Guapiles itself.

Puerto Limón offers the broadest range of services of any center in the region, and it has national importance as a transportation center. One source claims that 60% of all Costa Rica's international trade (including all border and air traffic) passes through Puerto Limón. Current investment in transportation facilities is directed toward improving the efficiency of the port and increasing the capacity of the cargo handling systems to meet future needs. Puerto Limón, however, is an old city with substantial problems of deterioration. There are high unemployment levels and a history of social unrest. While city planning problems in Puerto Limón are beyond the scope of this regional

study, it is clear that the importance of Limón cannot be ignored. Its physical facilities provide an all important link between the region and the rest of the country, and between Costa Rica and the rest of the world. The investment which they represent is a key to the future economic development of the entire nation. The human resources which are concentrated there are of equal importance. Policies which ignore political and social impacts in the urban area will have consequences well beyond the boundaries of the region.

In fact, it can be argued that all of these larger centers in the region have importance well beyond what population statistics might lead one to expect. As locations of existing infrastructural investment they must be exploited and protected. As locations for future development they have potential which is of great importance to the region. If agricultural expansion is to proceed, it will create the demand for new and expanded services which can best be located in these existing centers. Agricultural processing and marketing offer opportunities for the growth of settlements closely linked to the rural areas.

It is significant that most existing centers are arrayed along the important transportation network which connects the region with San Jose. This creates a corridor within which growth is concentrated and from which it spreads, slowly outward onto the landscape. With the completion of the highway between Guapiles and San Jose the transportation geography of the region will be changed. A new corridor will be created in which Guapiles will be changed. A new corridor will be created in which Guapiles will occupy a key location. The travel distance from Guapiles to the capital will be cut from approximately 160 km to 60 km. When the highway to Puerto Viejo is completed, Guapiles will become an important gateway to the north. This will provide access for the entire region to the northern part of the country. It will create new opportunities for both urban and rural development.

Concentrated Settlements in Region Huetar Atlantica

Few of the existing human settlements in the region can be characterized as urban in the sense of being cities in a contemporary industrialized society. Instead, they are wedded to the agricultural economy of the region. Their potential for growth in the foreseeable future is closely linked to their ability to provide services for the expanding agricultural sector. They can, thus, develop by providing locations for agro-based industries and by increasing the variety of goods and services available to the surrounding areas.

It must be recognized that it is neither feasible nor desirable that all the existing centers take on additional responsibilities in serving the region. It is not feasible because resources are not available to develop the necessary infrastructure, and it is not desirable because there is not sufficient demand to make such development possible. It becomes important, then, to select those centers with the greatest potential for growth so that investments can be systematically directed to achieve societal goals.

Criteria for selection of centers to receive stimulus for growth include the following:

1. Access to productive lands
2. Access to regional transportation
3. Availability of environmentally viable, developable land for the settlement, and
4. Existence of public facilities and services

Access to productive land is important both in terms of assuring that the center can provide services to prime areas and in constraining development in areas not suitable for growth or exploitation. Access to the transportation network is important because of trans-shipment of goods from and to the area. The necessity of selecting sites that are environmentally viable is stressed in the Report on Environmental Management (Kyle, 1981). It is mentioned here with reference to the settlement pattern to emphasize the importance of structuring growth in areas which can support development without environmental degradation. Sites subject to inundation or erosion are to be particularly avoided as places for settlement. Matina is an example of an existing center where the threat of flooding raises questions about the potential for future growth. Existing facilities notwithstanding, future investments might be better directed toward centers where environmental threats are less and can be more easily controlled.

Public Facilities and Services

Population centers can be defined by the functions they provide for the surrounding areas. The Region Huetar Atlantica is still very early in the process of development, and a clearly defined hierarchy of places and the functions they provide is not yet apparent in a major degree. However, certain tendencies are emerging, and they offer opportunities to structure future growth which can serve to create an efficient pattern of development.

Our concern here is primarily in terms of the relationship between the population center and its complementary area, and the relationships among population centers in the region. Complementary area must be defined as the area outside the center which is dependent upon it for a supply of goods and services and from which goods and labor are funneled into the center for use or for trans-shipment. It is because of the importance of the complementary area that one must study the productive capacity of the area in which the center is located. It is not sufficient to consider the confines of the concentrated settlement itself.

Nevertheless, it is clear that facilities tend to be clustered in the concentrated settlements, and a review of the variety and specialization of such facilities will help in determining the extent of the complementary area. Simply, people will be willing to travel long distances to obtain specialized services than they will to take advantage of lower level services. The specialized services which demand large populations to make them feasible will tend to be more centralized. Thus, a hospital may offer a variety of specialized services which are organized to achieve economies of scale. Patients will be required to go to a central location if they need access to the facilities of such a hospital. It is not possible to provide specialization in every centre de salud.

In addition, it is apparent that facilities serving a common complementary area tend to cluster in a single location rather than being distributed among several settlements. While the linkages between education and health facilities, for example, may not be immediately apparent, they both will tend to be centralized in a single center. This is partially because of common needs for access to transportation. However, it is also based on external economies of other sorts, which combined, create a setting for independence and interaction.

The resulting clusters of facilities can be expected to lead to a system of hierarchy among centers in which those with a variety of services and specialization of facilities serve large complementary areas, while centers which offer a lesser number of services and less specialization serve small complementary areas.

Note that not all services are subject to centralization. For many facilities, effectiveness is determined by immediate access to relatively small service populations. Schools, for instance, are located in such a way as to reduce travel time for the students attracted to them.

Pulperias offer an example of similar dispersion in the private sector. In an area like Region Huetar Atlantica, where transportation issues are of continuing importance, the distribution of such scattered service operations is a key to their successful utilization. We can expect, however, that as development matures there will be larger numbers of these non-specialized, small scale, service facilities which can be located in the larger settlements. By the simple process of accretion, the level of competition among private enterprises should lead to more efficient market operations: more competitors will lead to lower prices. The result is a greater set of alternatives for the consumer with potential for lower prices.

Agricultural Settlement Patterns

While the concentrated settlements are important to the potential for processing and distribution of agricultural products and for services, it must be recognized that the majority of the population in Region Huetar Atlantica resides in scattered rural areas in a broadly dispersed pattern. Such settlements are directly associated with access to agricultural or other primary sector resources. Many of them are characterized by a single house or by a small cluster of houses located within sight of each other. Urban amenities such as paved streets or street lights may be missing, although a football field is seldom far away. Design of structures may appear to be quite primitive, but it is typically based on a common-sense understanding of what works in a given setting. These settlements are typically isolated by location and by their lack of services. Some exist in areas not served by good roads or adequate public transport. Some are still by-passed by the road system and must rely upon infrequent rail service or on boats. Efforts continue to improve basic communications by extending electricity and telephone networks in such areas.

The level of housing services may be quite low when measured by urban standards, but it is not necessarily inadequate in meeting basic shelter needs as defined by the people who live there. The provision of minimum protection from the elements in a setting which fosters potential for human development and economic participation, may be more important than the quality of the housing structure itself.

Examples may be observed in Region Huetar Atlantica where modest cottages appear to serve the needs of their inhabitants better than would standardized designs imposed by outsiders. The idea of controlling one's own environment

is important to achieving an optimum level of development. Moreover, by diverting income away from housing expenditures a family may be able to realize long term goals which are otherwise unattainable.

The potentially dangerous implication of this argument is that it could be misused to foster neglect and exploitation of rural residents. That must be avoided. It is possible to over-romanticize the attractions of the rural life in contemporary society. Rather than doing that, one might consider the potential benefits of careful husbandry of the environment and the development of a self-sustaining economy not entirely dependent upon export markets and imported consumer goods. In order to do so it is important to recognize the fact that such development can be successful only if it takes place in areas with potential for sound utilization of resources.

Further, in existing low density areas it is often not feasible to provide public water supplies or sewers. Careful sanitation practices may avoid health threats if the capacity of natural systems are not exceeded. Such practices are fostered as much by education as by provision of services. If concentrations of such housing are permitted without the provision of adequate infrastructure to meet public health needs, then serious threats to human life result. This cannot be condoned.

Further, the advisability of encouraging such scattered, unstructured use of land should be reviewed in the context of long term productivity and the potential for success of the small scale enterprises which can be located there. If such a pattern emerges in areas of marginal land or areas which are environmentally sensitive, the settlers may be led into expecting success which is not, in fact, possible to achieve. Small land holders may not be able to overcome obstacles to efficient production and may be misled into thinking they will be able to profitably develop such areas. In their zeal they may use practices which lead to environmental degradation. Such degradation in sensitive areas may result in creating irreversible harm to the region's resource base.

Human Settlements in Huetar Atlantica: Methodology

A study of existing population centers was conducted utilizing existing secondary data collection sources. It was aimed at determining service levels and complementary areas for the centers. The lack of sufficient up-to-date information precluded a more exhaustive study of the characteristics of such centers.

Information on population was obtained from a 1980 study conducted by the Ministry of Health. Some sociological data were included in the information, but emphasis was placed on health related items. From this, we were able to determine a recent population count based on existing health center locations. Since the most recent census of the area was conducted in 1973, the Ministry of Health data were invaluable. Unfortunately, no check for accuracy was possible. Note that these data show concentrations of population and dispersed settlements which are served by health facilities.

From this information a map was prepared showing population distribution. Visual comparison of existing maps was used to determine whether the population was concentrated or dispersed. The great majority of human settlements in the region are non-urban; that is, they are small scale and are directly related to agricultural production or resource exploitation. The prevalent pattern was revealed as a corridor resulting from development along lines of transportation access.

Meanwhile, a study of public services was made by examining reports and listings of the various government agencies and institutions with facilities in the region. Some difficulty was experienced in linking place names with centers in the instance of small locations where population was dispersed throughout an area. This was overcome by cross-checking maps and reports and by relying upon the personal knowledge of term members.

Generally, only a most basic level of service was observed in the smaller centers. A relatively few locations featured substantial infrastructure or a broad range of public services. Note that this study disclosed the existence of facilities, but did not analyze the adequacy of services provided. A partial study of private facilities was carried out with results which appear to be consistent with the findings of the study of public services.

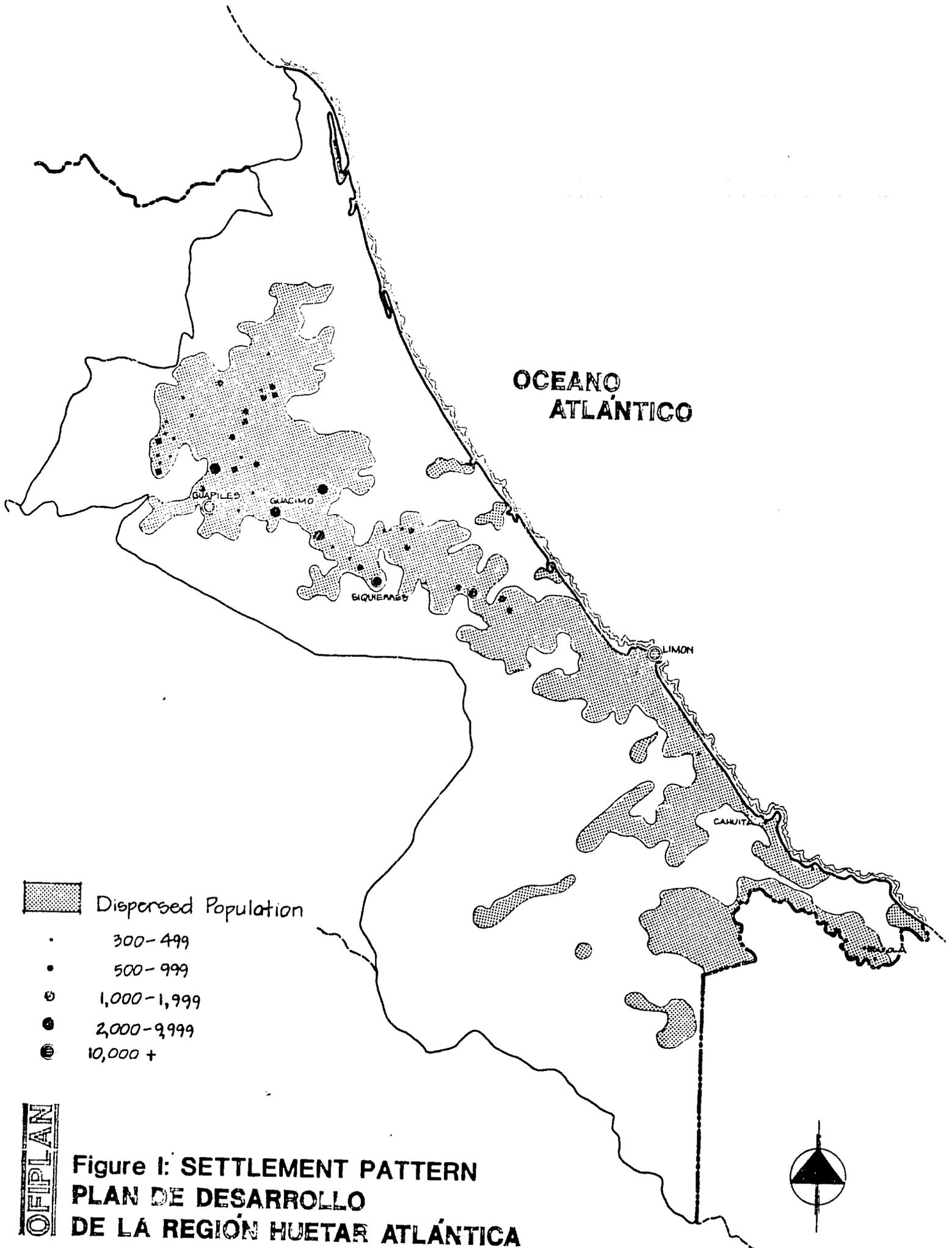
The purpose of the above-mentioned studies was to determine the regional settlement pattern and to investigate the existing service levels in the area. Understanding the present situation in these terms, it becomes possible to analyze which areas have the capacity for growth in the future.

In order to do so properly, the functional area of each center must be examined. The functional area or complementary area may be defined as that area outside the population center itself, which is served by the center

and the area from which agricultural products are shipped for processing or for trans-shipment. Such a study must consider access to the center and the productive capacity of the complementary area. It will necessarily take into account any hazardous zones and the density of development in any productive areas in order to determine the holding capacity of the area and the demand for services generated by people and enterprises with access to the center.

A rather simplistic approach to developing a settlement hierarchy was taken in this study. Although obviously some services are more specialized than others, and the former clearly serve broad complementary areas, no attempt was made to assign weights to the various factors. Similarly, the size of a given facility was not taken into account. Although clearly for example, a school with 1,000 students is different than one with 20 students. It was deemed more important, given the limited resources available during the brief study period to concentrate upon uncovering and organizing sources of information so that future efforts can move forward more efficiently than did this one.

As development occurs and differentiation among population centers becomes more apparent, it will become useful to develop more sophisticated measurement systems. Their usefulness, however, will be determined by the quality of the data which provides information to be measured.



OFIPLAN

**Figure I: SETTLEMENT PATTERN
PLAN DE DESARROLLO
DE LA REGIÓN HUETAR ATLÁNTICA**

El poblamiento de la Región Huetar Atlántica

A principios del siglo XVI, los españoles llegaron a esta área, la cual estaba poblada por aborígenes pertenecientes al grupo huetar, de donde deriva el nombre de la Región.

El crecimiento de la población fue lento hasta el siglo XIX, en que se comienzan a registrar migraciones importantes.

A principios del siglo XVII se desarrolla el cultivo de cacao por parte de grandes hacendados que vivían en Cartago y en 1637 se contaba con un camino que unía esta área al centro del país.

El área comenzó a poblarse, especialmente con negros y mulatos, que se dedicaban al cultivo del cacao y Hatina era el principal centro de población. Pero, debido a la piratería de que eran objeto por parte de los zambos mosquitos, fueron abandonando la zona. Posteriormente, en la segunda mitad del siglo XIX, se dio inicio a una serie de actividades que impulsaron el poblamiento del área. Debido al clima y a las enfermedades existentes, esta área no resultaba atractiva para los habitantes del Valle Central. Por esta razón fue necesario recurrir a la mano de obra extranjera para la construcción del ferrocarril, que se inició en 1871, y la plantación del banano que se realizaba simultáneamente. En 1872 se inició la construcción del puerto, donde ya existía una población cercana a los 1900 habitantes.

En cuanto la procedencia de los inmigrantes, se dio un predominio de negros antillanos, especialmente de Jamaica, europeos y asiáticos.

Al mejorar las condiciones higiénicas y las comunicaciones y con la rápida extensión del cultivo del banano, esta zona se convirtió en área de atracción para todo tipo de migrantes. La formación de los 3 centros urbanos más importantes se relacionan con las siguientes actividades:

Limón se conformó con una población heterogénea atraída por las actividades del puerto y como terminal ferroviaria.

Siquirres adquirió importancia como centro de operaciones ferroviarias con terminales a Monte Verde, El Carmen y Línea Vieja.

Guápiles como el centro de un área que, por sus óptimas condiciones para el cultivo, atrajo agricultores del Valle Central.

En esta región se registraron movimientos de población intra e inter-regionales de atracción y rechazo, causados por el incremento o disminución de actividades relacionadas al cultivo de productos de exportación, especialmente del banano. Entre 1920 y 1927 se registraron movimientos internos de población entre distritos debido a que la Compañía Bananera trasladaba la actividad entre sus fincas. Así fue que, en 1927, esta área concentraba el 8% de la población total del país, que es la máxima participación relativa alcanzada por esta Región y más de la

mitad de esa población era extranjera. Pero, en los años siguientes, la aparición de la enfermedad "de Panamá" y el agotamiento de los suelos causaron el traslado de la actividad bananera de la Compañía a las costas del Pacífico Sur. El impacto de este traslado se registró en las emigraciones que provoca y que se observa en la disminución a un 6% del porcentaje de la población total, que vive en la región. La situación se mantuvo estable según se puede observar en los datos censales entre 1950 y 1963. A partir de 1965, la reactivación de la actividad bananera volvió a convertirla en atractores de inmigración, especialmente el área de Guápiles por la apertura de nuevas zonas. Es por ello que la tasa de inmigración de la región pasó de 29% en 1963 a 36% en 1973 en tanto que la tasa de emigración se mantuvo constante en 12.6% y también se refleja en el incremento de la participación relativa de la población total que alcanzó casi el 7% en 1973.

En el estudio realizado sobre las inmigraciones en los cantones rurales del país para el período 1950-73 ⁽¹⁾ se destaca la situación de los cantones de Pococí y Siquirres que sirve para ilustrar lo comentado anteriormente.

En el período intercensal 1950-63 Pococí, que había sido un cantón de atracción, se presentó como un área de intercambio. Se registró una apreciable disminución de las áreas plantadas de banano, y a la vez, la expansión de los pastos y de cultivos comerciales de maíz. También se dio un limitado desarrollo cañero y el área de cultivo de cacao se mantuvo constante. La razón por la cual la retracción del sector de exportación no la convirtió en una área de expulsión, fue la extensión del sector de subsistencia dedicado al cultivo de la yuca y otros productos tropicales.

Siquirres, en este período, mantuvo su condición de área de expulsión, aunque con una disminución de la tasa. Esto se debió, también, a la reducción de los cultivos de exportación pues se dio prácticamente, la desaparición del abacá y también disminuyó del área de cacao. La expansión de los pastos y tierras de labranza, especialmente en maíz, no fue suficiente para equilibrar la relación.

La situación cambió totalmente en el período siguiente 1963-73 para ambos cantones, que se convirtieron en áreas receptoras de migrantes procedentes de otras regiones del país. En Pococí se registró la mayor inmigración del país. La población aumentó de 17000 habitantes en 1963 a 40000 habitantes en 1973, lo cual representa una tasa de crecimiento de alrededor de 9%.

Este efecto de atracción está relacionado con el notable crecimiento de las superficies dedicadas al cultivo del banano que aumentaron de 1251 a 16448 manzanas en Pococí, y de 605 a 6470 manzanas en Siquirres.

¹ C.S.U.C.A.: Estructura Agraria Dinámica de Población y Desarrollo Capitalista en Centroamérica - E.S.U.C.A. Edit. San José 1978.

Simultáneamente se dio una fuerte disminución en las áreas de cultivo de cacao y de maíz, así como en las de subsistencia, cuya población pasó como asalariada a satisfacer parte del incremento de la demanda de mano de obra. Esto también se puede observar en la variación en el porcentaje de asalariados que se registró.

Cantón	% de asalariados de la P. E. A.	
	1963	1973
Pococí	43.3	71.9
Siquirres	55.6	71.77

De acuerdo a la información obtenida del censo de población de 1973, los cantones donde se registró la mayor inmigración y saldo inmigratorio son Pococí, Horquetas y Siquirres que coinciden con las áreas que experimentaron la expansión de la actividad bananera, mientras que en las áreas de cultivos cacaoteros la población se mantuvo estable o disminuyó. En cuanto a la procedencia de los migrantes, el mayor número corresponde a las provincias de Guanacaste y Puntarenas.

En cuanto a los emigrantes de esta región, el mayor número correspondió al cantón de Limón. Del total de emigrantes de la Región el 54% tuvo como destino la provincia de San José, y las restantes se distribuyeron en las otras provincias.

Del censo también es posible obtener información sobre la migración interna. Pero en el caso de las subregiones Limón y Pococí, esta información, no es representativa pues las subdivisiones de cantones y distritos ocurridas en el período considerado por el censo 1968-1973 induce a error en la interpretación.

INFORMACION DEMOGRAFICA

La población estimada al 1º de enero de 1981 por la Dirección General de Estadística y Censos, por subregiones es:

<u>Subregión Limón:</u>		<u>Subregión Pococí</u>	
Cantón Limón	50471 hab.	Cantón Pococí	36609
Talamanca	7528	Siquirras	22244
Matina	13158	Guácimo	14148
	71157	Distr. Horquetas	8896
			81897

Total Región Huetar Atlántica 153054 habitantes - Total país 2.276.676

La distribución de la población según el censo de 1973 era:

<u>Subregión Limón</u>		<u>Subregión Pococí</u>	
<u>Cantón Limón</u>	40830	Cantón Pococí	28688
Talamanca	5431	Siquirres	18133
Matina	10489	Guácimo	11572
	56750	Distr. Horquetas	7236
			65629

Total Región 122379

Total país 1.871.780

La participación relativa de la población de la Región Huetar Atlántica, con respecto a la población total del país, ha sido:

1950	5.2%
1963	5.1%
1973	6.6%
1981	7.1

Es interesante señalar que la población regional ha aumentado su participación relativa respecto al total del país según los datos de 1973 y 1981. Eso indica la atracción que ha ejercido la región. Si bien estas estimaciones deben ser consideradas con cierta reserva ya que las estimaciones de población se realizan sobre la base de los registros de nacimientos y defunciones. Esto hace que los datos presenten una seria deficiencia al no tomar en cuenta la migración, pero es la única información más actualizada disponible.

Según los datos estimados de población al 1º de enero de 1981, de 2276676 habitantes distribuidos en la superficie de 51.100 km² la densidad media nacional es de 44.55 hab/Km². Comparando ésta con las densidades a nivel de distritos para la Región Huetar Norte, éstas se pueden clasificar como baja densidad de población, ya que encontramos que todas las densidades son inferiores a la nacional, lo cual permite deducir disponibilidad para el futuro. Sin embargo, hay que tomar en cuenta que en estas subregiones un gran parte del área presenta severas restricciones para la ocupación y utilización económica del espacio.

A nivel subregional encontramos una concentración de los distritos de mayor densidad en la subregión Pococí, y los distritos escasamente poblados (menos de 2 hab/km²) corresponden a los distritos fronterizos de Colorado y Talamanca. Ambos presentan condiciones difíciles para la ocupación. El primero, Colorado, por la amplia extensión de tierras bajas inundables. En Talamanca la extensión ocupada por la Cordillera de Talamanca que presenta un relieve muy escarpado, con fuertes pendientes. En ambos casos, el uso más recomendado ha sido de protección y de uso restringido.

TASAS DE CRECIMIENTO INTERCENSAL
1950-63 1963-73

Costa Rica	3.98%	3.33%
Provincia de Limón	3.91%	5.15%
Cantón Limón	4.22%	3.42%

En el período 1950-63, la provincia presenta un crecimiento ligeramente inferior al nacional pero el cantón Central o Limón presenta una tasa de crecimiento más fuerte.

En el período siguiente, 1963-73, se observa una reducción en la tasa de crecimiento del Cantón Central aunque superior a la media nacional, y la tasa provincial es mucho más alta que éstas. El cantón Pococí experimentó una tasa superior, en más de 2 veces a la nacional y muy por encima de la provincia 85.61%.

La región ha presentado una tasa de natalidad superior a la media nacional, pero en descenso como se puede observar en las tasas siguientes 1970 43.3% - 1976 34.6%.

La tasa de mortalidad es superior a la media nacional, pero también en descenso al igual que la mortalidad infantil.

Tasa de mortalidad:	1972	10.0%	1973	7.0%
---------------------	------	-------	------	------

Relación entre sexos

En cuanto a las relaciones entre sexo, según los datos censales para 1973, tenemos que en las áreas urbanas estén más o menos equilibradas. Pero en las áreas rurales el índice de masculinidad es mayor ya que la distribución es la siguiente:

65381	hombres	53.4%
56998	mujeres	46.6%

Según los datos censales de 1973, se observa la importancia de la ciudad de Limón en la subregión, ya que concentra el 53.1 de la población e indica una proporción de población urbana superior a la media del país. En esta subregión se identificaron como población urbana, los centros de Limón con 29.621 hab. y de Matina con 502 hab. Es evidente el efecto de concentración del centro subregional.

Por el contrario, la subregión Pococí se presenta como netamente rural ya que sólo el 13.8% de la población fue calificada como urbana y que corresponde a tres pequeños centros urbanos. Guápiles con 3524 hab., Siquirres con 4361 hab. y Guácimo con 1168 habitantes.

Aún cuando pueden existir diferencias en cuanto al número de habitantes identificados por el censo y haya una subestimación, las proporciones son representativas.

En cuanto a los criterios tomados en cuenta para definir las áreas urbanas en el censo fueron los siguientes:

Al igual que en los censos nacionales de 1950 y 1963, se tomó como base para determinar las zonas urbanas, a los centros administrativos de los cantones del país, o sea, por lo general, los distritos primeros. En estos demarcaron a prior: dichas zonas con criterio físico, tomando en cuenta elementos tangibles tales como cuadrantes, calles aceras, luz eléctrica, servicios urbanos etc. La relación entre las poblaciones urbana y rural a nivel nacional era de 40.6 y 59.4. Según las proyecciones para el año 2000 la relación será de 59% y 41% respectivamente.

Población económicamente activa

En el censo de 1973 la Población Activa (12 años o más) de Costa Rica era de 58313 personas lo que representa una tasa de participación de 31.3% y para la región Huetar Atlántica con una población activa de

40.444 personas la tasa de participación es de 33%. Para el año 2000 según las proyecciones de población, se estima la tasa de participación aproximada al 39%.

Rasgos culturales

La población negra, mientras se encontraba ligada al ferrocarril y a las plantaciones de banano, vivieron en campamentos y agrupaciones spáradas, por lo cual conservaron su idioma, religión y tradiciones. Con el fracaso del banano abandonaron el campo y se trasladaron a las ciudades y pueblos por la línea férrea. Solamente en casos excepcionales hicieron su finca en las zonas de penetración o se dedicaron al comercio. Prefieren vender su mano de obra como trabajadores o se dedican al cultivo de cacao como arrendatarios, muy pocos tienen parcelas grandes propias. La población negra se encuentra concentrada entre Siquirres y Limón con centros entre Pacuarito y Waldeck, en Matina, Estrada y el ramal Zent. Su centro cultural es Limón. Y también en la faja costera al sur de Limón en Cahuita y Puerto Viejo, dedicados al cultivo del Cacao.

En la Línea Vieja, donde antes también había muchos negros hoy día domina la población blanca. Los relictos de negros de esta zona se concentraron en Guácimo.

Otro grupo étnico pequeño forman los chinos, dedicados en su mayor parte al comercio. Desde el tiempo bananero tiene sus negocios grandes en los pueblos, a lo largo del ferrocarril y otros centros importantes. Falta mencionar la influencia de nicaraguenses que han tenido una participación importante en el desarrollo de la parte Norte y Noroeste del área estudiada. La mayoría de los habitantes de Barra Colorado pertenecen a este grupo y proceden de San Juan del Norte.

La población indígena que antes fue numerosa como la atestiguan los grandes cementerios al Norte de Línea Vieja ha disminuído considerablemente. En su mayoría se encuentra concentradas en la reserva indígena de Talamanca.

Es importante destacar que el grupo negro que en épocas pasadas fue mayoritario en la Región, ha pasado a ocupar un segundo plano.

El estudio efectuado por la Universidad de Cornell sobre "El Potencial de los Recursos para el Desarrollo de la Provincia de Limón en 1973" informa que:

La composición étnica de la provincia le da un carácter único, diferente al del resto del país. Se estima que el 49% de población es blanca, 46% negra, 3.% india y 2% de ascendencia oriental.

TABLE I

según: POBLACION DE COSTA RICA
 por : SEXO, AUMENTO VEGETATIVO
 : PROVINCIAS, CANTONES Y DISTRITOS
 : 1ero. DE JULIO DE 1979

Provincia, Cantón y Distrito	Población al 1° de julio 1979	Aumento de Población			Población al 1° de enero 1979
		Aumento vegeta- tivo	Nacimien- tos	Defuncio- nes	
PROVINCIA DE LIMON.- Ambos					
Sexos.....	137.329	1.831	2.147	316	135.498
Hombres.....	71.861	918	1.106	188	70.943
Mujeres.....	65.468	913	1.041	128	64.555
CANTON LIMON.- Ambos Sexos.	48.217	572	703	131	47.645
Hombres.....	24.533	275	354	79	24.258
Mujeres.....	23.684	297	349	52	23.387
LIMON.....	48.217	572	703	131	47.645
Hombres.....	24.533	275	354	79	24.258
Mujeres.....	23.684	297	349	52	23.387
CANTO POCOBI.- Ambos Sexos.	34.712	482	534	52	34.230
Hombres.....	18.478	258	285	27	18.220
Mujeres.....	16.234	224	249	25	16.010
GUAPILES.....	9.017	164	184	20	8.853
Hombres.....	4.552	85	97	12	4.467
Mujeres.....	4.465	79	87	8	4.386
JIMENEZ.....	3.037	25	29	4	3.012
Hombres.....	1.542	13	16	3	1.529
Mujeres.....	1.495	12	13	1	1.483
RITA.....	7.496	56	63	7	7.440
Hombres.....	4.123	31	35	4	4.092
Mujeres.....	3.373	25	28	3	3.348
ROXANA.....	5.096	51	52	7	5.045
Hombres.....	2.726	29	31	2	2.697
Mujeres.....	2.370	22	27	5	2.348
CARIARI.....	8.841	171	183	12	8.670
Hombres.....	4.283	91	95	4	4.792
Mujeres.....	3.958	80	88	8	3.878
COLORADO.....	1.225	15	17	2	1.210
Hombres.....	652	9	11	2	643
Mujeres.....	573	6	6		567
CANTON SIQUIRRES.- Ambos					
Sexos.....	21.204	305	342	37	20.899
Hombres.....	11.216	164	185	21	11.052
Mujeres.....	9.988	141	157	16	9.847

Fuente: Direccion Nacional de Estadisticos y Censos

TABLE I (continued).

según: POBLACION DE COSTA RICA
 por : SEXO, AUMENTO VEGETATIVO
 : PROVINCIAS, CANTONES Y DISTRITOS
 : 1ero. DE JULIO DE 1979

Provincia, Cantón y Distrito	Población al 1° de julio 1979	Aumento de Población			Población al 1° de enero 1979
		Aumento vegeta- tivo	Nacimien- tos	Defuncio- nes	
SIQUIRRES	11.384	220	243	23	11.664
Hombres.....	6.212	121	135	14	6.091
Mujeres.....	5.672	99	108	9	5.573
PACUARITO.....	3.093	41	48	7	3.052
Hombres.....	1.772	19	22	3	1.753
Mujeres.....	1.321	22	26	4	1.299
FLORIDA.....	1.584	12	15	3	1.572
Hombres.....	824	6	7	1	818
Mujeres.....	760	6	8	2	754
GERMANIA.....	2.648	20	23	3	2.628
Hombres.....	1.397	10	12	2	1.387
Mujeres.....	1.251	10	11	1	1.241
EL CAIRO.....	1.995	12	13	1	1.983
Hombres.....	1.011	8	9	1	1.003
Mujeres.....	984	4	4	...	980
CANTON TALAMANCA.- Ambos					
Sexos.....	7.017	154	186	32	6.863
Hombres.....	3.771	70	95	25	3.701
Mujeres.....	3.246	84	91	7	3.162
BRATSI.....	3.810	101	118	17	3.709
Hombres.....	1.971	50	62	12	1.921
Mujeres.....	1.839	51	56	5	1.788
SIXAOLA.....	1.268	17	17	...	1.251
Hombres.....	718	8	8	...	710
Mujeres.....	550	9	9	...	541
CAHUITA.....	1.939	36	51	15	1.903
Hombres.....	1.082	17	25	13	1.070
Mujeres.....	857	24	26	2	833
CANTON MATINA.- Ambos Sexos	12.581	169	206	37	12.412
Hombres.....	6.657	77	92	15	6.580
Mujeres.....	5.924	92	114	22	5.832
MATINA.....	3.110	38	49	11	3.072
Hombres.....	1.705	21	27	6	1.684
Mujeres.....	1.405	17	22	5	1.388
BATAN.....	6.215	100	120	20	6.115
Hombres.....	3.209	40	48	8	3.169
Mujeres.....	3.006	60	72	12	2.946

TABLE I (continued)

según: POBLACION DE COSTA RICA
 por : SEXO, AUMENTO VEGETATIVO
 : PROVINCIAS, CANTONES Y DISTRITOS
 : 1ero. DE JULIO DE 1979

Provincia, Cantón y Distrito	Población al 1° de julio 1979	Aumento de Población			Población al 1° de enero 1979
		Aumento vegeta- tivo	Nacimien- tos	Defuncio- nes	
CARRANDI.....	3.256	31	37	6	3.225
Hombres.....	1.742	16	17	1	1.727
Mujeres.....	1.513	15	20	5	1.498
CANTON GUACIMO.- Ambos Sexos	13.598	149	173	27	13.449
Hombres.....	7.256	74	85	21	7.132
Mujeres.....	6.392	75	88	6	6.317
GUACIMO.....	5.506	64	77	13	5.442
Hombres.....	2.833	32	41	9	2.851
Mujeres.....	2.623	32	36	4	2.591
MERCEDES.....	836	3	3	..	833
Hombres.....	432	1	1	..	431
Mujeres.....	404	2	2	..	402
POCORA.....	1.692	19	22	3	1.673
Hombres.....	887	8	11	3	879
Mujeres.....	805	11	11	..	794
RIO JIMENEZ.....	5.564	63	74	11	5.501
Hombres.....	3.004	33	42	9	2.971
Mujeres.....	2.560	30	32	2	2.530

RESUMEN GENERAL

Provincia, Cantón y Distrito	Población al 1° de julio 1979	Aumento de Población			Población al 1° de enero 1979
		Aumento vegeta- tivo	Nacimien- tos	Defuncio- nes	
TOTAL PAIS**.- Ambos Sexos	2.183.625	27.313	31.501	4.188	2.156.312
Hombres.....	1.084.983	13.735	16.222	2.487	1.071.248
Mujeres.....	1.098.642	13.578	15.279	1.701	1.085.064
TOTAL PROV.** Ambos Sexos	2.183.625	27.313	31.501	4.188	2.156.312
Hombres.....	1.084.983	13.735	16.222	2.487	1.071.248
Mujeres.....	1.098.642	13.578	15.279	1.701	1.085.064
TOTAL CANT.** Ambos Sexos	2.183.625	27.313	31.501	4.188	2.156.312
Hombres.....	1.084.983	13.735	16.222	2.487	1.071.248
Mujeres.....	1.098.642	13.578	15.279	1.701	1.085.064
TOTAL DIST.** Ambos Sexos	2.183.625	27.313	31.501	4.188	2.156.312
Hombres.....	1.084.983	13.735	16.222	2.487	1.071.248
Mujeres.....	1.098.642	13.578	15.279	1.701	1.085.064

TABLE II
POBLACION DE LAS SUBREGIONES DEL PAIS ^{1/}
1980-2000

	1980	1985	1990	1995	2000
COSTA RICA	<u>2.213.400</u>	<u>2.484.500</u>	<u>2.775.500</u>	<u>3.075.100</u>	<u>3.377.500</u>
1. REGION CENTRAL	<u>1.527.000</u>	<u>1.710.100</u>	<u>1.903.700</u>	<u>2.100.500</u>	<u>2.297.600</u>
1.1 Subregión San José	679.400	761.000	847.100	934.700	1.022.400
1.2 Subregión Heredia	143.400	160.800	178.900	197.500	216.000
1.3 Subregión Alajuela	139.000	155.600	173.200	191.200	209.100
1.4 Subregión Cartago	145.100	162.500	180.900	199.600	218.300
1.5 Subregión Puntarenas	97.700	109.400	121.800	134.400	147.000
1.6 Subregión San Ramón	82.500	92.300	102.800	113.400	124.100
1.7 Subregión Turrialba	65.700	73.500	81.900	90.300	98.800
1.8 Subregión Grecia	44.300	49.600	55.200	60.900	66.600
1.9 Subregión Caraiques	38.200	42.800	47.600	52.500	57.400
1.10 Subregión Puriscal	38.200	42.800	47.600	52.500	57.400

^{1/} Estimación preliminar del Departamento de Población de OFIPLAN con base en las proyecciones por Regiones preparadas por CELADE.

TABLE II (continued)

	1980	1985	1990	1995	2000
<u>4. REGION HUETAR</u>					
<u>ATLANTICA</u>	171.300	204.200	241.000	281.300	324.600
4.1 Subregión Pococí	91.800	109.500	129.200	150.800	174.000
4.2 Subregión Limón	79.500	94.700	111.800	130.500	150.800
<u>5. REGION HUETAR NORTE</u>	<u>89.200</u>	<u>100.800</u>	<u>113.600</u>	<u>126.900</u>	<u>140.600</u>
5.1 Subregión San Carlos	89.200	100.800	113.600	126.900	140.600

TABLE III

REGION HUETAR ATLANTICA: POBLACION TOTAL SEGUN GRUPOS DE EDAD
1970-2000

Grupos de Edad	AÑOS						
	1970	1975	1980	1985	1990	1995	2000
TOTAL	113 970	141 584	171 275	204 186	240 962	281 345	324 589
0 - 4	21 387	21 723	24 134	27 832	32 340	36 728	40 537
5	3 944	4 627	4 545	5 251	6 065	6 991	7 829
6	3 312	4 608	4 551	5 153	5 937	6 858	7 718
7	3 674	4 551	4 581	5 072	5 814	6 721	7 600
8	3 532	4 462	4 626	4 996	5 697	6 582	7 477
9	3 338	4 347	4 678	4 930	5 585	6 443	7 349
5 - 9	18 350	22 594	22 981	25 406	29 098	33 594	37 974
10	3 242	4 207	4 741	4 865	5 433	6 305	7 219
11	3 098	4 046	4 822	4 794	5 389	6 169	7 088
12	2 955	3 886	4 836	4 768	5 303	6 040	6 951
13	2 814	3 740	4 743	4 808	5 222	5 910	6 809
14	2 677	3 604	4 579	4 837	5 151	5 805	6 664
10 - 14	14 786	19 432	23 721	24 121	26 548	30 237	34 730
15	2 542	3 459	4 421	4 956	5 082	5 699	6 521
16	2 404	3 309	4 254	5 030	5 004	5 599	6 379
17	2 296	3 163	4 097	5 046	4 980	5 515	6 252
18	2 233	3 044	3 969	4 970	5 037	5 451	6 147
19	2 197	2 933	3 857	4 830	5 138	5 404	6 058
15 - 19	11 672	15 913	20 598	24 331	25 241	27 669	31 356
20	2 160	2 821	3 735	4 695	5 223	5 357	5 974
21	2 133	2 708	3 609	4 551	5 326	5 303	5 893
22	2 079	2 609	3 477	4 402	5 349	5 237	5 821
23	1 930	2 528	3 336	4 256	5 254	5 324	5 739
24	1 853	2 457	3 190	4 111	5 031	5 390	5 657
20 - 24	10 206	13 124	17 347	22 016	26 236	26 661	29 089
25 - 29	7 705	11 086	13 991	18 194	22 842	27 050	27 486
30 - 34	5 162	8 270	11 624	14 513	19 639	23 311	27 500
35 - 39	5 359	6 540	3 629	11 950	14 817	18 960	23 546
40 - 44	4 421	5 606	6 778	3 841	12 122	14 959	19 059
45 - 49	3 664	4 594	5 760	6 917	8 946	12 171	14 967
50 - 54	3 097	3 715	4 624	5 763	6 995	8 874	12 021
55 - 59	2 403	3 041	3 639	4 515	5 610	6 702	8 602
60 - 64	1 772	2 279	2 881	3 449	4 274	5 304	6 334
65 - 69	1 292	1 561	2 019	2 563	3 087	3 537	4 771
70 - 74	820	1 049	1 284	1 676	2 147	2 597	3 241
75 - 79	474	584	764	952	1 255	1 624	1 979
80 y más	390	422	502	641	815	1 066	1 396

Fuente: OFIPLAN, 1980

Mortalidad Infantil

Un aspecto muy importante en el estudio de las características demográficas de la población, es el correspondiente a la mortalidad infantil, ya que se considera representativa de las condiciones de vida de la población.

La tasa de mortalidad infantil en Costa Rica ha descendido notablemente en los últimos años: en 1964 se registró una tasa de casi 80% y en 1977 la tasa fue de 27%. Pero esta tasa media nacional comprende grandes diferencias en las tasas correspondientes a unidades político-administrativas más pequeñas, que permiten establecer las diferencias regionales.

Debido a que no disponemos de la información anual, para conocer la situación en el área de estudio se utilizará un análisis por cantones realizado para los trienios 1972-74 y 1975-77*. De acuerdo a estos datos, la tasa de mortalidad infantil nacional fue de 44.05% en el primer trienio y de 32.77% en el segundo. Para estos mismos períodos, en la Región Huetar Atlántica se encontraron las condiciones más deficientes. Según los datos obtenidos, la provincia de Limón presentó en ambos trienios las tasas más altas de mortalidad infantil, las que no registraron una disminución muy significativa como ocurrió en otros casos.

	Mortalidad Infantil por mil	
	1972-74	1975-77
Costa Rica	44.05	32.77
Provincia de Limón	44.05	56.85
Cantón Central	80.06	53.14
Pococí	59.04	62.02
Siquirres	71.63	61.64
Talamanca	64.05	74.32
Matina	52.49	47.15
Guácimo	72.99	47.85

Como se puede observar, Talamanca presentó en el trienio 1975-77 las condiciones más deficientes a nivel cantonal en la región y que lo son igualmente a nivel nacional. Todos los cantones presentaron tasas más altas que el promedio nacional.

La comparación de las tasas por cantones para estos dos trienios presenta tendencias a la disminución, con una fuerte reducción en los casos del cantón Central y el Guácimo. Las excepciones son Pococí y Talamanca, que presentan tasas mayores. En estos casos es posible que en el primer trienio haya ocurrido un subregistro en las defunciones, lo

* Bermudez, Alicia: La mortalidad infantil por cantón. 1972-1977. Sistema de Información en Nutrición, 1980.

cual se considera probable en las áreas más alejadas del país. En los últimos años se ha logrado una mejora notable en el registro de las estadísticas vitales, aun cuando todavía persisten ciertas deficiencias.

TABLE IV

COSTA RICA Y PROVINCIA DE LIMONTASA DE MORTALIDAD GENERAL E INFANTIL (POR 1000/Hab.)

<u>ANC</u>	<u>TASAS POR MIL HAB.</u>	<u>Mortalidad General</u>		<u>Mortalidad Infantil</u>	
		<u>COSTA RICA</u>	<u>REGION ATLANTICA</u>	<u>COSTA RICA</u>	<u>REGION ATLANTICA</u>
1970		6.6	10.6	61.5	87.6
1971		5.9	9.0	56.4	86.5
1972		5.9	10.0	54.4	84.2
1973		5.2	7.0	44.8	65.5
1974		4.9	7.2	37.6	62.7
1975		4.9	6.6	37.1	65.4
1976		4.6	6.2	33.3	52.8

FUENTE: Estadística Vital de Costa Rica, Oficina de la Organización Mundial de la Salud.

REGION HUETAR ATLANTICA POBLACION ECONOMICAMENTE ACTIVA

Análisis histórico P.E.A. región Huetar Atlántica

La P.E.A., según el Censo Nacional de 1973, era de 40.444, según la Encuesta Nacional de Hogares, Empleo y Desempleo en 1980 fue de 49.094. La tasa de desempleo con respecto a 1973 disminuyó para 1980, pues pasó de 7.71% a 6.0%, según datos de las mismas fuentes, en cifras absolutas los desocupados fueron 1.487 (1973) y 2.963 (1980).

Participación de la región en el total del país

En 1973 la región tenía el 6.0% de la fuerza de trabajo del país y en 1980 se estima que esa participación es de 6.3%, lo que refleja en parte la emigración de la zona, fenómeno contrario a lo que pasó en la década 63-73, pues en 1963 la región poseía el 5.2% de la P.E.A. del país.

La región manifiesta históricamente una mayor tasa de desempleo que el total del país, pues en 1973 para Costa Rica era de 7.34% (7.71% en la región) y en 1980 se estima en 5.3% (6.0% en la región).

Análisis por subregiones en 1973

Pococí poseía alrededor del 5.5% de la P.E.A. de la Región (22.152) mientras que Limón lo restante (18.292); sin embargo, la mayor tasa de desempleo se presentaba en Limón, pues era de 8.18%; en cambio en Pococí fue de 7.33%, lo que en términos absolutos era 766 y 721 personas respectivamente.

Según rama de actividad en Pococí predominó el sector primario pues era 71% de la P.E.A., esto debido a las plantaciones bananeras. En Limón el sector terciario representa el 41% y el primario se reduce también al 41%, ésto debido a la ponderación que tienen las actividades o servicios portuarios. El sector Secundario (industrias) muestra una mayor importancia en Limón pues emplea el 13% de la P.E.A.; en Pococí representa únicamente un 5%.

En lo que a categoría de ocupación alrededor del 78% son trabajadores remunerados y 16% en la categoría de cuenta propia, siendo los familiares alrededor del 6% trabajadores familiares y una cifra despreciable son patronos. El comportamiento es homogéneo para ambas subregiones.

Condición de actividades por sexo 1980

De la población total estimada (140.296) se estima que el 35% forman parte de la fuerza de trabajo (49.094) de los rurales, 46.13% son ocupadas y 2.963 desocupados. De los ocupados el 78% son hombres, mientras que en el caso de los desempleados se manifiesta un mayor problema para las mujeres que representan el 39% de los desocupados. Además, su participación en la fuerza de trabajo es bastante baja, pues de cada 6 mujeres únicamente una trabaja, mientras que en los hombres esa misma relación es de 2 a 1.

También, la tasa de desempleo en las mujeres es más alta (10.2%) que en los hombres (4.8).

Categoría ocupacional 1980

Con respecto a esta variable la región muestra un patrón de comportamiento similar al resto del país: 77% son asalariados, 15% trabajan por cuenta propia, 4% son patronos, 3% son familiares sin sueldo y 1% buscan trabajo por primera vez. Esas relaciones son muy similares cuando el análisis se hace por sexo.

Grupo ocupacional

La distribución de la fuerza de trabajo, según grupo ocupacional, es similar a la del conjunto del país, sin embargo se nota un ligero predominio de los operarios y artesanos pues representan el 56% del total de trabajadores, muestran la misma participación los administradores y gerentes que el personal de servicio, 13% cada uno, los empleados y vendedores son el 10%, finalmente, los profesionales y técnicos tienen una participación de 6%.

La composición del grupo ocupacional por sexo manifiesta notables diferencias. Por ejemplo, para los hombres el 67% son operarios y artesanos mientras que para las mujeres ese porcentaje se reduce a 22%. Para éstas hay un predominio en la categoría personal de servicio con un 32% (en los hombres es 7%), seguido por el mencionado 22% y después un 19% de empleadas y vendedoras, y 13% de profesionales y técnicos, ésta última cifra en los hombres es únicamente 4%, lo que podría revelar un mayor apego de las mujeres a su región de origen y una mayor disposición de los hombres a emigrar.

Distribución de la fuerza de trabajo según sector privado o público

La región muestra una distribución según sector privado o público similar al resto del país. El 80% de la fuerza de trabajo se localiza en el sector privado, el 19% en el sector público (7% en el gobierno central y 12% en instituciones autónomas) y el resto (1%) buscaron trabajo por primera vez.

La distribución por sector según sexo sí presenta diferencias notables pues el 83% de los hombres trabajan en el sector privado y únicamente el 16% en el público, en cambio para las mujeres el 71% está en la empresa privada, la cuarta parte de ellas con el estado, relación que también se mantiene a nivel nacional.

Fuerza de trabajo según sector de actividades en 1980

Para la totalidad del país los sectores más importantes son agropecuario y pesca (28%), servicios (22%) y comercio (18%). En la región se mantiene ese orden de importancia pero la diferencia del primero respecto a los otros es más marcada pues el sector agropecuario y pesca ocupa el 45% de la P.E.A., servicios el 15% y comercio el 14%.

Cuando se toman las cifras de distribución de sector según sexo aparecen diferencias muy marcadas, tanto entre sexo como en relación con la totalidad del país. En los hombres hay un marcado predominio en el sector agropecuario (53%), seguido por servicios básicos (14%) y comercio (10%), relación que para el país es 35%, 8% y 17% respectivamente. La principal causa de que cerca de la mitad de la P.E.A. esté en el sector agropecuario es la presencia de las plantaciones bananeras.

Para las mujeres, en el país principal actividad se localiza en servicios (45%) seguido de comercio (22%) e industria (18%) relación que se mantiene para los dos primeros, aunque con diferentes ponderación (37% servicios y 28% comercio), pero cambia para el tercer sector, pues la industria representa únicamente un 5% mientras que el agropecuario asume un 21% (en el país un 9%).

BIBLIOGRAFIA

Dirección General de Planificación del Trabajo en el Empleo. "Encuesta Nacional de Hogares Empleo y Desempleo por Regiones de Planificación. Año 1980"., Ministerio de Trabajo y Seguridad Social; San José, Costa Rica, 1981.

Oficina de Planificación Nacional y Política Económica. "Indicadores Socioeconómicos para la Planificación Regional"; OFIPLAN, San José, Costa Rica, junio de 1980.

TABLE V
REGION HUETAR ATLANTICA
POBLACION ECONOMICAMENTE ACTIVA

	Costa Rica	R. Huetar Atlántica	Pococí	Limón
P.E.A. (1973)	585.313	40.444	22.152	18.292
P.E.A. (1963)	395.273	20.677	8.157	12.430
Trabajaron	542.332	37.322	20.528	16.794
No Trabajaron	22.584	1.487	721	766
Tasas desempleo	7.34	7.71	7.33	8.18
Rama de Actividad				
Primario	214.783	23.281	15.820	7.461
Secundario	108.995	3.365	1.036	2.329
Terciario	230.818	11.477	4.040	7.437
No especificado	30.717	2.321	1.256	1.065
Categoría de ocupación				
Trabaj. remunerados	430.162	30.088	16.365	13.723
(1980)	582.244	37.947		
Cuenta propia	95.357	62.63	33 79	2.884
(1980)	120.686	7.159		
Patrono	4.744	264	126	138
(1980)	31.953	1.871		
Trabaj. familiares	34.613	2.194	1.379	815
(1980)	34.749	1.400		
Estimación personas de doce años y más (1980)	1.547.310	96.177	N.D.	N.D.
Fuerza de trabajo (1980)	779.638	49.094	N.D.	N.D.
Ocupados (1980)	738.076	46.131	N.D.	N.D.
Desocupados (1980)	41.562	2.963	N.D.	N.D.
Tasa desempleo abierto (1980)	5.3	6.0	N.D.	N.D.

ZONA FRANCA DE LIMON: Análisis

Ventajas para Costa Rica

Dentro de las ventajas que se citan como resultado del establecimiento de Zonas Francas y Parques industriales están:

- a) contribuir al desarrollo económico del país
 - b) uso de recursos nacionales
 - c) mejora de la balanza comercial
 - d) creación de fuentes de empleo
 - e) desarrollo de regiones periféricas
 - f) Integración y estabilización de la industria.
-
- a) Se argumenta que "... el sector manufactura tiene que jugar un papel más activo que el sector primario o el terciario en el futuro... es una de las herramientas efectivas... para promover el proceso de industrialización del país" ^{1/}.
 - b) Se pretende un mayor uso de recursos naturales y humanos así como de infraestructura ya desarrolladas y otros procesos de construcción.
 - c) La producción en estos proyectos va dirigida especialmente hacia la exportación, aunque se plantea la posibilidad de sustituir importaciones
 - d) Se afirma que el sector secundario (manufacturas) deberá, en el contexto nacional, absorber más empleo que cualquiera de los otros sectores de la economía; sin embargo, también se dice que ello no significa necesariamente la promoción de industrias que absorban mano de obra intensiva.
 - e) Estos proyectos se promueven como un instrumento para lograr el desarrollo en zonas distintas del Valle Central para evitar la excesiva centralización de actividades.
 - f) Se afirma que esta actividad contribuirá a que exista una estructura industrial más estable y desarrollada, pues se dice que hasta ahora la industria en Costa Rica está poco integrada.

^{1/} Nippon Koci Co. Ltd. "Establecimiento de Parques Industriales y Zonas Francas en Moín y Caldera Costa Rica". Corporación de la Zona Franca de Exportación, Tokio, Japón. 1981.

Desventajas para Costa Rica

- a) La evaluación hecha en el estudio de factibilidad presenta una serie de indicadores de rentabilidad entre ellos:
 - a) Tasa interna de retorno financiera 11.5%
 - b) Tasa interna de retorno económica 12.5%

Dado que la tasa social de descuento es de alrededor de 15%, el proyecto no es conveniente para el país pues hay inversiones alternativas con mayor rentabilidad tanto privada como social. Para "salvar" el proyecto se argumentan algunos beneficios "adicionales" ya contemplados en una evaluación económica apropiada así como otros beneficios no cuantificables cuya forma de lograrlos no es exclusiva de esta actividad. Se enfatiza que el proyecto es económicamente rentable, sin embargo, son la evidencia aquí expuesta se puede afirmar lo contrario.

- b) Los costos estimados para el proyecto de Moín son de ₡60 millones, lo que se supone a precios de inicios de 1981, dado que la mayoría de los costos (85%) son construcciones, y que los costos de éstos han subido por lo menos un 40% (a la fecha); el esfuerzo financiero es mucho mayor para un proyecto que tiene graves tropiezos legales y resistencia abierta de algunos de los principales líderes de la comunidad lo que los podría llevar al fracaso.
- c) Pueden surgir problemas de contaminación ambiental sinno se aplican los controles respectivos en forma adecuada.

Impracto sobre empleo

El proyecto creará alrededor de 2.000 nuevas plazas de las que se estima 725 será para mujeres. Según grado de especialización 370 serán administrativas, 1135 personal de fábrica especializado y 495 no especializados. Se preve que gran parte de este personal tendrá que ser formado por intervención del I.N.A. y el Instituto Tecnológico.

Demandas secundarias

Dentro de las demandas secundarias previstas están:

- a) Utilización efectiva de las facilidades portuarias, las cuales se han mejorado a un alto costo de inversión. Se debe esperar un incremento en el manipuleo portuario, así como un incremento en otros cargos.
- b) La utilización efectiva en carreteras y otros servicios de transporte, así como en el uso de instalaciones públicas, incluyendo facilidades para la conservación ambiental.

- c) Debido a la necesidad de personal especializado se ha presupuesto un 2% para entrenamiento y promoción. También dentro de los costos totales de los edificios se prevén instalaciones para el I.N.A.
- d) También se han tomado en cuenta los costos correspondientes a vías de acceso, agua y Sistemas de alcantarillado, electricidad y teléfono.

Sin embargo aparentemente no se ha tomado en cuenta servicios para la población trabajadora como sería:

- a) Un mínimo de 1.000 viviendas (suponiendo que de cada familia 2 personas se integran a la actividad industrial)
- b) Otros servicios para esa población de 5.000 personas (tomando 5 habitantes por vivienda) como escuelas, iglesia, cines y centros de recreación. A pesar de que se supone que una parte de la población provendrá de Limón, ésta es gente que carece de todos estos servicios en forma adecuada.

Impactos ambientales

Los tipos de industrias seleccionados para Moín serán industrias livianas que no tienen, por lo general, problemas de contaminación del aire (SO_x y NO_x). Para la disposición de agua de desecho se ha planeado instalar una planta de tratamiento de desecho líquido. Se dice que se prestará atención para un desarrollo que permita la preservación de cursos de agua, vegetación y otras condiciones naturales que permitan un "diseño con la naturaleza".

Estudio de mercado y productos

El estudio de factibilidad analizó la situación de mercado de los países más importantes desde el punto de vista de posibles importadores. Se revisaron las tendencias recientes de importación de tales países para determinar qué productos se podrían efectivamente promover para su exportación. El análisis se hizo producto por producto para determinar suposible potencial, tanto para exportación como para sustitución de exportaciones.

Entre los principales productos se determinaron alimentos para animales, cajas de cartón productos plásticos, muebles de metal, maquinaria (excepto eléctrica), aparatos eléctricos, comida congelada, productos de cacao, ropa equipo de comunicación y equipo de medición.

TABLE VI

GENERACION DE EMPLEO

Tipo de industria	Empleo		Total	2.000
	Tot.	Femenino		
Alimentos para animal	60	15% 9		
Asorraderos	120	20 24	Oficina	370
cajas papel	70	10 7	Gerencia	45
cemento y plásticos	70	15 11	Otros adm	325
muebles metal	250	15 38	Trabaj. fábri	1630
maquinaria (excepto eléctricos)	180	20 36	Espec	1135
aparatos eléctricos	180	25 45	mec	415
Comida congelada	90	40 36	electr	255
cacao	95	40 38	quim	165
telares	70	70 49		200
ropa	210	70 147	Otras especi	100
productos de hule	220	60 132	No especid	495
equipo comunic.	190	40 76		
equipo medición	110	40 44		
no Isificado	70	50 35		
bodega	15	-- --		
25 empresas	1070	557		
44 empresas	2000	725		

FUENTE: Anexo: A: 30 Tomo II

Bibliography

- C.S.U.C.A. (1978) "Estructura Agraria Dinámica de Población y Desarrollo Capitalista en Centroamérica". San Jose, Costa Rica
- Dirrección Nacional de Estadística y Censos (1973)
Censos de Poblacion. San Jose, Costa Rica
- Fernandez, M.S. y A. Basausi (1976) "La Población de Costa Rica". EUCR
- Ministerio de Educación Publica (1980) Prediagnostico Región Huetar Atlantica. San Jose, Costa Rica.
- OFIPLAN. (1980) Proyecciones de Población por Subregiones, Dpto. Poblacion: San Jose, Costa Rica
- PIDRA (1976) 5 Aspectos Sociales, A. San Jose, Costa Rica

APPENDIX D

TRANSPORTATION IN THE REGION HUETAR ATLANTICA

Charles Stapleton

Department of Urban Planning

School of Environmental Design

California State Polytechnic University, Pomona

with

Rodrigo Gutiérrez G.

OFIPLAN

TRANSPORTATION PLANNING FOR THE

REGION HUETAR ATLANTICA

Regional transportation planning is generally classified into two categories: that planning which preserves or enhances the development which already exists in the region and that which facilitates development which is yet to take place. After regional development has essentially reached a mature state, there is an implication that the existing transportation system must be preserved. However, when a region has yet to be developed, or is in an immature state, then the transportation system which is still to be fully developed should be used as a strategic tool to carry out overall planning which has been proposed for the region.

TRANSPORTATION THEORY

Before discussing the particulars of transportation planning of the Atlantic Basin and our recommendations, there should be an understanding of the nature of transportation within the overall framework of human societies.

Transportation is a communication system and must be examined as to what the various elements which comprise it can accomplish to satisfy the requirements of this system. Individual transportation elements by themselves actually have no value. An automobile without roads is useless; a railroad train without rails cannot function; unless there is an airport with supportive facilities, airplanes have no purpose.

Transportation is a social system with physical components as a base. The point is now being reached where some of the physical elements of the system can be replaced, due to the advanced technology of the telecommunications industry. In many cases it is not necessary for person-to-person contact to physically take place, thereby eliminating the necessity for people to travel to a central meeting place. Communication or social interaction can occur electronically and is especially useful in "soft ware" types of businesses. Of course where people must gather to perform physical operations such as an assembly plant, travel

to that central place is required. While a description of individual transportation vehicles is presented in the following pages, the inter-relationships of these vehicular components or modes* is indicated as follows:

Vehicle:	car, bus, train, ship, airplane
Guideway:	road, rails, shipping lane, airspace
Storage:	parking space for automobiles, buses trucks, railroad yards, hangers or tie-down areas
Terminals:	bus, train, air, water

Concepts

A transportation system requires a sufficient supply of each type of vehicle, guideway, storage, and terminals which comprise the system in order to meet existing and estimated demand.

Each mode is designed and used for what it does best. Railroads and ships move large amounts of heavy or bulky freight at relatively inexpensive costs, once the infrastructure such as roads, rails, and terminals have been built. Buses and cars are ideally suited for moving passengers from home to work, but require the necessary streets, roads and highways.

When properly layed out, this arrangement becomes a transportation network, permitting an infinite number of combinations, some of which are shown below:

Ship	-----	rail	-----	truck
rail	-----	truck	-----	truck
air	-----	bus	-----	walking
bus	-----	bus	-----	walking
		car		
		walking		

While these networks can be analyzed and determined by mathematical models which can serve as a helpful tool for making transportation decisions, the true test is made by people who use the network on a daily basis: commuters going to and from work; businesses distributing goods; industries shipping in raw materials and shipping out finished products.

* Components or elements which are used for the movement of people and goods and which represent the vehicles and their support facilities.

The traffic engineer is concerned with getting the most efficient vehicular flow possible from the street and highway infrastructure; and in urban and semi-urban areas, modes will be grouped and regrouped to form what is termed "transit". For example, bus lines will be laid out to criss-cross an area in an effort to provide maximum service for maximum demand. While the purpose of transit is to form a network for meeting the public transportation needs of people, experience has shown that at no point does the system ever achieve an equilibrium state, for urbanized areas are dynamic and the variables comprising it are numerous.

The urban planner is concerned with these modes because of their effect on land use. Transportation is a basic element in organizing and shaping urban space, since a direct relationship exists between land use and travel. As urbanized areas are developed and redeveloped, accessibility is a prime factor in making locational decisions. Trip patterns, volumes, and the distribution of the several transportation modes provide valuable information and become one facet in the preparation of plans. In determining spatial arrangements for housing, employment, commerce, and services (such as education, health and recreation), there must be direct transportation linkages. Also, each of these areas will have its own peculiar transportation requirements which are based on specific location and type of development (The Urban Transportation System: Politics and Policy Innovation, 1979).

In a similar manner, but with less intensity, these same relationships are present in planning for rural areas. People who work and live in villages and on farms require a supportive transportation system in order to function as a viable unit. An infrastructure must exist to transport products and goods to and from the market, to secure social services, to allow participation in cultural events, and to have transportation linkages with cities.

Transportation routes have historically directed the migration of people between regions and have been the determining factor for the location of settlements. Paths, waterways, and roads have made it possible for large-scale population flows and for regional linkages for travel. At appropriate locations such as places where these routes crossed, where it became necessary to break the bulk of cargo, or at strategic locations requiring fortifications, shelter and services were provided. In many instances, these places became the locations of the towns and cities of today.

Classification of Modes

There are six general transportation classifications of modes: automotive, railroad, water, air, pipeline, and nonmotorized. A breakdown of this modal framework for Costa Rica, with emphasis on the Atlantic Basin, is as follows:

1. Automotive

- a. Cars
- b. Taxis
- c. Buses
- d. Trucks
- e. Motorcycles and Motorscooters

2. Railroad

- a. Passenger
 - (1) Intra-city
 - (2) Inter-city
- b. Freight
 - (1) Intra-city
 - (2) Inter-city
 - (3) Industrial

3. Water

- a. Ocean and coastal vessels: These range in size from large oil tankers to small vessels of perhaps 5,000 tons. They are usually designed for specific types of cargo.
- b. Inland waterway vessels: These are various sized smaller boats which depend on the navigation potential of particular rivers.
- c. Barges and Lighters: This class of vessel normally has no internal power and is used to load cargo in harbors.

4. Air

In Costa Rica, airplanes account for almost all of the international travel. They are also important domestically.

- a. Passenger
- b. Freight

5. Pipeline
6. Non-motorized

A sizable proportion of the population uses one or more of the following in daily movements:

- a. Walking
- b. Bicycles
- c. Animals

TRANSPORTATION POLICIES AND PRIORITIES

An examination of transportation reveals that it has two basic functions -- transportation provides a service to the public and transportation serves as an industry (Regional Study of the Hinterland of Caldera and Puntarenas Ports, 1977).

The service aspect of transportation has been discussed above; however, as an industry it is an important producer of employment. National policy dictates whether as an industry transportation will be supported by the public or private sector. Many western nations do not take an "either-or" approach, but rather relate ownership to modes. For example, buses and railroads are owned and operated by the public sector while other modes, such as the trucking industry, are privately owned. Generally, private enterprise will disengage itself from uneconomic transportation operations or will not become involved in these operations. However, when there is a concern for the public welfare, the government is likely to take over these operations that have been abandoned or which have provided poor service to the public. This almost always requires a subsidy to make up the difference between operating costs and revenues. After this decision, the questions usually center around how much subsidy; to which mode; and the quality of the service.

Whatever the transportation ownership pattern, there are large costs required to operate, maintain and expand the system. In this section of the transportation report, policies and priorities will be discussed in terms of fiscal relationships.

Whether transportation vehicles themselves are publicly or privately owned and operated, as determined by public policy and the particular mode, the guideways and terminals are usually owned by the public. (In Costa Rica there is an exception, since there are railroads and port facilities privately owned by banana, sugar and seafood companies.)

Since these guideways, terminals, and possibly vehicles, are expensive capital investments, it is necessary to spread their cost over many years. There are always more of these transportation facilities needed than there is money to pay for them; consequently it becomes necessary for priorities to be established.

It is not possible to establish logical priorities unless it can be shown that they reflect what is to be accomplished on an overall basis. In order to obtain agreement for this, there must be a reason for acceptance. Acceptable implies the formation of policy. For planning to be effective, it is necessary to state policies in as precise a manner as possible. Broad generalities which are intended to pass as policy planning are often worse than no policy at all since they provide little if any basis for agreement for implementing plans.

Transportation planning must be clearly related to overall policy plans of development and not become the basis for the design and construction of projects which are isolated from policies and priorities of other important elements of development. These other important elements include land use, social programs and the economy itself.

TRANSPORTATION AND THE DEVELOPMENT OF THE ATLANTIC BASIN

In the above discussion of transportation modes, there was a generalized discussion of the several components affecting the Costa Rican transportation system. In this section, a more detailed examination will be made of each of these elements with special reference to the Atlantic Basin.

Automotive

Particular attention must be given to the automotive vehicle because of its dominance in the country. The government of Costa Rica has been strongly committed to preparing an extensive automotive transportation system. An analysis of the total budget for the country between 1967 and 1975 reveals that at no time was the yearly percentage for overall transportation less than 16.8%, with 1973 showing an annual transportation budget of 24.7%. The yearly average for this 1967-75 period was 21.4%. While no percentage of this total transportation budget is shown solely for highways and roads, nevertheless a substantial amount of this money was allocated for automotive vehicle purposes, since all classes of roads (paved, improved and unpaved) increased by over 6,400 Km between 1968 and 1975 (Caudros Estadísticos Sobre el Sector Transportes, 1973 y 1975,

1974 and 1976). With this amount of spending for the automotive infrastructure, it is not surprising that the number of vehicles began to increase, especially the number of automobiles (including taxis) and trucks. According to the Ministerio de Obras Públicas y Transportes (Regional Study of the Hinterland of Caldera and Puntarenas Ports, 1977), between 1965 and 1977:

"The number of automobiles has increased a faster rate than that of buses. The number of automobiles per one bus was 23.23 in 1965, 30.56 in 1979, and 38.51 in 1975. People prefer private transportation to public transportation." 1/

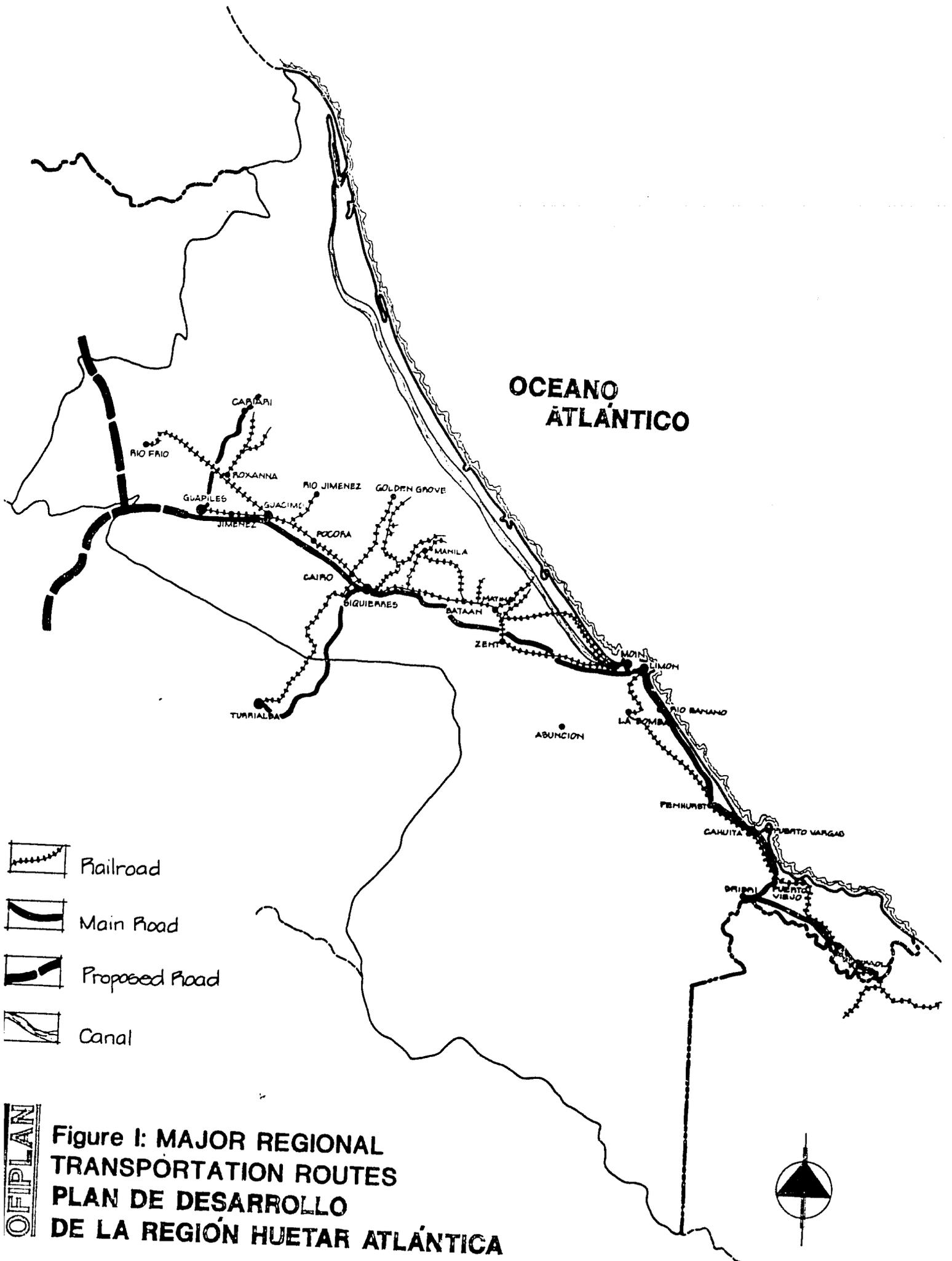
What has taken place in Costa Rica in respect to the increase in automobiles is consistent with what has occurred in other countries throughout the world. However, special attention should be given to this transportation mode and its guideway -- highways and roads -- so as to have a proper understanding of the relationship to all transportation systems.

Automotive modes of travel have had an extraordinary influence on the form and function of regions, their settlement patterns, their environment, their quality of life, and their economic development.

Settlement Patterns

The extensions of roads and highways into the Atlantic Basin has replaced the railroad as a determinant of settlement patterns. Historically, settlements were clustered around the railroad line, forming a long population corridor from Limón to Guápiles. With the building of new highways, population has tended to move to these roads where settlement patterns have formed in less concentrated clusters, with occasional off-shoots or branches where new roads are being constructed.

Highway development and roadway extensions have led to dispersed settlement patterns on the one hand and to concentrations of population in other instances. When new roads have opened areas for new settlements, often people have spontaneously moved into these sections as in the case of areas around Cariari. Where new highways form cross-roads or form new linkages, substantial major growth can be expected. Guápiles will undoubtedly experience rapid growth and new activity because the city is near the cross-roads of the new road connecting San José with the northern region (Huetar Norte), and because the new road will cut distance and travel time. (See Figure I.)



OPIPLAN Figure 1: MAJOR REGIONAL TRANSPORTATION ROUTES
PLAN DE DESARROLLO DE LA REGIÓN HUETAR ATLÁNTICA

Environmental Problems

Highway extensions, while opening up new land for settlement, have sometimes caused severe environmental problems. These road extensions have often permitted random deforestation and loss of endangered animal and bird species. In some instances these have been constructed without proper consideration for the effects of erosion, or embankments have not been well prepared. Frequently roads have not been well graded, and consequently drainage is poor. Road building materials and debris have been thrown about which, together with other construction activities, has led to erosion, soil degradation, and visual blight.

Quality of Life

The ability of people living in rural areas to gain access to services and commodities needed to satisfy their basic needs is directly related to the presence of roads and transport. In rural areas, roads and some form of passenger transport are needed to provide the connections between farms and between urban areas and farms for social as well as economic purposes. Where roads are absent or properly maintained so as to be impassable, or where adequate mode of transport is missing, a person's ability to satisfy his basic needs for food, health, education and employment is lowered.

At the regional level roads, trucks, buses, and possibly individual cars are the major links between rural and urban areas or settlements. Rural labor needs transportation to urban jobs and urban labor must travel to rural areas. A transportation infrastructure is the major link to bring products from farms to settlements and manufactured commodities in rural dwellers. Without adequate transport, the major link in the post-harvest production system is missing; conversely, a major market in rural areas for manufactured items will not be served. In effect, the integration between the rural and urban settlements cannot be made.

Recurrent Maintenance Costs

The investment in roads is a necessary part of the economic, political and social integration of the nation. But the road infrastructure can be over-extended necessitating a great commitment on the part of the government to recurrent maintenance costs. Frequently the materials and equipment for road maintenance must be imported and this leads to an outflow of foreign exchange if the roads

are maintained. If the roads are not maintained, then serious deterioration of the system can lead to a downward spiral of economic and social problems in the area affected. The commitment to build highways and roads must include -- at the outset -- a commitment to maintain them. To prevent fiscal over-extension, priorities for both should be established.

New Employment

One part of the automotive industry that is frequently neglected in regard to regional development is the employment created by new industries and services dedicated to the maintenance of cars, trucks, buses, and farm machinery. On the positive side, the advent of automotive transport gives rise to these needs and to the need for trained mechanics, repairmen, sales agencies, manufacturers of spare parts and other services. The growth of automotive related services and industries can boost employment significantly and can give many opportunities for training directly related to job openings.

Deteriorating Inventories

On the negative side, when necessary components of the automotive industry are missing, the entire quality of transportation services declines to a dangerous level that negatively affects the economic development not only of regions that depend on the transport of commodities internally and externally, but the development of the nation as a whole (Ewusi, 1975). These conditions can be brought about when spare parts are not available, where trained mechanics are not in good supply, where fuels and materials for maintenance and repair cannot be locally manufactured or provided because of a shortage of foreign exchange, and when new imports of vehicles are prohibited for the same reason.

Roadways and Multiple Travel Modes

When priorities are set for transportation planning, it is easy to lose the perspective of the importance of the non-motorized mode. However, this is still an important part of the overall movement of people in Costa Rica. There is severe competition for the use of highway and road space between different types of travel: horseback, oxcart, tractors, bicycles, motor scooters, cars, buses, and trucks all share the same road with pedestrians. There is insufficient width for all, and many types of non-motorized transport are simply ignored when guideways are designed. Numerous examples of these conditions can be cited in the sub-regions of the Atlantic Basin.

Railroad

Railroad transportation has a long tradition in Costa Rica and has played an important role in the international marketing of the country's products. At present, there are two independently operated systems -- the private one owned and operated by the banana companies for shipping bananas and the public system, Ferrocarriles de Costa Rica (FECOSA). The length of these railway systems has increased very little since 1965 according to the Ministerio de Obras Públicas y Transportes (Cuadros Estadísticos Sobre el Sector Transportes, 1975, San José, 1976); however, the number of passengers and amount of goods have been increasing.

The Ministerior de Obras Públicas y Transportes indicated that between 1966 and 1975 the number of passengers served by the Atlantic Basin railroad increased by 36.5% compared with 29.1% for the country as a whole. The amount of goods shipped by this railroad during the same period increased by 54.8%, while for the country as a whole the increase was 38.4%.

The public railroad system was operated by two public agencies until 1977 when they were merged into the present organization. JAPDEVA has been responsible for the railroad system on the Atlantic portion of Costa Rica and INCOP on the Pacific side. As reported in the Regional Study of the Hinterland of Caldera and Puntarenas Ports, both systems were experiencing management problems and the reason for the reorganization was to form a new management system under FECOSA. The report concluded that ". . . unfortunately management of the railroads did not improve."

This statement seems to have been substantiated by the feasibility study of INCOP, JAPDEVA, and COMPANIA BANANERA DE COSTA RICA (Cuadros Estadísticos Sobre el Sector Transporte, 1975, San José, 1976) which said that ". . . in recent years the average transportation cost of goods is 0.415 colón/ton/Km while the income is 0.296 colón/ton/Km; the average transportation cost of persons is 0.172 colón/person/Km while the income is 0.162 colón/person/Km." Such data as these would indicate a negative cash flow caused by higher costs and lower income.

Railroad transportation is important to the Atlantic Basin and as part of the national network serving Costa Rica. The railroad provides the port facilities at Limón and Moín with the necessary linkage for handling bulky and heavy cargo. Expansion plans now underway at both ports rely strongly on the railroad to provide these necessary services. The rail line between Siquirres and Limón is

presently being electrified and other improvements to the system, including the construction of double trackage and the straightening of alignments, will be necessary. But probably the greatest concern should be in regard to the old problem of management. Based on the past difficulties of the Ferrocarriles de Costa Rica and the present challenges of increased responsibilities in expanding the system at a time of high energy and material costs, great management skills will be required to make the system function well.

Water Transportation Facilities

Two types of water transportation activities are prevalent in the Atlantic Basin. The first is related to river and canal transportation; the second, and most important from the point of view of the impact on the economy and for investment priorities, is the transportation connected with the ports.

Limón and Moín

Major ports have a dual function along with railroads of serving as vital transportation linkages for the national economy and for that of the immediate or regional area in which they are located. In the case of Limón and Moín, the geographical area of influence, known as the hinterland, is regional as well as national. This is because of the relatively close proximity of the several regions of Costa Rica and their economic interrelationships. While both ports have national economic significance, it is important to recognize the physical, economic and social impacts which they have on the Atlantic Basin, especially on the area in the immediate vicinity of Limón.

Port facilities at Limón are undergoing extensive expansion and at Moín, about five Km distance from Limón, an entirely new facility is under construction. Cargo assignments at both facilities include coffee, bananas, containerized cargo, general cargo, petroleum and break bulk cargo. These facilities are of great importance to Costa Rica since 60% of the country's international traffic (including airports and border traffic) are handled there (Hutten, 1981). Extensive railroad facilities are intended to be developed as part of the new port infrastructure.

Port construction and reconstruction for the Atlantic Basin is a high priority and represents an enormous investment for the Government. Primarily, the investment is meant to achieve significant improvements in cargo handling, but the construction also represents opportunities for physical

improvements in adjacent urban areas and in the transportation facilities that are linked to the ports. The new ports also represent problems and potentials for employment in the area. For these reasons the planning and construction of both ports and the facilities in the surrounding area must be closely coordinated.

Cargo Handling

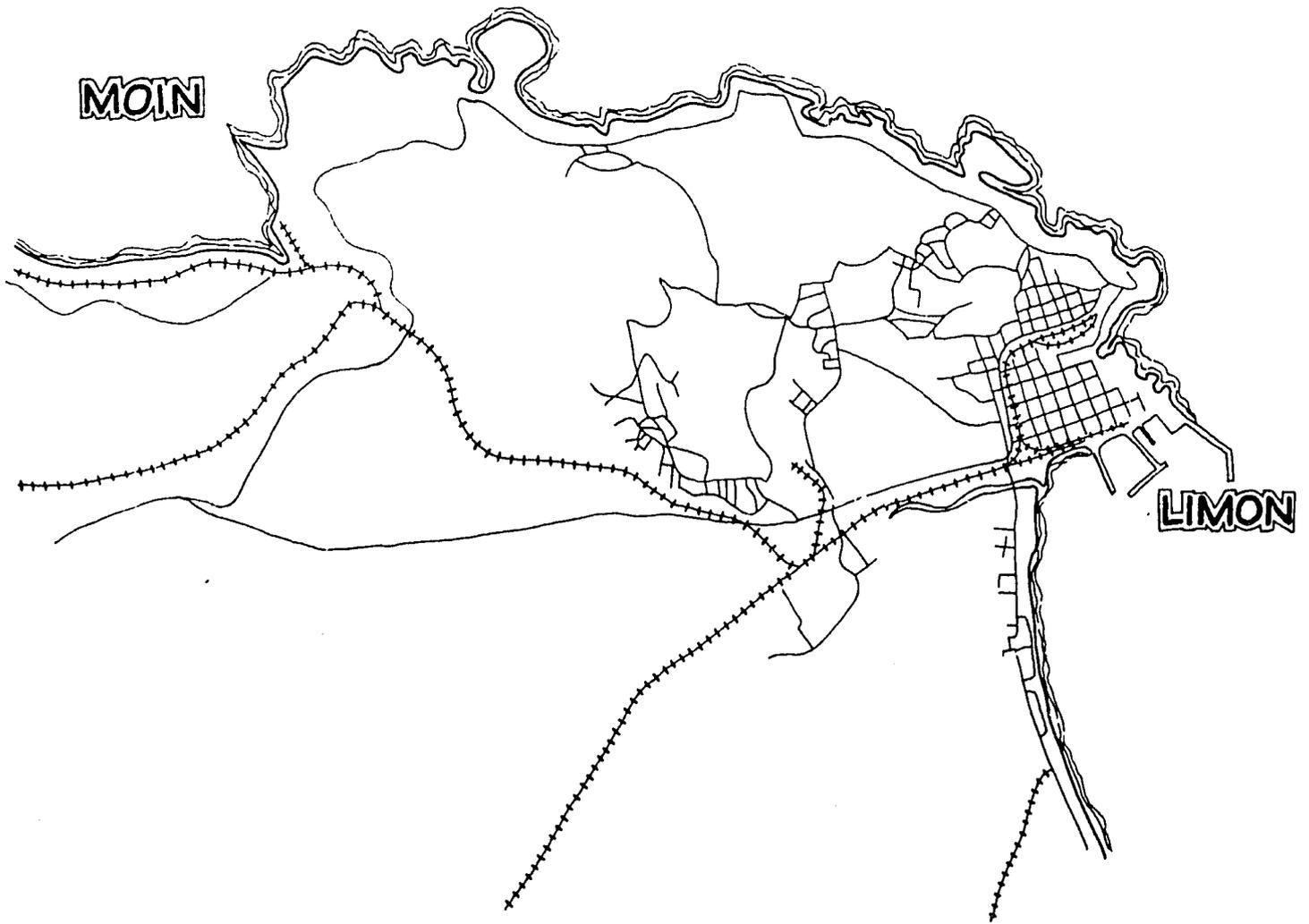
The construction of the port at Moín began in 1977 primarily as a project for the off-loading of petroleum destined for the nearby RECOPE refinery. Apparently work on the project was well along when the design of the project was changed to include major facilities for handling containerized cargo. The port of Limón is also being prepared for this type of cargo. Currently there is disagreement as to which of the two ports will handle the major portion of the containerized cargo. This disagreement has immediate and serious implications for the coordination of capital improvements such as rail and truck access, and storage facilities.

Municipal-Port Relationships

Considerable difference will exist in terms of rail and truck access between the new facilities at Moín and the redeveloped physical facilities at Limón. The port of Limón is squeezed between the harbor and the city. Expansion of these port facilities is occurring within the existing confines of the port. All access for railroad and highway transportation must come from one direction and that is via the public street which separates the port from the city and Vargas Park. This street, Avenida Una, is in poor condition and will require rebuilding. Even so, transportation to and from the port will result in severe disruption of the city's vehicular and pedestrian circulation patterns. Moreover, office space with the existing port cannot be accommodated because of insufficient space.

Employment Impacts

The latest technologies pertaining to containerized cargo handling are going to be used at the ports of particular significance. In this respect is the proposal to use refrigerated containers for shipping bananas, since this will allow the fruit a longer time to mature before cutting. This will provide a more valuable product for the world market. The maximum time from the cutting of the banana stalk to shipping should not exceed 36 hours. Consequently, an efficient transportation system is vital.



OFIPLAN

**Figure II: DETAIL of MUNICIPAL PORT
PLAN DE DESARROLLO
DE LA REGIÓN HUETAR ATLÁNTICA**



The target date for full containerization of bananas is 1990. Moreover, by 1983, 90% of all the coffee exports are expected to be containerized (Hutten, 1981).

In order to meet these target dates, there will be a need for 20% more personnel trained in this new, more sophisticated transportation technology. However, containerized cargo handling requires less labor -- approximately 40% less than conventional cargo handling techniques. Also, a new industry will be needed, that of container cleaning and repair. Therefore, centers for these activities will be required, as well as the people trained for their operation. January, 1982 has been set as the opening of the container age for Costa Rica (Hutten, 1981). With it will come a shift in traditional work assignments, which will produce social adjustments as the new technology replaces the old.

Inland Waterways

Rivers flowing to the north, into the Atlantic Ocean, and the Tortuguero Canal system comprise the inland waterways of the Atlantic Basin. While these waterways have the potential for providing an extensive transportation system, they are not well developed and presently provide only a relatively small amount of the total transportation for the region. (See Map Appendix for river courses in the region.)

A recent study of the inland waterway system has been completed for Costa Rica (Informe de Trabajo No. 22, 1980). This report addresses the problems and potentials of the waterway systems and should be used as a reference if more detailed information on this subject is required.

Although the Pacific coastline is considerably longer than the Atlantic, the geography of Costa Rica is such that there are many more inland waterways draining to the north and to the Atlantic side of Costa Rica than to the Pacific Coast.* The Atlantic basin is part of the northerly watershed and comprises all of the Atlantic watershed. A number of important rivers provide river transportation in these

* According to Informe de Trabajo No. 22, cited above, Costa Rica has approximately 1,063 Km of maritime coastal waterways, of which 879 Km are on the Pacific and 184 Km are on the Atlantic Ocean side of the country. Of the 812 Km of inland waterways in the country, 374 Km are in the northerly watershed, 328 Km are in the Atlantic watershed, and only 110 Km are in the Pacific watershed.

watersheds including the Río San Juan and the Río Colorado which form the northerly boundary of the Atlantic Basin. The Tortuguero Canal provides inland water transportation from Moín to Barra del Colorado, a distance of 112 Km, well over one-half of the entire Atlantic coastline.

The Tortuguero Canal is a system of natural and artificial waterways which provides protected inland waterways transportation for small boats, launches, rafts, and barges. The principal products transported between Barra del Colorado and Moín are coco, logs and cacao. From Moín to Barra del Colorado the primary cargo is foodstuffs. A few passengers travel along this waterway. Barges and most boats travel very slowly and take from four to five hours for the trip. A number of settlements are served along the way including Matina, Paisma, Tortuguero and Barra del Colorado.

Barges with motors are used to haul the heavier cargo. They weigh about nine tons, are 15-plus meters long and have 150 horsepower. Tree trunks are lashed together by chains and pulled to sawmills. Small boats, with and without motors, are also used on this waterway. Boats of various sizes made from a single hollowed-out log are used on the canal and are also quite common as river transportation. JAPDEVA operates a launch named the "Gran Delta", between Moín and Tortuguero. It has a capacity of 50 passengers and 1,600 Kg of cargo.

The following weekly cargo is transported on the Tortuguero Canal as reported in Informe de Trabajo, No. 22:

Barra del Colorado to Limón

Coco	140,000 nuts
Timber	450 logs
Cacao	3,500 Kg

Limón to Barra del Colorado

Foodstuffs	15,000 Kg
------------	-----------

A considerable effort was required to prepare the Tortuguero Canal for inland waterway traffic. The canal was dredged and docking and other infrastructure facilities were built. Now the canal is filling with silt from the rivers at various places and in general, docking equipment is in disrepair. At Moín there exists a warehouse and a marginal docking facility which is in good condition. This is administered by JAPDEVA and serves as a terminal for launches, barges and boats. The Barra del Colorado docking facility was destroyed when the river changed course. However, there are facilities for launches.

The rivers serving the Atlantic Basin have a poor transportation infrastructure, yet serve an important function in providing transportation to the people living in the remote areas of the sub-regions. Between the Río Colorado and the Río Sixaola, and from the Atlantic Ocean to the Río Chirripó (the boundaries of the Atlantic Basin), there are a number of navigable waterways. For the purpose of the inland waterway study mentioned above, there was established a standard for navigation which recognized only those rivers providing more than one meter of depth for boats with a capacity of more than three tons of cargo.

Docking facilities are generally not in good condition, and in many instances there are no installations at all. When these facilities do exist, they are generally constructed of wood. Cargo and passengers are usually transported in the same boat, which is likely to be of the type made from a hollowed-out log. Cutboard motors may or may not be used for power.

Owners of farms use these small boats to transport their own products grown along the river. A good example of this is the Río Sixaola. It provides transportation for cacao, plantain, and corn. Only small boats are used -- no barges. Supplies are obtained from Limón and repairs done in Bribri or Sixaola. This particular river system serves people living in Sixaola, Bribri, Sepeque, Bambú, Shiroles, Amubri and other settlements. From Sixaola to Sepeque, a round-trip takes 14 hours by motor boat. There is no mail or package service.

People living in the remote areas served by the inland waterways have developed a different way of life from those living in other parts of the Atlantic Basin. Every day's activities are intimately associated with a river or a canal. These waterways are for many the sole means of communication outside of the immediate area since there are no roads or other means of transportation for them.

Boats bring a life's necessities and take out products to sell; they provide for social interaction and the means for acquiring some education and medical assistance. Without these waterways, it would not be possible for people to live here, for they would be absolutely cut off from the remainder of the region.

Yet, throughout the region the docking and support facilities are poorly maintained or are non-existent. While the water level of these rivers is a problem because it varies greatly, and over a short period of time, it is

necessary that there be a better means for getting people and cargo on and off of these small boats. Also, dredging and cleaning of these rivers and canals is needed in order to make these waterways more navigable.

As pointed out in Informe de Trabajo, No. 22, a series of minor investments for this inland waterway system could bring about immediate short-term gains. This would have the advantage of providing improved transportation for those now living here and for others who choose water transportation as an alternative to more costly petroleum-based transportation modes.

While primary data has only recently been collected regarding the physical, social and economic implications of these inland waterway systems, they should be recognized as a valuable and viable means of transportation. In order to make them more usable they need to be tied into access roads so as to form a network. These connections and improvements in the waterway infrastructure itself should provide a greatly improved means of accessibility for a sizable area of the Atlantic Basin.

Air Transportation

Costa Rica is served by the Juan Santamaría International Airport in San José and smaller facilities of various sizes throughout the country. According to Cuadros Estadísticos Sobre el Sector Transporte, 1975, San José 1976, the country had over 200 airports in 1975. These included those with runways constructed of asphalt, concrete and gravel, as well as those on pasture land and on the seacoast. Airports are owned by the government and the private sector. While those with full facilities are government owned, in 1975 there were about four times as many airports privately owned, often with hotel services and radio communication.

Limón's airport has an asphalt runway used primarily for passenger service. Within the Basin are a number of small airports or airstrips primarily for agricultural supervisory personnel. Freight shipments for international transportation are handled from San José. As high-value products have been developed of relatively small bulk or of a perishable nature, it has become cost effective to use air freight. An example of this air transportation mode is the flying of ornamental horticultural products to the United States by a company located near Siquirres.

Pipelines

Only a small percentage of Costa Rica's transportation is conducted by pipelines, yet this can be an efficient method of shipping certain products. Petroleum, chemicals and gaseous materials are the best type of products for this specialized mode.

In the Atlantic Basin, pipelines exist from the port facilities at Moín to the nearby RECOPE refinery, from where they extend to San José. These lines lie exposed for many miles over the surface of the ground, which provides ease of maintenance but makes them vulnerable to accidental or intentional damage.

Non-Motorized Transportation

No data are available as to the numbers of people using non-motorized transportation modes in the Atlantic Basin. Reference has already been made to those unable to drive automobiles for various reasons; consequently unless other vehicular modes of travel are available (buses, railroad trains, and water transportation primarily), there is not really a choice available to these people. Of course, even where there are highly sophisticated transportation systems, walking can still be a most desirable means of travel -- if within reasonable distances and under favorable environmental conditions.

The people of the Atlantic Basin rely heavily on walking, the use of horses and even bicycles. In rural areas the roads can be quite bad, yet bicycles are used. There is usually a high correlation between non-motorized transportation and income in rural areas. This is certainly the case throughout the region. However, the road network in many areas is in such poor condition, or is non-existent, that people there find the horse to be the viable means of transportation. Of course, the ideal solution for problems associated with non-motorized transportation modes is to provide people with a choice -- a choice which is related to some form of vehicular travel when long distance transportation is required.

Maintenance

The operations of various modes of transportation and how these modes serve the needs of people have been the focal point of this report. However, fiscal considerations for building these systems cannot end with their construction, for it is necessary that the several components

of the system be maintained. Maintenance (along with employee wages, interest on money borrowed, and administrative overhead), is an important phase in the operation of transportation systems. As a fixed cost, maintenance cannot be ignored.

Highways, once built, have to be continuously maintained; buses are always wearing out and need to be repaired; the roadbed of railroads needs constant attention to assure safe and efficient movement of passengers and freight. Numerous other examples could be added.

Since the Atlantic Basin has a heavy rainfall, highways are a good example of the necessity of maintenance, for they are not only difficult to build here but require constant attention. This is especially true of mountainous areas. Once a transportation plan has been formulated and a decision made to build the roadway, there must also be a maintenance commitment. If this is not done, the entire highway investment could be seriously impaired or perhaps lost. Since this is a public facility, having been built with public money, this is not only an ethical matter but one that could have serious political consequences as well. Other examples can be cited of the necessity to recognize maintenance as a critical part of transportation operations.

TRANSPORTATION PROBLEMS AND RECOMMENDATIONS

FOR THE ATLANTIC BASIN

An examination of the several sub-regions of the Atlantic Basin reveals that the most basic problems of transportation lie within three modes -- automotive, rail, and water. This discussion will focus attention on these three modes in regard to specific existing difficulties and several recommendations will be made.

Automotive Modes -- Roads and Highways

Two general observations can be made concerning the automotive ground transportation system. Many portions of existing roads and highways are incomplete and in poor condition. Also, roads are a major governmental expenditure, yet there is only scant evidence of work now being done. In the Limón-Sixaola area, for example, roads range from good gravel to bad ones of ruts and stones. Here there is a two-lane road, but the shoulders are narrow, thereby reducing capacity. In the Bribrí-Shiroles vicinity, roads are mostly built for logging and oil exploration. In a number of places they are quite inferior. When roads have

been pushed into the hilly undeveloped areas, they are normally passable only by heavy trucks and tractors of the caterpillar type. Bridges are non-existent in a number of places; consequently it is necessary to cross running streams. From Bribrí to Sixaola the gravel road is narrow and in bad condition in many places. (For more specific descriptions of roads, see Appendix I and Table 1.1 of this report.)

In the Siquirres-Guápiles area there is an asphalt road which is new and in good condition, but a sizable portion of this route is under construction with only the bed-rock sub-base as a surface for the roadway. The public uses this road -- trucks, buses, jeep-type vehicles, and passenger cars. This is a rough road. With one exception, however, the bridges are completed.

From Guápiles to the Cariari area the roads vary from gravel to earthen. In some places the old technique has been used of placing horizontal wooden boards across the road with earth placed on top to form the roadbed. Bridges do not exist in many places.

Roads in the various cities are generally paved with asphalt and have good drainage. These include Siquirres, Limón and Guápiles. While they appear to be well maintained, the approaches to these communities are often gravel and severely rutted.

In many cases, no road maintenance seems to be carried out. Sections of existing highways are deteriorating because of potholes, trenches and ruts. It is essential that road maintenance be constantly carried out; otherwise the entire capital investment will be lost.

Throughout the Atlantic Basin, public transportation is insufficient. Buses are the primary transportation mode and are lacking in three ways: frequency, routes, and capacities. Frequency is the number of trips over a particular route. Routes represent the separate lines which form the network. Capacity indicates the number of passengers served and space for storage of packages and goods.

Recommendations

1. Complete the highways and roads which lie within already concentrated areas of settlement before expanding the road system into outlying areas.

Give high priority to those settlements which are most densely concentrated and to road connections which will enhance consolidation. Connect one settlement to another in order to further intercommunication.

2. Assign sufficient funds for road maintenance at the time planning is made for road completion.
3. Completion of the entire route between Siquirres and Guápiles and repair of the roads extending from Guápiles to existing nearby settlements is of the utmost importance.
4. Pave with asphalt all of the route between Limón and Sixaola and repair the existing roads that extend to several adjacent settlements of the sub-region. (See Map for specific designations of routes.)
5. Give special consideration to the protection of stream beds and to those areas through which roads have been cut.
 - a. Bridge construction and drainage facilities are necessary throughout the region, with priorities in accordance with the most heavily used roadways.
 - b. Erosion control such as terracing and planting must be given high priority; this is especially critical in hilly and mountainous areas.
 - c. "Good housekeeping" practices must be required of road construction and maintenance crews. This will avoid unsightly and damaging effects to the land.
6. Economic development programs for the region should include the training of individuals who can do automotive repair and maintenance; programs of incentives for the development of automotive servicing agencies -- especially for farm machinery and trucks -- should be considered.

Rail Transportation

Railroads are important to the Atlantic Region because of their ability to handle heavy and bulky cargo. They also provide access to settlements which have been constructed along the rights-of-way. The passenger and freight facilities are important to the quality of life of the people in the region and to the economy of the region and the nation

as a whole. As indicated previously, two independent railroad systems operate in the region; there are private banana company railroads and the government system, FECOSA.

While a large amount of money has been spent on the improvement of the FECOSA system, more will be needed. A real concern, discussed earlier, is the efficient operation and management of this rail system.

Recommendations

1. Before embarking on the construction of new rail lines, existing equipment should be made more available and usable. This includes the repair and replacement of passenger and freight facilities serving the existing settlements.
2. Railroad cars need to be better maintained and in some cases they need to be replaced.
3. It is critical that FECOSA complete the development of the rail facilities that are to serve the ports of Moín and Limón. The linkage between the shipping and rail facilities is a vital part of the successful operation of these ports.
4. Continuous monitoring or organizational and management problems is needed if rail transport in the Atlantic Region is to be maintained.

Water Transportation

The two types of water transportation in the Atlantic Region have totally different problems. The ports of Limón and Moín are undergoing extensive expansion and new development in order to efficiently handle the cargo transportation needs of the future. New techniques will cause social and economic readjustments for some people since old methods of handling cargo will be replaced by new techniques. In addition, the activities at the ports will affect nearby urban areas and will require the completion of linkages between shipping and rail and shipping and truck facilities.

The inland waterways have the potential for greatly improved small boat transportation with relatively small amounts of investment. At present, these waterways are not well developed and meet only a small percentage of the total transportation needs of the people in the Basin. Improvements to these waterways could substantially increase the present limited capacities of this transport mode. Improvements can be accomplished fairly quickly.

Recommendations

1. A decision must be made as to which port will be the primary port for containerized cargo. The coordination of major capital expenditures depends on such a decision.
2. The municipal authorities of Limón and JAPDEVA need to plan the coordination of transport linkages between shipping, rail and truck. It is clear that the efficiency with which transportation connections are carried out within the port facility will affect the city; it is also clear that the efficiency (or congestion) of transport linkages within the city will affect the operations of the port. As mentioned previously, FECOSA will also have an important role to play in the coordination of transport linkages.
3. Tie the inland waterway system into the access roads and highways of the region. This would enhance the overall transportation possibilities by forming an improved network.
4. Direct priorities for inland waterway-road linkages to those settlements which presently exist.
 - a. For a relatively small investment these waterway improvements can greatly enhance the quality of life and the economy of people residing in remote areas.
 - b. Careful study of the environmental effects development will have on plant and animal species is needed prior to expansion of inland waterway transport. Parts of the region are rich in natural protection and preservation.

Concluding Statement

The potential for a good transportation system is essentially present in the Atlantic Basin. However, the linkages from one mode to the other are missing. These linkages will be necessary in order to form a more complete transportation network than now exists.

The ability of Costa Rica to pay for this total transportation system should be a major concern. At the time of this writing (September, 1981), the country is confronted with severe economic problems which are not going to be quickly solved. Consequently, the financial aspects of all government programs will be of great importance.

Fiscal requirements for transportation must include not only the maintenance of the existing systems, but capital expenditures for future facilities. Some of these costs will be quite high, such as those needed for the completion of the Atlantic Basin ports and expansion of the railroad. Other costs, such as the improvements of the inland waterways system, will be relatively modest.

Whatever fiscal programs are decided upon, priorities need to be established for project implementation. Priorities call for establishment of planning policies. Those policies which now exist require clarification and, where necessary, new ones should be formulated.

F O O T N O T E S

1/ The automobile has had a strong influence on the form and function of urban areas, the life styles of people, and on the environment. While this transportation mode offers maximum individual mobility and privacy, it has also created extremely serious physical, social and economic problems which many nations are still endeavoring to overcome.

The private automobile is costly for those who own it and for the general public who support its infrastructure. It is becoming more costly to manufacture because of the increased cost of raw materials and energy. It is costly to operate since automotive fuel is still predominantly made from petroleum and alternative fuels are only in the early stages of experimentation. Automotive maintenance also contributes to higher operating costs.

Environmental pollution and circulation problems caused by the automobile are staggering. Our urban areas are afflicted by foul air from exhaust fumes, loud noise from motors, vehicular congestion and confusion on local streets (The Urban Transportation System: Politics and Policy Innovation, 1979). While all of these problems can be quantified, it is more difficult to measure the negative effects of automotive visual pollution. Nevertheless, this too further contributes to environmental degradation.

Air pollution is a fairly new theme in discussing urban transportation problems. Where clean air standards exist, the costs of meeting them are enormous. While most industrial nations have given this a top priority, they have found it extremely difficult to address that part of the air pollution problem that is caused by vehicles.

Noise is now recognized by health experts as having a detrimental effect on people, both physically and psychologically. As with the case of air pollution, noise is costly to control with solutions ranging from prompt replacement of worn out engine mufflers to requiring manufacturers to equip new vehicles with improved muffling systems. Buses, trucks, and motorcycles are particular problems and require special attention.

The concept of congestion refers to overcrowding and can be quantitatively measured. During peak hours on highways, the most significant consequence of congestion is user delay. For business, it accounts for direct monetary costs. For transit users, it is more likely to entail personal discomfort. Congestion is directly related to energy efficiency and cost per passenger mile.

A direct social and economic impact of the automobile is the number of people killed and maimed in automobile accidents. To this could be added the economic loss from days absent from work as well as the associated human misery.

It must be recognized that a large number of people are precluded from driving automobiles. Because of the expense of owning and operating a car, the poor are prevented from using this transportation mode. Those who are either too young or too old cannot drive cars, nor can many of the physically disabled.

Finally, no discussion of automotive vehicles would be complete unless storage facilities are taken into account. There must be provided a place to park all of them. Usually only temporary parking is provided on the guideway itself. An area, preferably within a structure, must be provided. This of course adds to the vehicular operating costs and profoundly affects land use and urban space.

B I B L I O G R A P H Y

Altshuler, Alan, The Urban Transportation System: Politics and Policy Innovation, The MIT Press, 1979.

Ewusi, K. "The Quality of the Transportation Inventory and its Effects on Internal Trade", Bulletin, Institute of Social Science and Economic Research, Legon, Ghana, 1975.

INCOP, JAPDEVA, COMPANIA BANANERA DE COSTA RICA, Ministerio de Obras Públicas y Transportes, Dirección General de Planificación Cuadros Estadísticos Sobre el Sector Transporte, 1975 (San Jose, 1976).

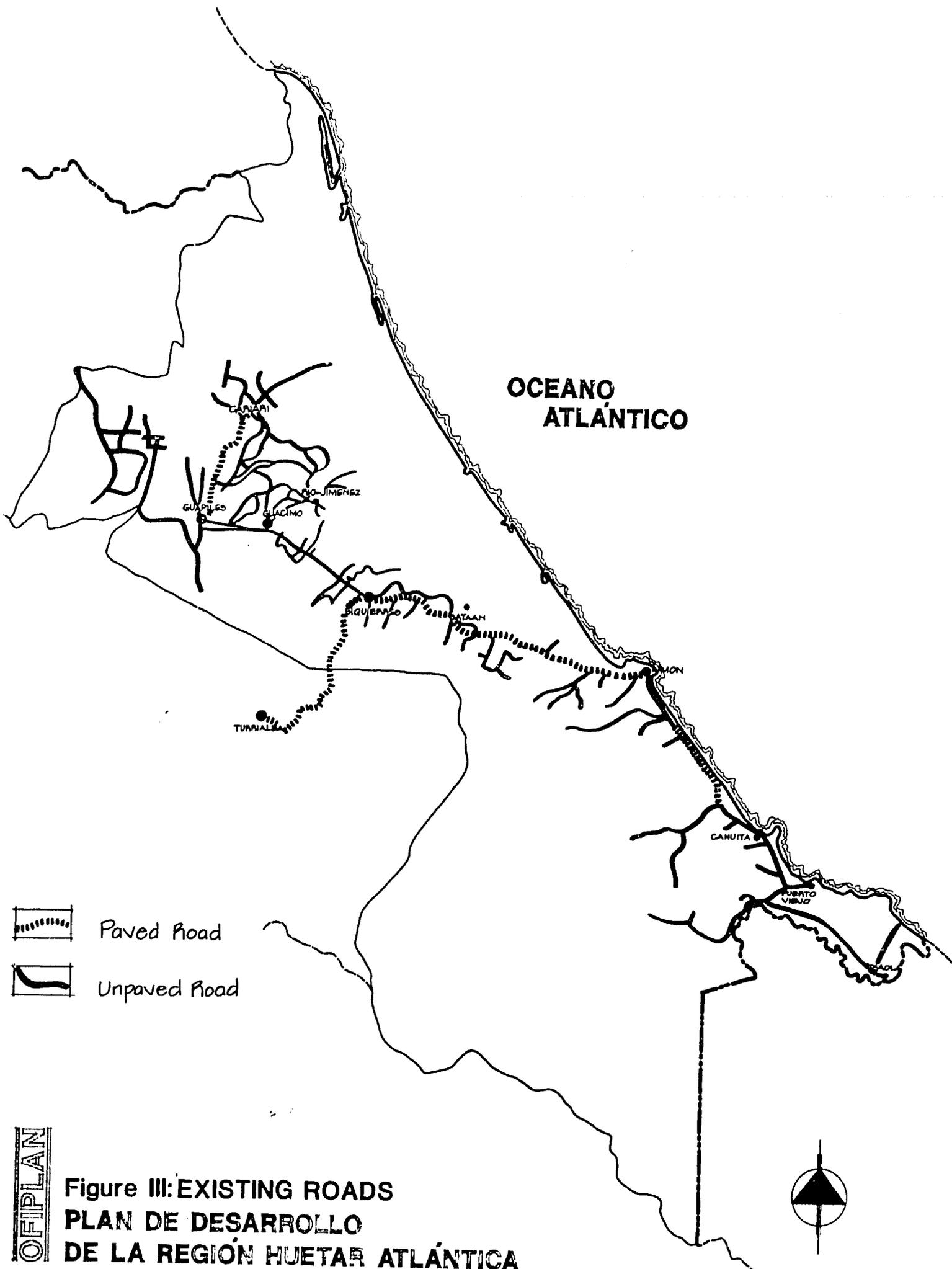
International Development Center of Japan, Regional Study of the Hinterland of Caldera and Puntarenas Ports, The Republic of Costa Rica, Draft Final Report, Japan International Cooperation Agency, August, 1977.

Hutten, Klaus, Captain of the Port of Limón. Interview, August, 1981.

Ministerio de Obras Públicas y Transportes, Cuadros Estadísticos Sobre el Sector Transporte, 1973 y 1975 (San Jose, 1974 and 1976).

Ministerio de Obras Públicas y Transportes, Dirección General de Planificación, Cuadros Estadísticos Sobre el Sector Transporte 1975 (San Jose, 1976).

Ministerio de Obras Públicas y Transporte y Systan International, Inc., Análisis Preliminar del Transporte por Vías de Navegación Interior y de Cabotaje, Informe de Trabajo No. 22, Preparado para el Grupo de Transporte Marítimo y Navegación Interior, Dirección General de Planificación, Diciembre, 1980, San José, Costa Rica.



OFIPLAN

**Figure III: EXISTING ROADS
 PLAN DE DESARROLLO
 DE LA REGIÓN HUETAR ATLÁNTICA**

INFRAESTRUCTURA SUBREGION LIMON

1. Proyectos viales

1.1 Penshurst - Bribri

En la actualidad el contratista realiza trabajos en la parte montañosa del tramo Hone-Creek - Bri-Bri, en donde el movimiento de tierras, la colocación de la sub base y algunas alcantarillas mayores son los trabajos más avanzados.

Debido a que los trabajos de pavimentación se realizarán hasta el año entrante y a que el tramo Penshurst-Hone-Creek está en muy mal estado, se estima que una nivelación de este tramo vendría a beneficiar el movimiento de tránsito en este trayecto.

1.2 Limón-Santa Rosa-Río Banano

Para este proyecto sólo se ha ejecutado los estribos del puente sobre el río Limoncito, este tramo está en malas condiciones.

1.3 Portete-Moín-Refinadora

En este tramo la maquinaria trabaja en la remoción de tierras y ampliación de la carretera actual que va de Portete a Moín, se están ejecutando trabajos en el tramo Moín-Refinadora, ya que la base ya fue colocada; el espesor del relleno total es más de 2 metros.

1.4 Saopin-Parque Zonas Francas

Este tramo está en base y sólo falta que se pavimente (lozas de concreto) Conduce a los edificios en donde se ubicarán las industrias de Zona Franca.

2. Proyectos ferroviarios

2.1 Patio de ferrocarril-Moín

Este proyecto se encuentra muy avanzado ya que todo el relleno ya fue colocado, sólo falta que se coloque el balastro, durmientes y rieles sí es de notar que no se observa obras de drenaje a la vista, su extensión es de 10 hectáreas aproximadamente.

2.2 Proyecto de reconstrucción de vías

El mismo está concluido en todo el tramo Limón-Siquirres, sólo falta las unidades transformadoras de corriente.

3. Puertos

3.1 Complejo portuario de Moín

Este puerto será para uso exclusivo de bananeros, petroleros y contenedores, según información suministrada en el proyecto, el número actual de barcos petroleros por mes es de dos; por lo consiguiente el resto del tiempo se usa el atracadero petrolero para contenedores.

Los muelles bananeros no están en uso, debido principalmente a que falta la terminación de las bodegas y parios de ferrocarril. Una estimación de la terminación probable del proyecto es que a fines de año se inaugurará, pero entrará dentro de uno o dos meses en uso. Este complejo presenta la posibilidad de construir un muelle a granel a la par de los atracaderos bananeros, para la exportación de granos, o algún otro producto.

3.2 Complejo portuario de Limón

"El muelle alemán" como le llaman posee un avance de un 90%, los atracaderos están terminados y se está finalizando la iluminación y patios de contenedores y la bodega principal.

Además se implantó un sistema para la amortización de las presiones internas en el relleno, debido a la porosidad del rompeolas (similar aun un respiradero). La rampa ro-ro al igual que la de Moín está terminada.

Los muelles actuales (nacional, metálico y muelle 70) están en uso siendo el muelle nacional el usado en buques de poco calado y para carga universal. El muelle metálico se usa para el transporte del banano, exclusivamente cuando entre a funcionar Moín. El muelle 70 se usa para carga universal, cuenta con una grúa con ua capacidad de toneladas (sistema eléctrico), en este atracadero se descargan los buques de mayor calado.

INFRAESTRUCTURA SUBREGIÓN POCOCHI

1. Proyectos viales

1.1 Siquirres-Guápiles-San José

Este proyecto avanza en la pavimentación del tramo Siquirres-Guácimo, ya que la parte Siquirres-Río Reventazón ya está finalizada; se ha colocado ^{/el sello} (impresión) en uno dos o tres kilómetros más .

Además el puente sobre el Río Guácimo está en la chorrera de la loza de concreto, el puente sobre el Río Parismina está ya en uso y se estima que si se sigue con el ritmo de avance el tramo Guácimo-Siquirres estará listo a principios del año entrante, con algo de asfaltado

del tramo Guácimo-Guápiles para mediados del próximo año.

En cuanto al tramo Guápiles Río Patria se encuentra en la ejecución de los puentes y no se nota ninguna obra de movimiento de tierra reciente.

1.2. Heredia- La Alegría

En este proyecto el trayecto Heredia-Río Heredia está colocada la sub base y parte de la base con lo que se estima que su pavimentación se realizará pronto, ya que el tramo Río Heredia-Alegría, es corto (2 Km aproximadamente).

1.3 Guápiles - Cariari

Actualmente el tramo La Rita-Guápiles está terminado y se trabaja en el tramo La Rita-Cariari; es de notar que de este último tramo se tiene concluido unos 304 km aproximadamente, y se ha colocado la base de la otra ruta, pero el día que se visitó (lunes) no se observaron trabajos en el mismo.

TABLA 1. 1. RED NACIONAL

Características de las principales carreteras de la Región Huastar Atlántica

Ruta o tramo	Longitud Km	Tipo de Superficie	Ancho de calzada (mts)	Espaldón Mts	Pendiente pondera %	% de Avance	TPD	Clasificación u orden
Sixaola - Bri-bri	32.7	Grava	6.0	0	1%			1
Bri-Bri - Shiroles	19.5	Grava	5.0	0	2%			3
Bri-Bri - Hotel Creek	9.7	Grava	5.0	0	5%			1
Hotel Creek - Puerto Viejo	5.0	Grava	5.0	0	0%			-
Hotel Creek - Cruce Cahuita	11.8	Grava	6.0	0	1%			1
Cruce Cahuita - Cruce Penshurst	8.3	Grava	6.0	0	1%			1
Cruce Penshurst - Pandora(Colegio)	10.3	Grava	5.0	0	3%			-
Cruce Penshurst - Cruce La Bomba	23.3	Asfalto	6.1	.4	1%			1
Cruce La Bomba - La Bomba	6.6	Grava	6.0	0	1%			2
La Bomba - Asunción	15.2	Grava	4.5	0	3%			2
Limón -Santa Rosa- La Bomba	10.0	Grava	4.5	0	1%			3
Santa Rosa - Trébol	2.2	Grava	4.5	0	1%			(3)
Cruce La Bomba - Cieneguita	6.0	Grava	7.0	.5	1%			1
Limón - Moín	4.3	Asfalto	6.0	0	3%			1
Moín - Carretera Saopín	5.4	Grava	5.0	0	2%			1
Limón - Cruce Río Blanco	10.9	Asfalto	7.4	1.8	1%			1
Cruce Río Blanco - Río Blanco	3.5	Grava	6.0	0	1%			(3)
Cruce Río Blanco - Cruce Rústica		Asfalto	7.4	1.8	1%			1
Saopín - Larga Distancia	2.8	Grava	5.0	0	1%			(3)
Saopín - Catorce Millas	7.5	Grava	4.0	0	1%			3
Saopín - Estrada	5.0	Grava	3.5	0	1%			3
Saopín - Corina	6.6	Grava	8.0	1.8	1%			3

Continuación TABLA 1.1. RED NACIONAL

Ruta o tramo	Longitud Km	Superficie	Ancho de calzada (mts)	Espaldón Mts	Pendiente ponderada %	% de Avance	TPD	Clasificación u orden
Corina - Zent	6.0	Grava	3.0	0	1%			3
Río Barbilla - Batáan	5.0	Grava	5.0	0	1%			3
Bataán - Sara	7.6	Grava	4.0	0	1%			3
Bataán - Matina - Cuatro Millas	11.4	Grava	4.0	0	1%			3
Sara - Sta María-Cuatro Millas	14.5	-	-	-	1%			3
Sara - Manila	15.0	-	-	-	1%			3
Siquirres - Dcrotea	17.9	Grava	3.0	0	1%			3
Cairo - Milano	17.4	Grava	3.0	0	1%			3
Milano - Pocoro	3.5	Grava	4.0	0	1%			3
Pocora - Río Parismina	14.5	Grava	4.0	0	1%			3
Río Parismina - Río Jiménez	3.0	-	-	-	1%			3
Río Jiménez - Guácimo	11.7	Grava	6.5	0	1%			3
Río Jiménez - Angeles	13.4	Grava	4.0	0	1%			2
Río Jiménez - Villa Franca	5.5	Grava	4.5	0	1%			3
Villa Franca - San Cristóbal	10.8	Grava	3.0	0	1%			2
San Critóbal - San Antonio	9.9	Grava	6.0	0	1%			2
San Antonio - Río Jiménez	11.2	Grava	3.0	0	1%			2
Guápiles - Pueblo Nuevo	10.7	Asfalto						2
Pueblo Nuevo - Colonia Cariari	14.5	Asfalto						2
Jiménez-San Antonio	8.0	Grava	6.0	0	1%			2
Heredia - La Alegría	9.42							3
Turrialba - La Alegría	47.8							3
Horquetas - San Miguel	35.5							3
Guápiles - Cariari	29.8							1

570.00

1732

OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y COORDINACION REGIONAL

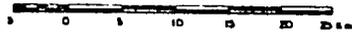
CANTONES Y DISTRITOS

SIMBOLOGIA

- CABECERA DE CANTON
- CABECERA DE DISTRITO
- LIMITE CANTONAL
- LIMITE DISTRITAL

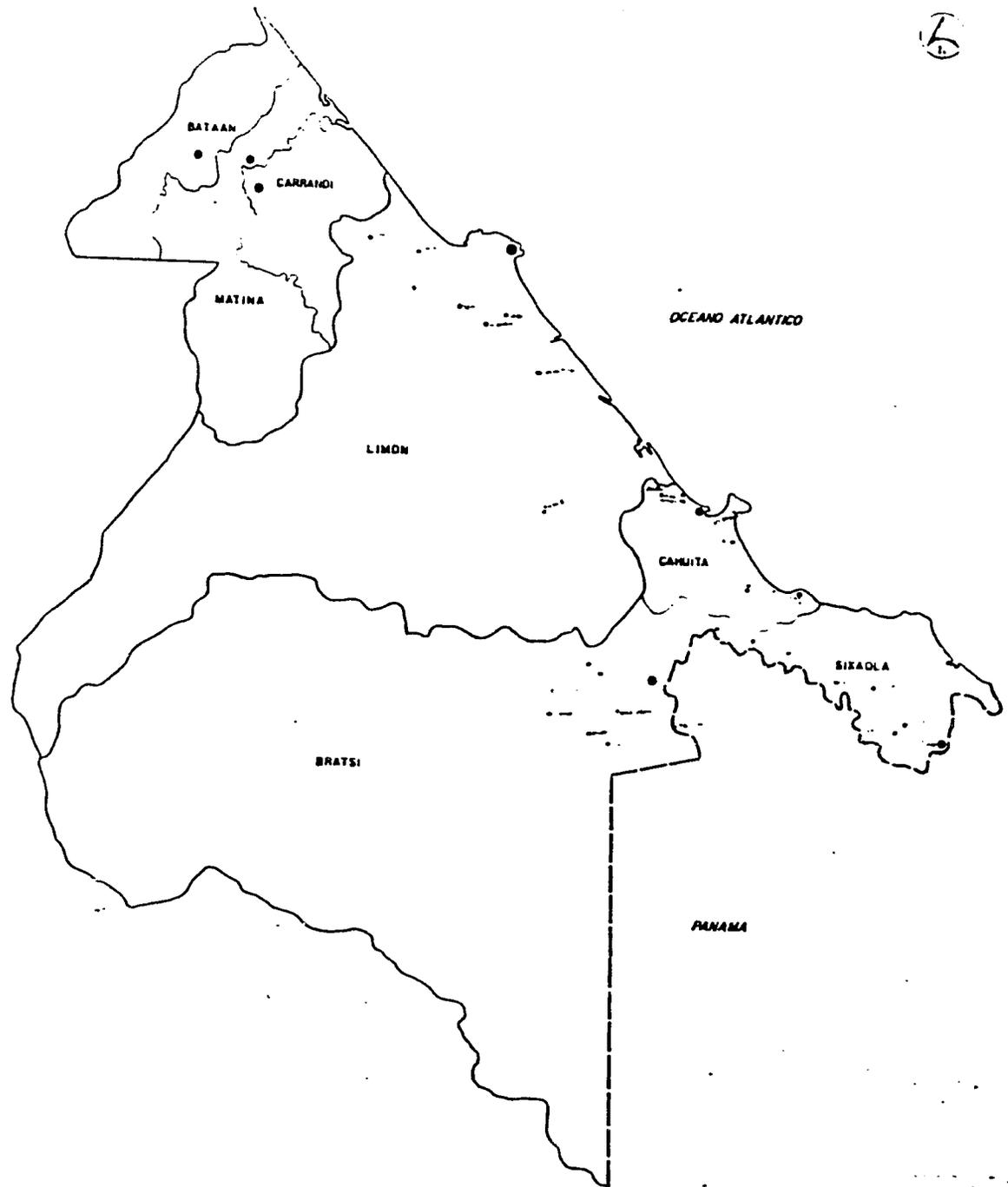
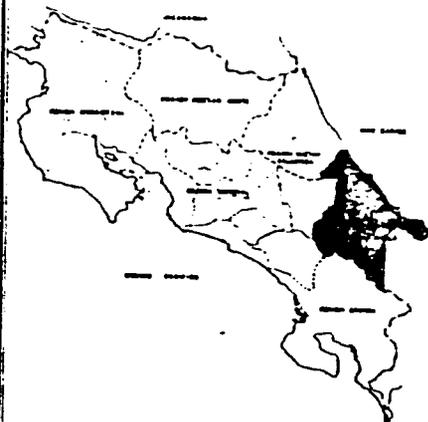
FUENTE IGN
PREPARO JOSE A. BINTEREZ
DIBUJO DENNIS CAMARGO MONTANAR
FECHA MARZO 1991

ESCALA 1:200 000



REGION LIMON

SUBREGION
LIMON



58-1

OFIPLAN

OFICINA DE PLANIFICACION REGIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANIFICACION Y COORDINACION REGIONAL

DIVISION POLITICO-ADMINISTRATIVA

SIMBOLOGIA

- CABEZA DE CANTON
- CABECLA DE DISTRITO
- LIMITE DE CANTON
- - - LIMITE DE DISTRITO

FUENTE
PREPADO
DIBUJO
FECHA

ESCALA 1:200,000

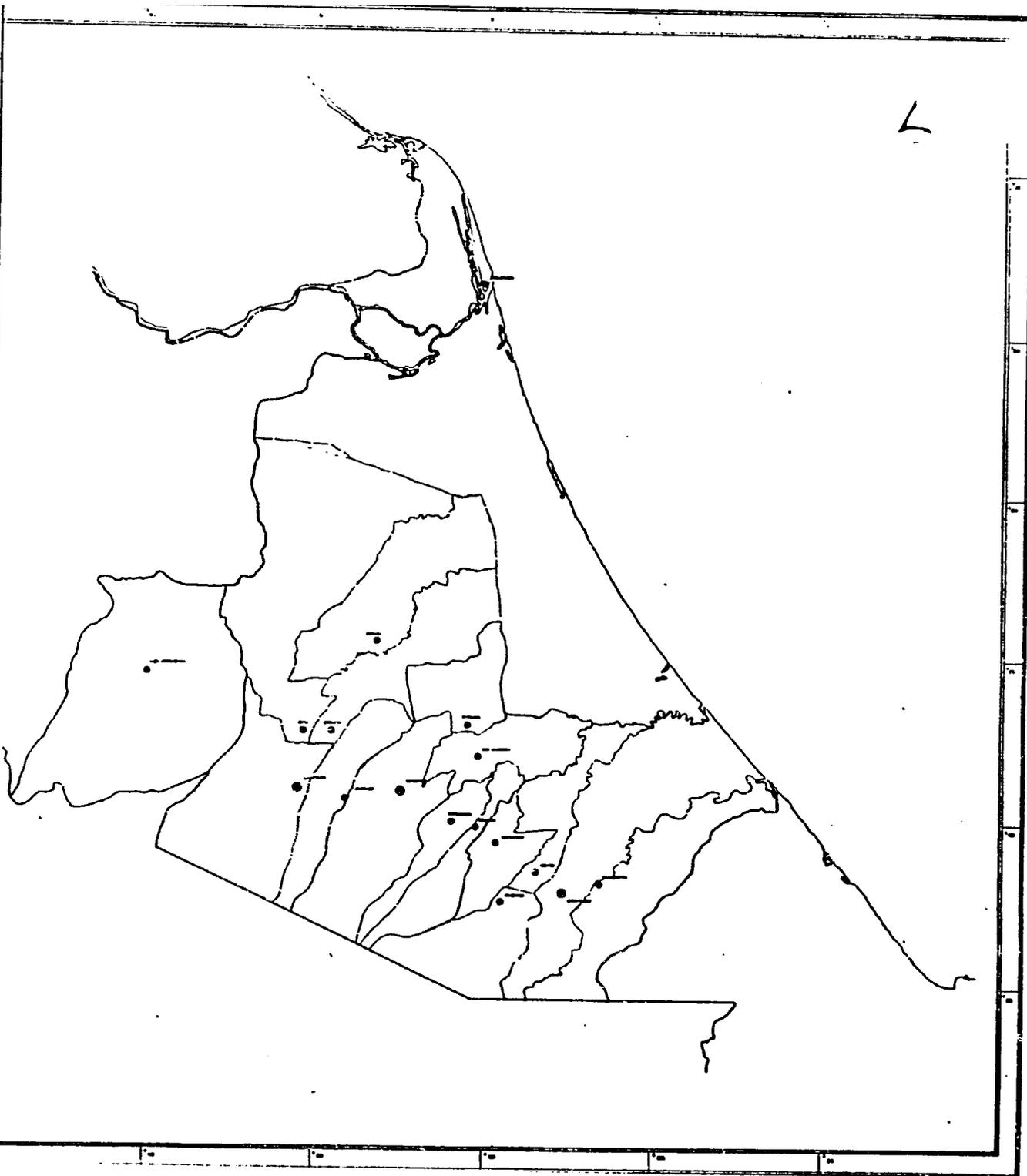


REGION
NUESTRAS ATLANTICA

SUBREGION
POCOCI



(A)



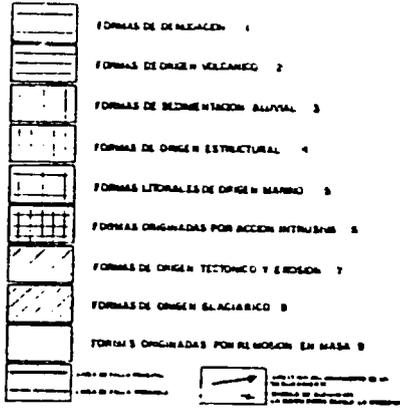
236

OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

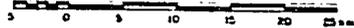
DIVISION DE PLANEACION Y COOPERACION REGIONAL

MAPA GEOMORFOLOGICO



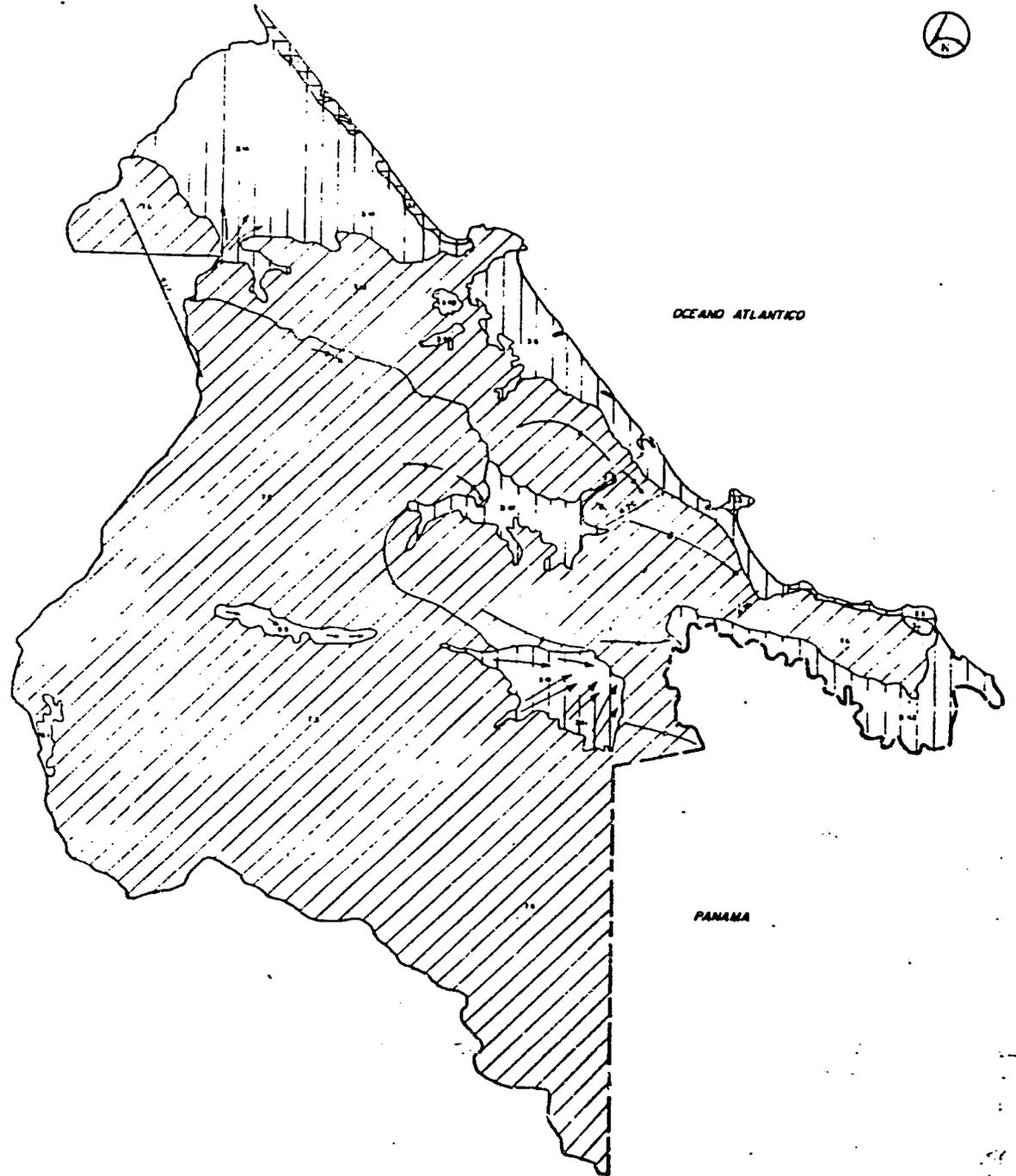
FUENTE: OFICINA DE PLANEACION SECTORIAL AGROPECUARIA
MUNICIPIOS DE LIMON Y TALAMANCA ETC. 1:500,000
PREPAC: JOSÉ A. GUTIÉRREZ
DIBUJO: DENNIS CASIANO MONTAÑA
FECHA: MARZO 1977

ESCALA 1:200,000



REGION LIMON

SUBREGION
LIMON



D-37

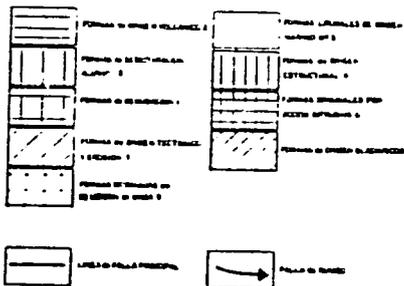
OFIPLAN

OFICINA DE PLANIFICACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANIFICACION Y COORDINACION REGIONAL

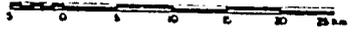
MAPA GEOMORFOLOGICO

SIMROLOGIA



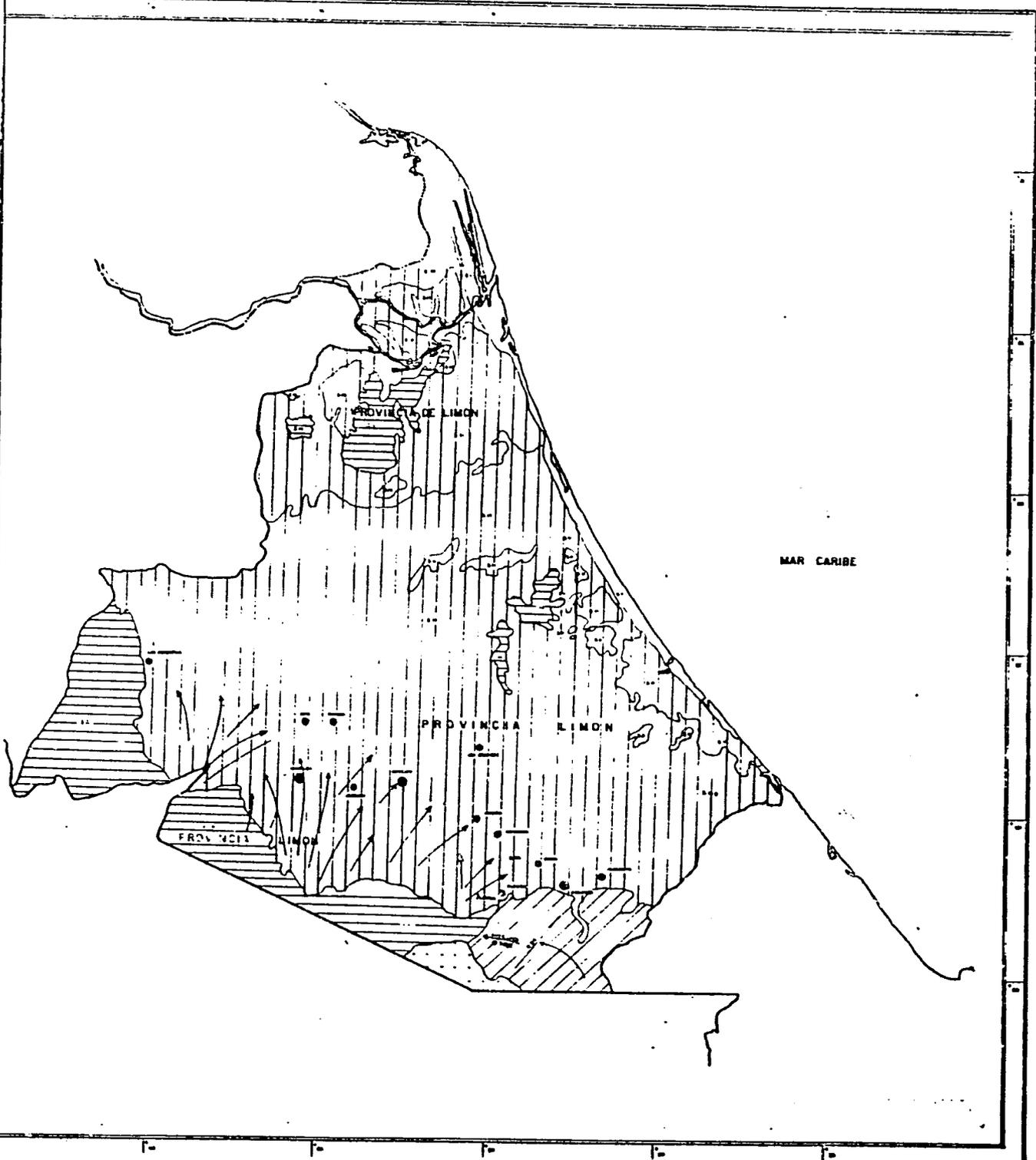
FUENTE: OFICINA DE PLANIFICACION REGIONAL, AGRICULTURA
SENAS DE QUEPOS Y TALAMANCA, INC. Y FODOD 00
DISEÑO: JOSE SUAREZ A
FECHA:

ESCALA 1:200 000



REGION
NUESTAR ATLANTICA

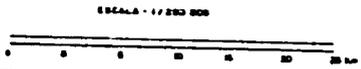
SUBREGION
POCOCI



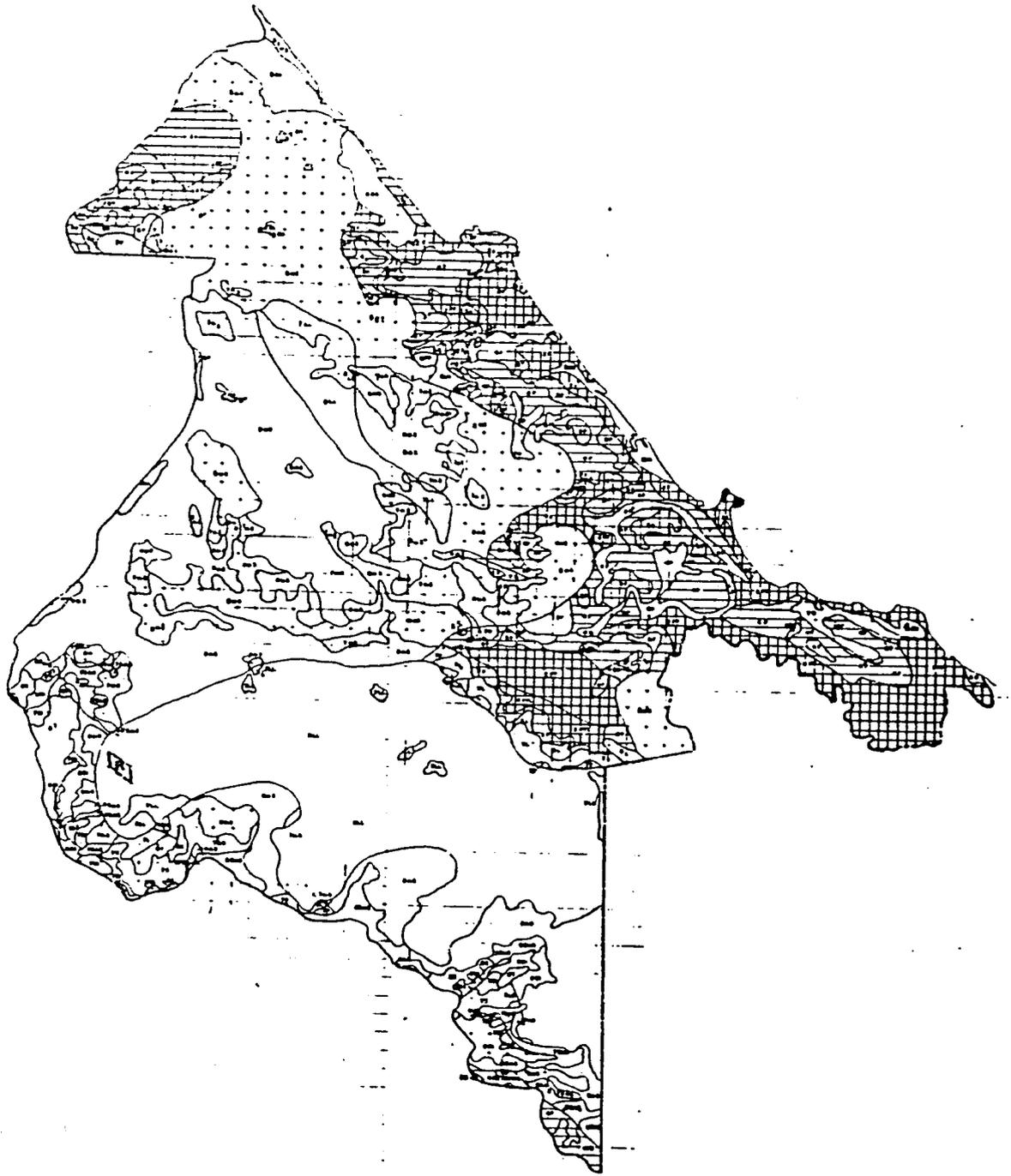
238

18-2

PROYECTO - G.P.S.A. (1957-64)
PREPARED BY -
DIBUJADO - SERGIO OBILA GASTON
FECHA - MAYO 1961



REGION HUEYAR ATLANT SUBREGION LIMON



OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y COORDINACION REGIONAL

ASOCIACION DE GRANDES GRUPOS DE SUELOS
DE COSTA RICA

SIMBOLOGIA

DATA
DESCRIPCION DE LOS GRUPOS DE SUELOS DE ESTA REGION

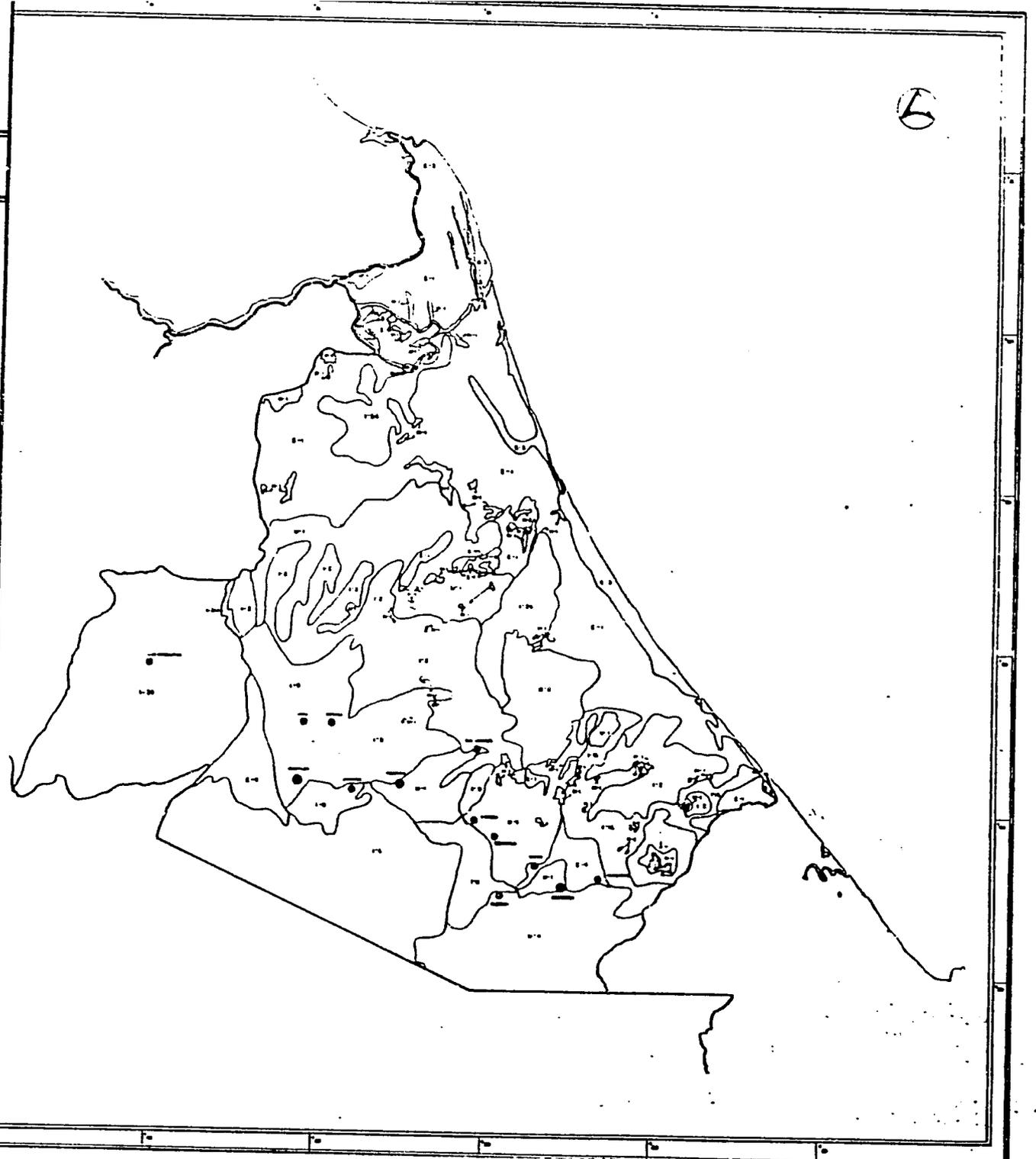
FUENTE OFICINA DE PLANEACION SECTORIAL AGRICULTURA - 1979
PREPARO Y DIBUJO JOSE A. ESTERRELLA
FECHA FEBRERO 1980

ESCALA 1:200 000



REGION
HUEYAR ATLANTICA

SUBREGION POCOCI



01-42

OFIPLAN

OFICINA DE PLANIFICACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANIFICACION Y COORDINACION REGIONAL

CUENCAS HIDROGRAFICAS

1
2
3
4
5
6
7
8
34

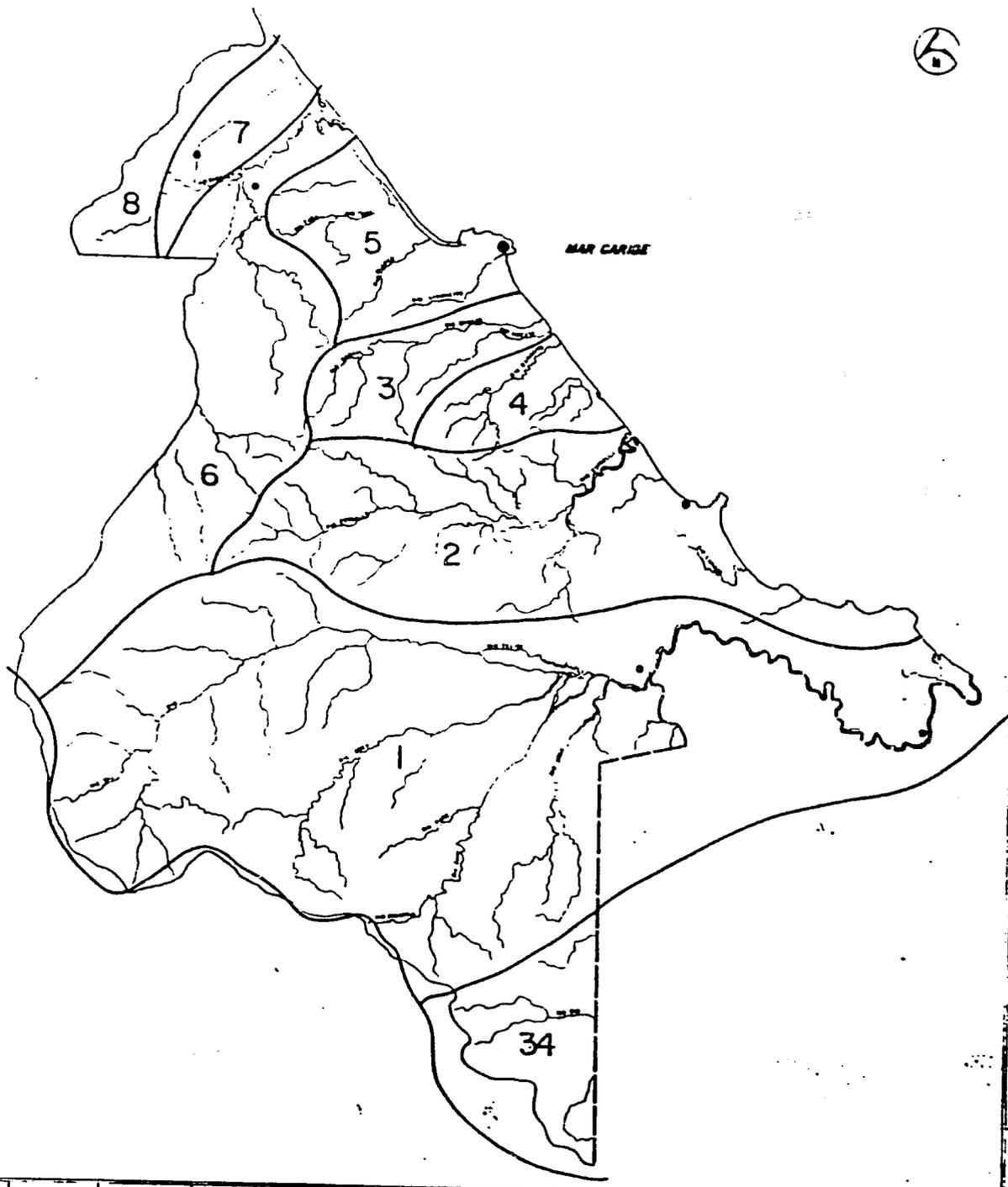
FUENTE IGH
PREPARO JOSE A GUTIERREZ
DIBUJO DENNIS CAAMANO MONTANARI
FECHA MARZO 1981

ESCALA 1:200 000

0 5 10 15 20 25 km

REGION LIMON

SUBREGION
LIMON



h-c

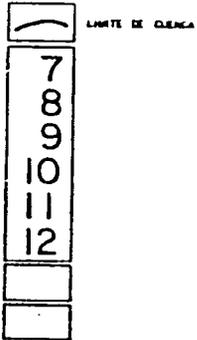
OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y COORDINACION REGIONAL

CUENCAS HIDROGRAFICAS

SIMBOLOGIA



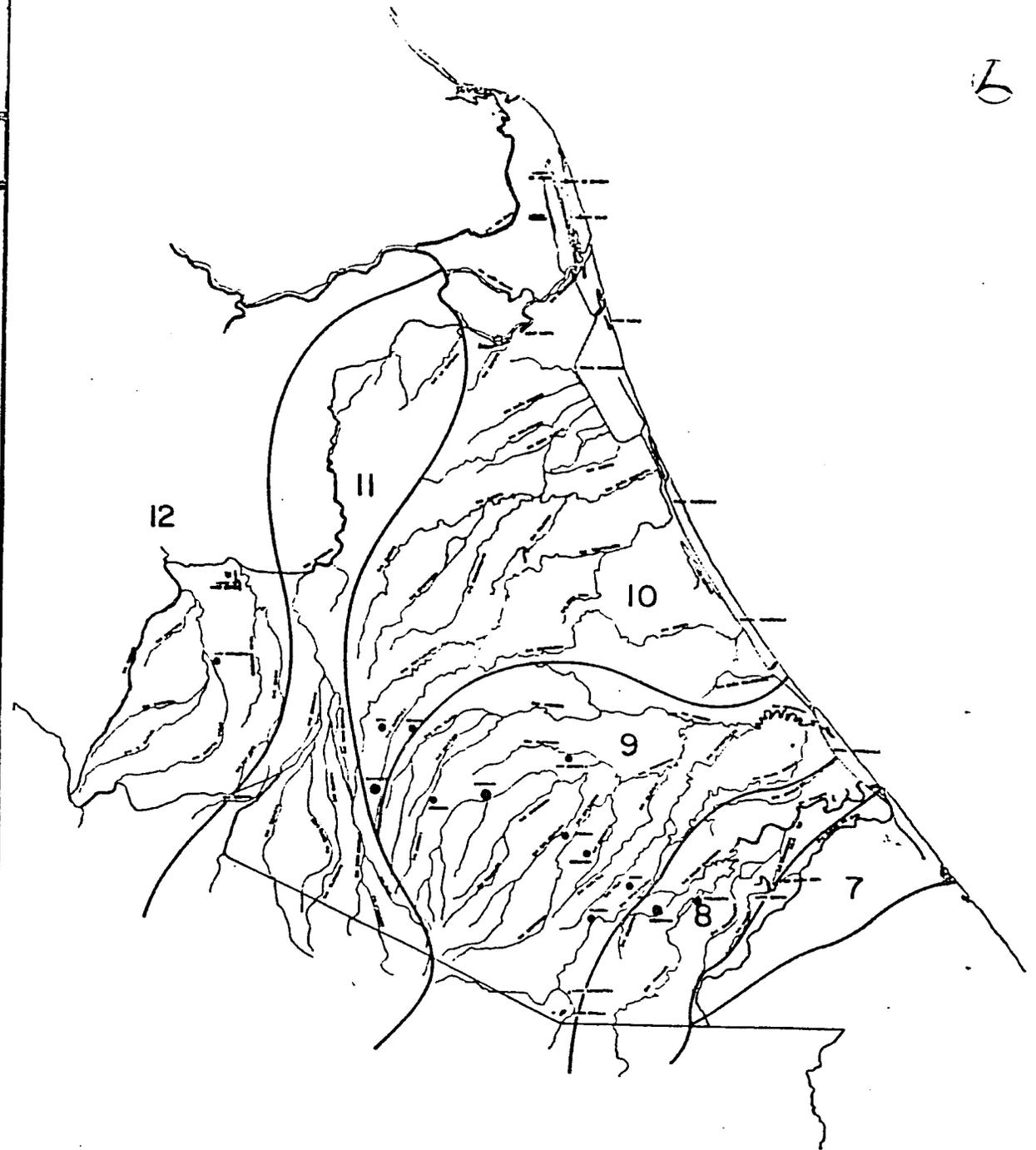
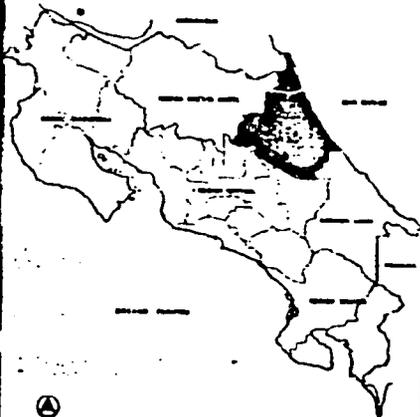
PUENTE MOJAS 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

ESCALA: 1:200 000



REGION
METAR ATLANTICA

SUBREGION
POCOCI



OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y COORDINACION REGIONAL

USO ACTUAL DEL SUELO

SIMBOLOGIA

	SEQUE EN ZONA PANTANOSA
	BOSQUE
	MUSACEAS
	CULTIVOS DE TRANSICION
	CAOCCO
	CACAO
	PLANTAS Y CACAO
	TERRENAS DE AGRICULTURA (ARBEZ Y PLANTACIONES DE MIMAZO)

PUNTEO
PROYECTO JOSÉ A BUTERREZ
DISEÑO DENNIS CALAMAND MONTAÑARI
FECHA JUNIO 1991

ESCALA 1:200 000



REGION LIMON

SUBREGION
LIMON



- MIMAZ
- PLANTAS
- BOSQUE
- PASTO (SARACI)
- BANANOS
- MACADAMIA
- CAFE
- PLANTAS HORTICOLAS
- PEJIBATE
- CITRICO (LIMON - MIMAZO)
- MIMAZO
- PLANTAS
- BANANOS
- ARBEZ
- ARBOLES DE HOJA
- CAFE
- HORTICOLAS
- VIVERO DE ESPECIES (ESTACION EXPERIMENTAL LAS BARRANTELAS)



OCEANO ATLANTICO

PANAMA

D-43

OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y COORDINACION REGIONAL

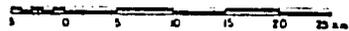
USO ACTUAL DEL SUELO

SIMBOLOGIA

	BOSQUE
	BOSQUE EN ZONA PANTANOSA
	MUSACEAS
	POTRERO ABOLADO
	POTRERO POCO ABOLADO
	AREA DEDICADA AL PASTOREO Y DE CULTIVOS DE TRANSICION
	MAIZ Y PLATANO
	CULTIVOS DIVERSIFICADOS
	COCO

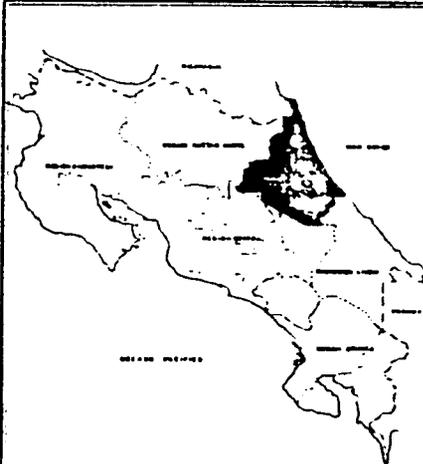
FUENTE: IMAGEN DE SATELITES LANDSAT CORTECIA A.T.D.
PREPARO: JOSE A. GUTIERREZ
DISEÑO: DENNIS CAHIANO MONTAÑA
FECHA: MARZO 1981

ESCALA 1:200,000



REGION
PUERTO ATLANTICA

SUBREGION
POCOCI



SIMBOLOGIA

CULTIVOS DETECTADOS EN EL CAMPO
DE OFIC. MAPA A ESTA ESCALA

	MAIZ
	PLATANO
	CAJAMA
	PASTO (SECAO)
	BANAN
	MACADAMA
	CAJAO
	PLANTAS ORNAMENTALES
	PLANTAS
	CYTRICOS (LIMON Y NARANJA)
	GUANO BARRA
	PALMITO
	BANAN
	ARROZ
	ARBOLIZ DE OLA
	CAFE
	INDUSTRIAS
	VIVERO DE ESPECIES (SEPCION EXPERIMENTAL LAS BARRITAS)

6

hh-cc

OFIPLAN

DIRECCIÓN DE PLANEACIÓN NACIONAL
Y POLÍTICA ECONÓMICA

DIVISIÓN DE PLANEACIÓN Y COORDINACIÓN REGIONAL

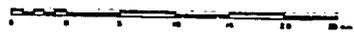
CAPACIDAD DE USO DEL SUELO

SIMBOLOGIA

	CLASE 1
	CLASE 2
	CLASE 3
	CLASE 4
	CLASE 5
	CLASE 6
	CLASE 7
	CLASE 8

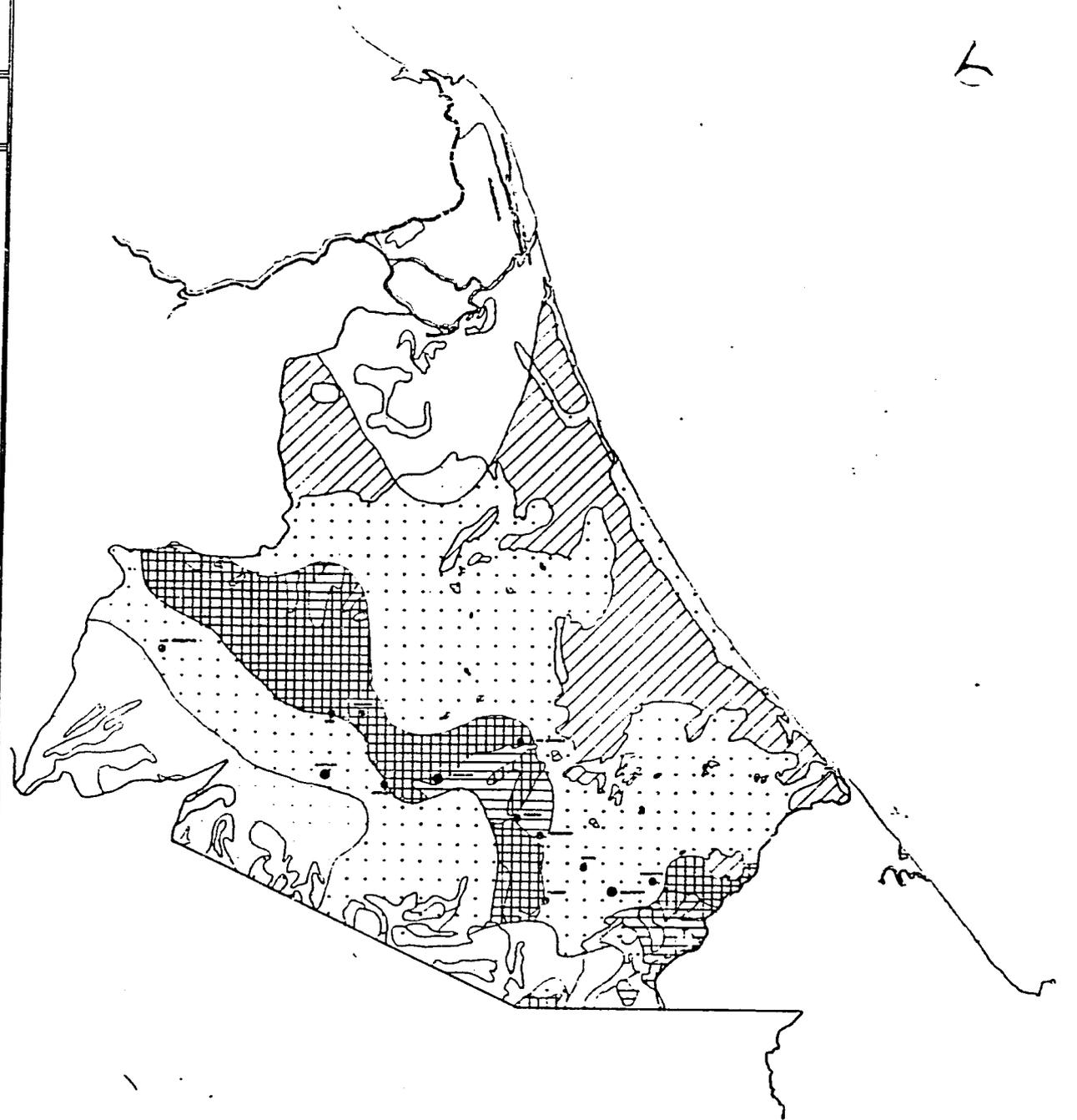
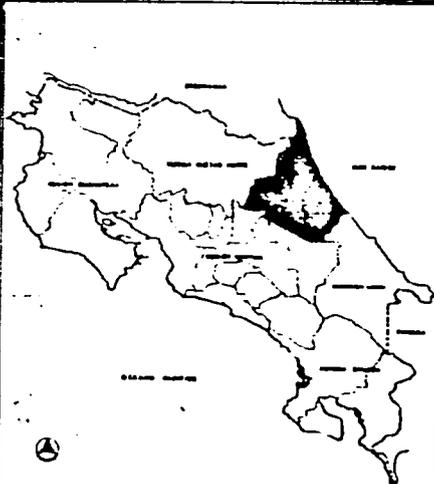
FUENTE: OFICINA DE PLANEACIÓN SECTORIAL AGRICOLA - 1979
PREPARO Y DIBUJO: JOSÉ A. SANTIAGO A.
FECHA: ENERO 1980

ESCALA: 1:200 000



REGIÓN
NUESTRAS ATLÁNTICA

SUBREGIÓN POCOCI



OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y ECONOMIA REGIONAL

CALIDADES DE PENDIENTES

SIMBOLOGIA

LETRA	PORCENTAJE	DESCRIPCION
A*	0 - 5	PLANO O CERCANO
A	6 - 15	PLANO O SUAVEMENTE
B	16 - 30	ACCIDENTADO
C	31 - 45	MUY ACCIDENTADO
D	46 - 60	MUY ACCIDENTADO
E	61 - 80	MUY ACCIDENTADO

NOTA: EN LOS PUNTOS DE 10% SE SUAVIZA CON UN VALOR DE 5 METROS
POR CADA 100 METROS DE DISTANCIA HORIZONTAL.

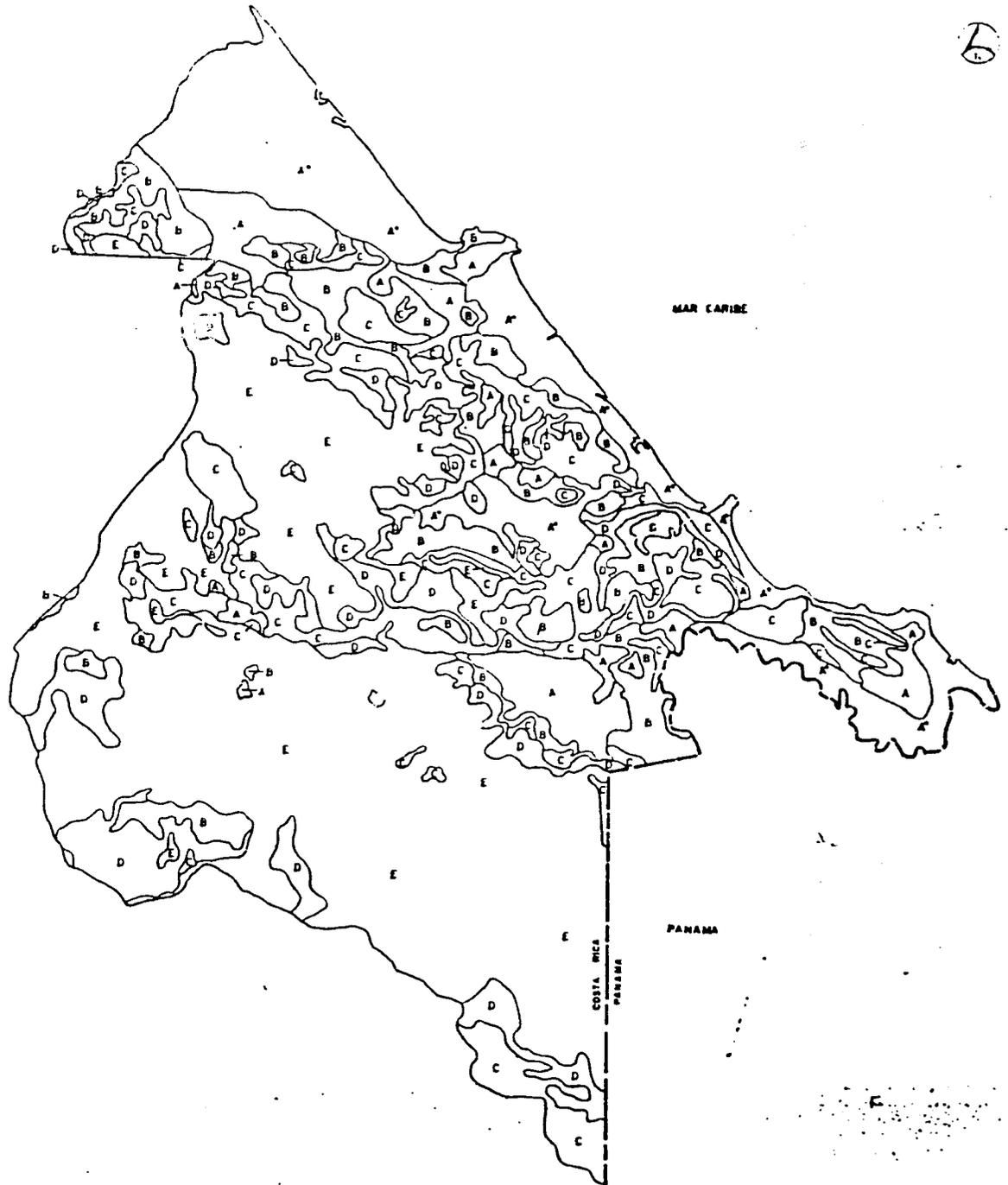
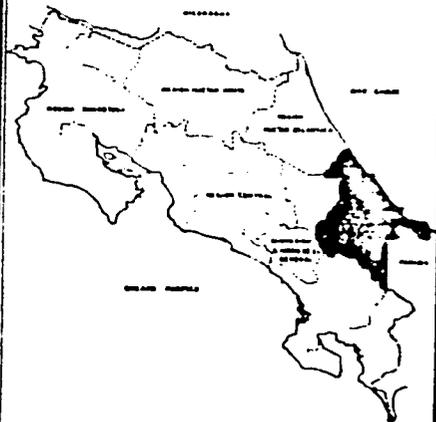
FUENTE: DPSA
PREPARO: JOSE A. GUTIERREZ
DISEÑO: DENNIS CARRASCO MONTANAR
FECHA: MARZO 1981

ESCALA: 1:200 000



REGION

SUBREGION
LIMON



9/17-81

OFIPLAN

OFICINA DE PLANEACION NACIONAL
Y POLITICA ECONOMICA

DIVISION DE PLANEACION Y COORDINACION REGIONAL

CALIDADES DE PENDIENTES

SIMBOLOGIA

SIMBOLO	PENDIENTE	DESCRIPCION
AF	0-5	PLANO - CONCAVO
A	0-15	PLANO o ONDULADO
B	15-30	ACCIDENTADO
C	30-45	MUY ACCIDENTADO
D	45-60	QUEBRADO
E	mas de 60	MUY QUEBRADO

NOTA

UNA PENDIENTE DE 1% SIGNIFICA UNA ELEVACION DE
1 METRO POR CADA 100 METROS DE DISTANCIA HORIZONTAL

FUENTE: OFICINA DE PLANEACION SECTORIAL AGRICULTURA 1978

PREPARED Y DIBUJO: JOSÉ A. GUTIERREZ

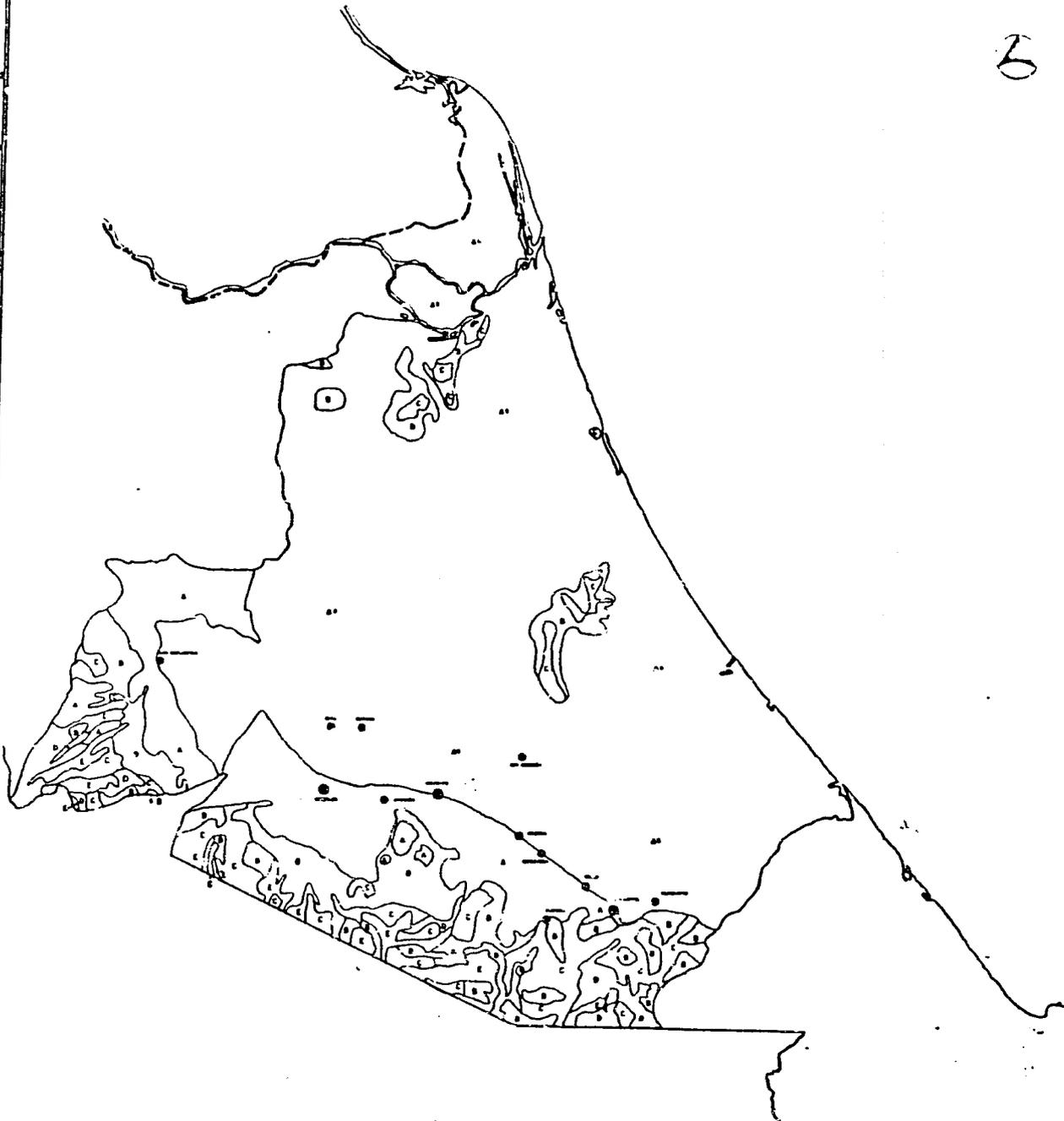
FECHA: SEPTIEMBRE 1981

ESCALA: 1:100 000

REGION

HAETAS ATLANTICA

SUBREGION POCOCI



3

1-4-81