

ATLANTIC ZONE PROGRAMME



Field reports No. 7

THE ATLANTIC ZONE OF COSTA RICA
Agriculture in the Talamanca and Pococí/Guácimo study areas

S.B. van Ee ✓
M.P. Grundeman
T.M. van de Hel
J.J. Ottens

Guápiles, December 1986

CENTRO AGRONÓMICO TROPICAL DE
INVESTIGACION Y ENSEÑANZA - CATIE

AGRICULTURE UNIVERSITY
WAGENINGEN - AUW

MINISTERIO DE AGRICULTURA Y
GANADERIA DE COSTA RICA - MAG

PREFACE

The multidisciplinary research carried out by the Atlantic Zone Programme (CATIE-AUW-MAG) in Costa Rica consists of three phases:

- An exploratory survey for a rapid identification of the most important agricultural production systems, i.e., actual situation and problems, the land units and the socio-economic conditions of the Atlantic Zone so as to enable the selection of subareas for a baseline study.
- A baseline study in one or more subareas to identify the problems besetting the agricultural production systems and to collect data on the most important agricultural transformations as a benchmark for future reference.
- Development oriented research on transformation problems identified during the previous stages.

The exploratory survey was carried out between March and July 1986 and resulted in the choice of two general study areas: the canton Talamanca and the cantons Pococi and Guacimo. Within these two areas smaller subareas had to be selected for the baseline study.

The study presented in this report contributes to this further selection. It was carried out between September and December 1986 by a team of 4 postgraduate students of agronomy, forestry, animal husbandry and sociology. The report provides information on agricultural production systems and socio-economic conditions and their spatial variation within the canton Talamanca and the cantons Pcoci and Guacimo.

Henk Waaijenberg

CONTENTS

1	ABSTRACT	1
2	INTRODUCTION	2
3	DESCRIPTION STUDY AREAS	5
	3.1 History	5
	3.2 Soil and vegetation	5
	3.3 Climate	6
	3.4 Description Pococi/Guacimo study area	6
	3.5 Description Talamanca study area	7
4	ASPECTS	9
	4.1 Introduction	9
	4.2 Migration	10
	4.3 Labour force	11
	4.4 Extension	11
	4.5 Credit	12
	4.6 Marketing	13
	4.7 Influence banana companies	14
	4.8 Inputs	15
5	FARMING SYSTEMS	16
	5.1 Introduction	16
	5.2 Farming systems illustrated	16
	5.3 Remarks and amplifications	20
6	SUB-SYSTEMS	24
	6.1 Cropping systems	24
	6.2 Animal production	33
	6.3 Household systems	38
	6.4 Forestry	40
7	SUB-AREAS	44
	7.1 Introduction	44
	7.2 Pococi/Guacimo	44
	7.3 Talamanca	46
	7.4 Choice of sub-areas	48
8	EPILOGUE	50
9	LITERATURE	52
	ANNEX	

1. ABSTRACT

In the scope of the CATIE-MAG-WAU cooperation this report is giving you a rough description of the cantons Pococi, Guacimo and Talamanca in the Atlantic zone of Costa Rica. This zone, influenced by a number of institutions, has a dynamic character. Also some rather important aspects are described. By means of interviews of farmers and other people, a view is constructed on farming systems and sub-systems. Together with the reports of the exploratory survey, the interviews are the foundation for the selection of sub-areas in which in 1987 baseline-studies will start. Some recommendations for the choice of sub-areas has been given.

In het kader van het CATIE-MAG-WAU samenwerkingsverband, geeft dit verslag U een globale beschrijving van de cantons Pococi, Guacimo en Talamanca, gesitueerd in de Atlantische zone van Costa Rica. Deze zone is een gebied met een dynamisch karakter waarop verschillende instituties invloed hebben. Tevens vindt U een aantal belangrijke aspecten die ook een rol spelen. Aan de hand van interviews met onder andere boeren is een beeld verkregen van bedrijfssystemen en teeltsystemen. Samen met de verslagen van de exploratory survey vormen deze interviews een basis voor de keuze van sub-area's, in welke in 1987 baseline-studies zullen beginnen.

2. INTRODUCTION

In the framework of the CATIE-MAG-WAU study of the Atlantic zone in Costa Rica we, four students of the Wageningen Agricultural University of the Netherlands, have been asked to make a more detailed description of this zone as a connection between the exploratory survey which took place from April to July 1986, and the baseline study which will start in January 1987. The study areas we are concentrating on, are the cantons of Pococi and Guacimo in the northern part of the Atlantic zone and the canton of Talamanca in the south.

The aim of this research is to get a more detailed view of both study areas on aspects, farming systems and sub systems in order to choose sub-areas for in-depth studies during the baseline-study.

Four disciplines are involved: agronomy, tropical animal production, rural sociology and forestry. In October and November 1986 we have visited the study areas with a checklist as a guideline, talking to over 39 people. By car, equipped with 4-wheel drive, we made most daytrips from our base camps: Guapiles (Pococi/Guacimo study area) and Puerto Viejo (Talamanca study area). The choice of the people was not asefect. Most of the farms could be seen from the road. Sometimes when the road was too bad, we went on foot looking for a farmer. Most interviews were rather informal and not all checklist-topics were elaborated equally. The information collected in the interviews (see annex 2.D) and information from other sources like reports of the exploratory survey and literature is used as basis for writing this paper. We collected various maps of the study areas as well (see annex 2A). It must be considered that a large part of this paper is based on the view of farmers and that this report is a snapshot of a changing area.

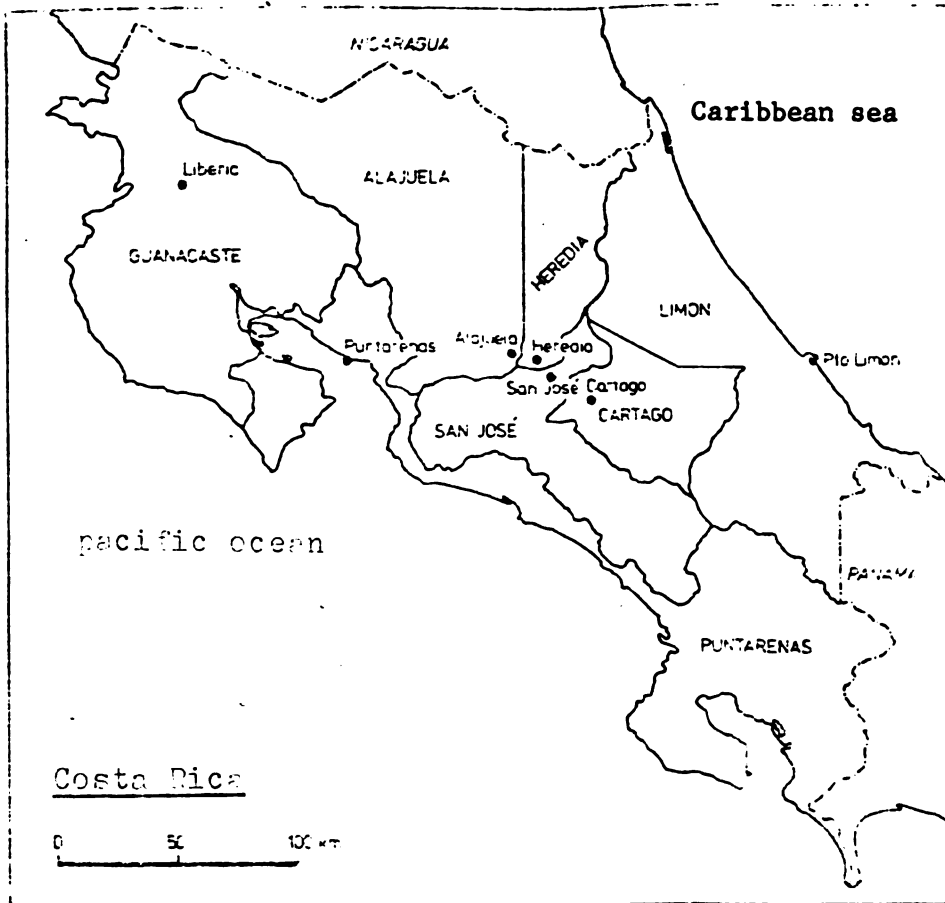


Fig. 2A. Map of Costa Rica.

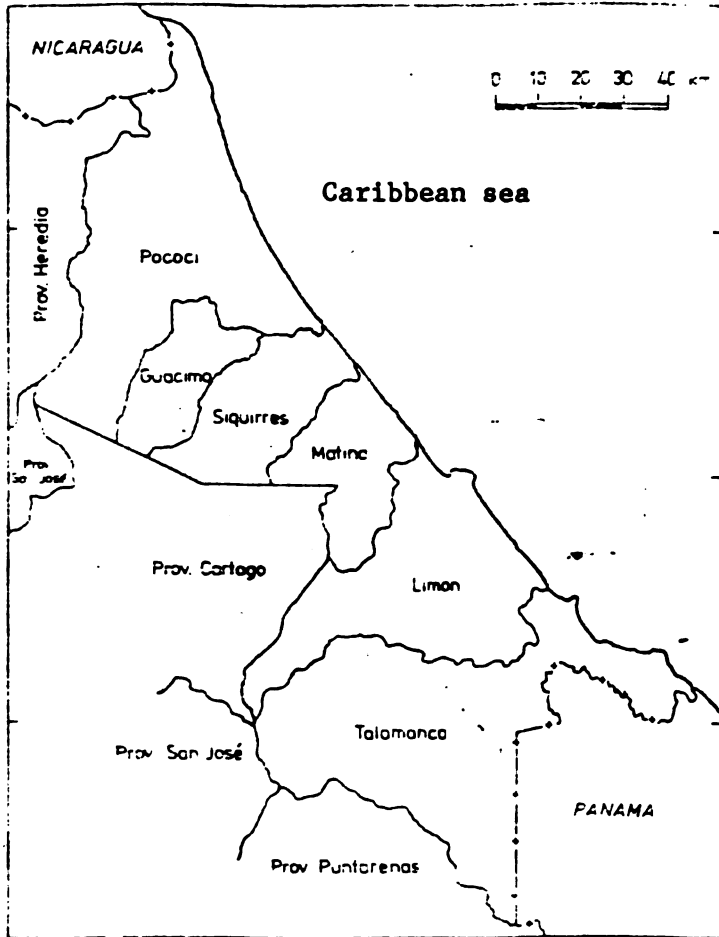


Fig. 2B. Map with cantonal division of Limon province.

3. DESCRIPTION STUDY AREAS

3.1. History

In colonial times the land use in Costa Rica consisted of small self sufficing and mainly poor farmers. Most of the people lived in the fertile and temperate Central Valley. The major part of the Atlantic zone was under a forest cover.

The first important change in the zone came shortly before the independence of 1821 with the introduction of coffee in the Meseta Central. Because of the need for a harbour on the east coast for the export of coffee to Europe, a railroad was constructed some decennia later from San Jose to Puerto Limon. Negroes from the Caribbean, Italians, Chinese and Amerindians who lived in the Atlantic zone, were attracted as labourers.

A second change came with the introduction of large banana plantations in the Atlantic zone in the course of the nineteenth century. For the extraction of the product from the plantations a network of railroads has been constructed. Bananas were exported from Puerto Limon and via Panama. The every 10 - 20 years shifting banana plantations moved through the zone, constantly searching for better soil conditions. Several diseases, like the Panama disease in 1903 (MAILLARD, 1985) forced the banana companies to abandon plantations in the thirties. The companies returned in the fifties to former and new areas with resistant cultivars and chemical treatments in order to restore production.

In times of low banana production, cocoa replaced banana as more important crop. Unfortunately the Monilia fungus invaded the cocoaplantations about eight years ago and together with bad management, it reduced the yield to a fraction of what it used to be.

A third important change in the Atlantic zone is the strong expansion of cattle ranching since the nineteenfifties. Together with the enlargement of the pasture area the amount of forest diminished, a process which is still going on.

Nowadays the population of the Atlantic zone is growing fast, partially caused by a large inflow of people from other parts of the country, looking for a better life.

3.2. Soil and Vegetation

For information about the soils and vegetation of the Atlantic zone see KLOOSTERMAN, SLIJKHUIS & WIELEMAKER (1986) and ROMEIJN & STAUDT (1986).

3.3. Climate

Only one aspect of the climate, the precipitation, will be mentioned. In the Pococi/Guacimo area the yearly amount of rain is 3500 - 4000 mm. The wettest part is the area around Guapiles. (See annex 3.3)

The Talamanca canton is much drier: 2200 - 3000 mm of rain per year. The area east of Bribri has the lowest amount of rainfall. See for more information Mapa de precipitacion promedio anual en Costa Rica (1961 - 1980).

Dry months are not common but the january - april period is less wet. See WAAIJENBERG (1986) for more information about climate.

3.4. Description Pococi/Guacimo study area

3.4.1. Topography

The area of the cantons is about 2983 sq km . Three geographic units can be distinguished:

- the slopes of the Irazu and Turrialba mountains
- the plains
- the hills of volcanic origen.

See map Pococi/Guacimo study area, annex 2B.

3.4.2. Population

In the Pococi canton live over 44 thousand people, the density of the population is about 18 people per sq km . In the Guacimo canton we find some 16 thousand people with a density of about 28 people per sq km (WAAIJENBERG, 1986). Villages like Guapiles, Cariari, Guacimo and Siquirres are regional centers for education, health service, public transport and supply of agro - inputs.

3.4.3. Infrastructure

Most railroads in this area were constructed by banana companies. Some old tracks were broken up and converted into unpaved roads. Lately a electrified railroad from Limon to Rio Frio was constructed. Except a few roads (e.g. Guacimo - Rio Jimenez and Guapiles - Cariari) most roads are unpaved. Since 1984 Guapiles has a quick connection with Puerto Limon by an asphalted highway. In 1987 the highway San Jose - Guapiles can be used so the San Jose market shall be in one hour reach from Guapiles.

3.4.4. Use of land

About 5 land zones with specific characteristics can be distinguished. See map Pococi/Guacimo study area annex 3.4.4.

I Land zone between Guapiles and Rio Jimenez. The oldest agricultural area with high landprices. In the eastern part many IDA settlements schemes can be found. There are rather

intensive cattle farms (many dairy farms). Crops like cocoa, maize, fruits, roots and tubers grow in this zone.

II Ticaban - Villa Franca strip, with large banana plantations, alternated by smallholders (maize, cattle, cassava) and large farms with ornamentals and cash crops. The acces is rather good.

III Palmitas - Pueblo Nuevo zone: rather new area with rather bad accesability. Mainly pasture for beef cattle and some diary can be seen. Not many crops are grown.

IVa Slopes of Turrialba/Irazu till the Guapiles - Siquirres highway, with primary and secondary forests, timber logging, extensive cattle farms and macadamia.

IVb Lomas de Sierpes and Barro del Colorado. Very new zones with primary and secondary forests, timber logging and large scale cattle farms.

3.5. Description Talamanca study area

3.5.1. Topography

The Talamanca canton is about 2810 sq km . Three geographic units can be distinguished:

- coastal plain
 - river valleys
 - foothills and mountains.

This canton is marked by mountains which take up nearly 80 % of the area and are intersected by large rivers. Some of them have wide valleys. The coastal plain gets narrow in the south. See map Talamanca study area annex 2.C.

3.5.2. Population

In this canton live about 11 thousand people, the density of population is some 4 people per sq km (WAAIJENBERG, 1986). There is an anglophone population of negroes in the coastal plain. Still there are Amerindian tribes like the Bribris, with their own languages and habits. The majority of of them live in reserves. Places of local interest are Cahuita, Puerto Viejo, Bribri and Sixaola.

3.5.3. Infrastructure

For a long time the big valleys were depending economically on Panama. Banana companies had constructed railroads to Panama and near the village of Sixaola there is the large railroad bridge across the river Sixaola. There used to be a rather bad connection with other parts of Costa Rica. Recently the road from Puerto Limon to Bribri has been asphalted. All other roads are unpaved. The connection with the Talamanca valley is very poor. A few years ago the old

railroad bridge near Suretka has been washed away. Nowadays you can cross the river only by canoe.

3.5.4. Use of land

Geographically 7 areas can be distinguished. See also map Talamanca study area annex 3.5.1 .

VIa Coastal plain. You can find a large amount of cocoa plantations but most of these are overgrown because of neglect on account of Monilia. Other uses are coconutfields and pasture. There is also some fishery.

VIb Refugio. The southern part has been declared Refugio del vida silvestre.

VIIa Estrella valley. There are large banana plantations with also some smalholders and some plantations of macadamia and coconut.

VIIb Sixaola valley. The northern part of the valley is an area of former banana plantations. Nowadays various crops are grown, and there are some cattle farms. In the southern part most of the land is used for banana and other plantations.

VIIc Talamanca valley. In the overgrown abandoned banana plantation the Amerindians produce crops for own consumption as well as cash crops. Still they practice forms of shifting cultivation.

VIIIa Hills near Bribri. After opening by Recope, there was an invasion of timber loggers and squatters. Recope is searching oil and coal.

VIIIb The mountains of the Cordillera de Talamanca and Fila de Matama cover about 80 % of area. The access is poorly.

4 ASPECTS

4.1 Introduction

As is pointed out in 3.1 about the history of the Atlantic zone the development of the zone has been a very dynamic one, still going on at this moment. The link to international markets through the presence of banana companies, cocoa producers and -recently- cattle estates has been of much influence on agriculture and on the social and economical situation of the farmers.

Up to the middle of this century the development used to be a rather autonomous one, but since the fifties the state chose to intervene with various programs and policies, concerning credit, stimulating agricultural production and improving the infrastructure. Besides, colonization was stimulated into the zone to respond to urgent calls for land, the land pressure in the Central Valley becoming more and more a problem.

(DE VRIES, 1986, p. 11) Nowadays, this State intervention is still strong. Infrastructural projects are going on, improving the accessibility of the area and, with this, indirectly influencing extension and marketing possibilities.

An improved infrastructure has its impact on migration as well, which in turn affects the existing labour force in the area. Both the phenomenon of migration and the size of the labour force have been influenced by the existence of the banana companies, having attracted many people to move into the Zone to find jobs.

Another example of State intervention is the price setting for various agricultural products (maize, milk etc.). For the production of these products credit is often needed; this need for credit is affecting the demand for extension; extension raises the level of knowledge; all this affecting the average standard of living in the Zone. In a very complex net-work all these aspects have inbetween relations, mutually influencing each other.

In this chapter we want to lift out some of the aspects to describe them in detail. The choice of the aspects: migration, extension, credit, marketing, the labour force, inputs and the influence of the banana companies, is rather arbitrary without pretending to be complete.

Whilst interviewing, these aspects struck us to be important for the farmer, who gave a lot of information about them.

Leaving out other aspects has two reasons:

Firstly, the limited time for interviewing restricted us in obtaining complete information on all questions, thus leaving a lot of gaps to be filled in further research.

Secondly, the exploratory survey of may/june 1986 covered

already a lot of information, thus releasing us from doing the same job twice. See for example for "precarismo" DE VRIES (1986), for "institutions" both DE VRIES (1986) and VAN DER WEYDEN (1986), "land use" WAAIJENBERG (1986) and for "environmental impact" ROMEIJN & STAUDT (1986).

4.2 Migration

The most recent example of migration we found in Talamanca where we met a woman who just one and a half month ago moved into the area with her two sons. They came from Alajuela but originated from Guanacaste. The reason for migrating was the expensive way of living in Alajuela. Without a job, depending on others for their daily income their standard of living was rather low and having a finca and the possibility to grow their own foodcrops seemed the only solution. They went south because they had heard that good and cheap plots were available.

Migration however is not a recent phenomenon. It has been going for decennia, since the first labourers came from Jamaica to build the railroad. One man, already being in the country for 55 years, told us he came with his parents to Costa Rica where his father worked for the railroad company. He himself was one of the first inhabitants of the area between Guacimo and Rio Jimenez, having cleared the than existing wood to be able to farm.

In between these two examples lies a range of stories about coming from Jamaica, Guanacaste, Puntarenas, the Central Valley since 5, 10, 20, 30 or even more years, while the stream of migrants still has not dried up. The expected abundance of land, the cheaper way of living, the availability of jobs and the wish to be independent, are the main reasons we heard for coming into the Atlantic Zone. The started farms show many differences as for farm types, size, capital, aims etcetera although almost every farmer is growing his own foodcrops.

We expect that infrastructural improvements will greatly affect migration:

- the new road connecting Guapiles and San José will improve the accessibility of markets, thus attracting new people, depending on these markets.

- the recently finished road from Bribri to Shiroles, the electrification of a large part of the area as well as the activities of RECOPE will have the same effects in Talamanca.

The consequences of migration will be obvious. The demand for new land will rise and new lands will be occupied. To make this possible more woods will be cut of, negative results of this will be pointed out in 6.4.

4.3 Labour force

Region Atlantica has a population of 118,596 persons of which 49% or 58,188 persons belong to the labour force (see table 4.1) The labour force consists for 78% of men and 12% of women, while 7% of the men and 12% of the women are unemployed. In the agricultural sector the contribution to labour of both sexes is respectively 90% (male, 27,441 persons) and 10% (female, 2,746 persons).

Whilst considering these figures one has to take into account that it is merely a snapshot, giving a static picture of a dynamic process. Year over year the flow of migrations, the settling of new farms, the production level of the banana plantations, which will determine their stay or withdrawal from the area are affecting the size of the labour force and with it the certainty of employment. A detailed study of the fluctuations of the labour force over the years will be interesting and valuable for the understanding of the areas dynamic processes.

Notes

1. This paragraph is based on the "Encuesta de Hogares", carried out by the "Ministerio de Trabajo". Each three months, this ministry takes a sample to get a continuous picture of the household sector. However, one has to be careful with the interpretation of the figures. Comparison with the "Censo de 1984" -carried out each decennium by the "Ministerios de Vivienda, Poblacion y Agropecuario" - shows striking differences.

The most important one is the size of the population. According to the "Encuesta", the size of the population of Region Huetar Atlantica is 118,596 persons. According to the "Censo" the population of the region is 178,427 persons: a difference of almost 60,000! Whether this difference is caused by using different definitions of "Region Huetar Atlantica" or by unreliability of data has to be sifted out. One has to keep it in mind while reading this paragraph. (Definition of "Huetar Atlantica" as used by the "Censo" is to be found in annex 4.3.)

4.4 Extension

The need of extension in the Atlantic Zone of Costa Rica is obvious. First because so many migrants live in this area, who lack knowledge about farming adapted to the climate and soils of the zone. Second because the rapid development of the zone offers new possibilities to the farmers, which can be used better with new technologies.

Extension is given by various organisations. The Costa Rican extension service SEA (Servicio de Extension Agricola)

has 52 sub agencies, called MAG-extension offices, in the entire country. The MAG extension offices are grouped into eight centres (CAR: Centro Agricola Regional) which coordinate extension services. Each CAR has one extension agent and specialists on various disciplines. (De Vries '86). The director of the MAG extension office in Guapiles told us his extensionists reached 10% of the farmers, especially bigger farmers.

Extension is also given by other organisations. The agency for land reform IDA (Instituto de Desarrollo Agricola) offers various extension services, but only to farmers in settlement schemes. (Nequev, see: interview 34)

In the Talamanca study area we met extension activity of ANAI (Asociacion de Nuevas Alquimistas Inc.). ANAI is an organisation founded by north americans. Their aim is to diversify the products of the Talamanca farmers. They started nurseries to grow new crops offering plants and extension in exchange of farmers work. (Interview 36,38). The ANAI extension is limited to the new products. The farmers working in the nurseries are reached.

Extension is given as well by (semi-)private commodity organisations. Examples are ASBANA for bananas and the milk processing company Borden for dairy cattle. The aim of this extension is to increase the quantity and quality of some products.

By asking questions about extension services we found, that only few of the farmers we visited received help from extensionists. Various complaints were uttered. For example: "MAG only passes, never stops" (interview 31).

Another problem is that the informaton does not always suit the farmer. Near Jimenez we met a cocoa growing farmer, who had followed a course about how to control the fungus disease Monilia. He applied the methods he learned, but in spite of this he did not succeed in growing a profitable crop (intevieiw 27).

4.5 Credit

Credit is an instrument used to steer agricultural development. Interest rates are both dependent of land use and size of farms. In this way the government encourages credits for certain products and subsidizes credits used by smallholders. To raise their standard of living, smallholders have to increase their production by extending their farm, or adapting to new technologies. They need to finance these investments and often need credit. However, they do not use credit because of certain problems, illustrated by the following example.

To obtain credit in the Nequev settlement (IDA):

- 1 The farmer has to prove his title on the land.
- 2 An extensionist of the local IDA office evaluates the farm and the reason for asking credit.
- 3 Documents are made at the local office and are analyzed at the department "de caja agraria" of IDA in San Jose.
- 4 The "junta directiva" decides.
- 5 Money is given step by step, for every step the farmer has to perform certain requirements.

Although obtaining credit via IDA is only possible for farmers on IDA settlements, we think it is comparable to other ways to obtain credit.

Some problems can be extracted from this example. First, only farmers who have a title on their land have access to credit. Many farmers do not have titles on their land, although some families have been living in certain areas for generations.

Second, credit is linked with extension. Credit will only be supplied when recommended by an extensionist. So, many farmers who do not get extension, not only lack extension but access to capital too. This problem is considerable, for many farmers do not get extension. (see 4.4)

Third, farms are evaluated. Investments in small farms, especially those in which auto consumption plays an important role in the objectives, are not supposed to be feasible. For example a farmer (interview 12) said, that to obtain credit for maize he has to grow at least 8 hectares.

Fourth, although subsidized, farmers think credit is very expensive. Some say one has to invest in requirements which do not always conform to what a farmer has in mind. It is hard to pay back debts, fear exists of what will happen when one can not.

In short, credit is not used by many small holders because they do not have access to credit or think it is too risky.

4.6 Marketing

Animal products

The market for beef cattle includes both the market for weaned calves and fattened cattle. Weaned calves are sold for fattening to middlemen or to fattening farms. Meat is sold on the national market or exported to the USA. Export requires high quality.

Milk is bought by the milk processing companies Borden and Dos Pinos. Borden is more active in the study areas. Cheese and milk are as well sold to middlemen or directly to the consumer.

Agricultural products

Considering their markets, agricultural products can be divided into four groups.

Bananas are the first group. Multinationals possess a big part of the production units and control the market. Selling bananas for export can only be done via these companies.

The second group consists of macadamia, pejobaye, ornamentals, spices, etc. These crops are often cultivated in farms financed with foreign money. Products are sold on foreign markets. For small producers it is difficult to find access to these markets.

The third group, the basic grains (rice, beans, maize) is sold to CNP (Consejo Nacional de Producción), a governmental marketing institution. CNP is important in the Pococi/Guacimo study area, where maize is the main cash crop. The CNP offers guaranteed prices. In the future this expensive practice might be changed (WAIJENBERG, 1986). Lowering the prices requires adaptation from the farmers. They will probably choose another cash crop, or try to lower the production costs of maize.

The last group, containing plantain, cocoa, and other fruits, is usually bought by middlemen. The activity of middlemen is more pronounced in Talamanca where plantain and cocoa are the most important cash crops. Dependency on middlemen makes exploitation possible. We met an example of exploitation by middlemen in a Talamanca indigenous reserve. A farmer we met received only C 40,- per kg * dry cocoa, while the usual price is about C 90,- per kg (interview 17).

* US\$ 1,- values ca C 60,- (December 1986)

4.7 Influence banana companies

In this paragraph several influences of the banana companies on the Atlantic Zone will be analyzed. As is already indicated in chapter 3, the companies entered the zone more than 100 years ago, leaving it in the thirties and returning in the fifties. Most of them are foreign companies: Del Monte, Cobal, The Standard Fruit Co. The national research institute is called ASBANA (Asociación Bananera Nacional). The companies own good soils, of which they have greatly improved the accessibility by the construction of railroads. The most recent example of this is the section between Rio Frio and Limon, a modern and electrified line.

Except this infrastructural influence, the influence on the areas employment is significant. The companies offer many jobs and relatively high wages. Most labourers we have spoken to were rather positive about their jobs, although some critical words were heard. Two examples will illustrate this.

One man we met had a rather good job on the plantation as a supervisor over the packing section. However, the

regularity of his job was rather unsure, being dependent on the harvest of the bananas. A day before he was told he could come to work, usually for 2 or 3 days a week, sometimes in the weekends.

The second example is a man who used to work on a plantation. Preferring to be independent he asked to be paid in land. Since a year he had his own plot of maize. The company we asked about this paying in land (Bandeco) told us that usually the worse soils were for payments in kind. (Interviews 2 and 3)

A third influence of the banana companies is the environmental impact. Small airplanes are spraying chemicals every week, to which the labourers and their houses in the neighbourhood are exposed. This spraying is a threat to their health. Some years ago a chemical causing male sterility was used for example. The chemicals are polluting soil, ground water and rivers, and although we do not know the extent of the pollution yet, we think the consequences will be considerable.

The impact of the banana companies on the Atlantic Zone used to be and still is large as shown by the above mentioned influences. Although the positive attitude of the labourers towards their jobs is clear (employment) it would be interesting to consider their attitude towards the negative influences.

4.8 Inputs

The level of inputs used in agriculture depends on crops, knowledge and access to finance. The use of land and labour varies very much, depending on which farming system is involved (annex 4.8).

Mechanisation is not common in the study areas. Machines are very expensive, labour is available. Besides the combination of humidity and weight of machines ruins the structure of the soil.

Agro chemicals and veterinary products are easy to obtain in many stores in almost every village. Especially herbicides (Gramoxone) are used in large amounts and nearly used by everyone. ICI and Bayer are well known companies.

5. FARMING SYSTEMS

5.1. Introduction

Because so many criteria exist, and because every farm is different, it is very hard to place farmers in a typology of farming systems. Two problems arise; how to classify farming systems, and how to use this classification in practice.

DE VRIES (1986) already made a classification, which we decided to use. He distinguishes 5 systems:

- plantations
- cattle estates
- commercial farming
- capitalist agriculture
- peasant agriculture

In this chapter we want to give a summary of the description of de Vries for every farming system, and when needed we will add one or more illustrations of certain farms, which we think are representative.

However there are many discrepancies between theory and practice. For this reason after his description we will criticize his typology, and end with some amplifications.

5.2. Farming systems illustrated

5.2.1. Plantations

Banana plantations are heavily capital- and labour intensive. They are characterised by high input use, narrow integration with marketing and agro industry, and strong specialization on one product. Management is strongly hierarchial and centralized. They receive good technical assistance.

Non-banana plantations like macadamia, pejobaye and ornamentals are usually set up by foreign individuals or companies, they have like banana plantations easy access to capital sources. The government has recently started to stimulate non-banana plantations with credit subsidies. (DE VRIES 1986)

As this farm system has had a lot of attention in other parts of this report, it will not be illustrated.

5.2.2. Capitalist agriculture

Capitalist agriculture generally involves Costa Rican corporations or wealthy individuals. Large mechanized rice and maize farms are set up with purely profit orientated objectives. (DE VRIES 1986)

As we did not see any representative of this farm system, it is not possible to give an illustration.

5.2.3. Cattle Estates

Cattle estates are very labour extensive and are often set up for land speculation purposes. Input use is low. Capital is acquired principally from private sources, as there is no stimulating policy by the government. (DE VRIES 1986)

To illustrate this system we describe farm "San Elias" near Guapiles, owned by Miquel Garcel living in San Jose. The area of the farm is about 300 ha of which half is covered by native grassland, while the other half is covered by improved grassland. The first half is to maintain calf-producing cows, the second half is used mainly for fattening of those calves. No fertilizers nor herbicides are used. Animals are supplemented with hay, sugarcane sirup and salt, depending on to what production group they belong. There are about 280 cows, 150 calves fattened a year, 30 bulls, and 30 horses.

The farm is well equiped. The about 14 labourers are reasonably paid each fortnight. Every one has a specific task, there are some specialists working like a veterinarian and the manager.

The farm is a commercial enterprise, cattle is sold to be slaughtered and exported. The animals are collected by a truck coming to the farm. The enterprise has an advanced level of technology concerning nutrition, reproduction and health. (interview 1)

5.2.4. Commercial farming

Holdings are mostly medium sized family farms below 100 ha and usually specialized in one product like rice, maize or dairy cattle. Input use on these farms is high, capital use per hectare is high while labour use per hectare is relatively low in comparison with peasant farms.

Commercial farming is highly dependent on government services and policies, what sometimes leads to problems. (DE VRIES 1986)

A farm belonging to this system is finca "La Union" It has an area of 60 ha with very good soil in the Sixaola valley. The main crop is plantain, other products are cocoa, yam, papaya, mais, rice, etc. Some of the latter crops are used for auto-consumption. Because of the fertile soil no fertilizers are used.

The owner was born in the Meseta Central. He has worked 25 year for a banana company, before buying this farm. He has just built a nice house near his farm.

He and his wife have several children, but only one son lives in the neighbourhood with his family. This son will be the successor. The owner and his son both work on the farm,

assisted by some employees. The owner rather would like to use machines, he stressed his need to have possibilities to hire a tractor, because as he said labour costs are very high.

For some products, like plantain, cocoa and yam, he said the markets are good. These products are sold to middlemen along the road. Other crops give more problems. For example, he has 0.5 ha of papaya, but it is imposible to sell the fruits, so they are rotting away. These products he tries to sell to local people in a little stall along the roadside.

He complained about extension. He only gets some assistance from CATIE for yam production. (part of the experiment of the section Tubers and Roots)

For marketing- and extension reasons, he wants to increase his yam and plantain production.

5.2.5. Peasant Agriculture

This is the largest category in numbers, there are many differences between cultivators in terms of market orientation, crops, involvement in off-farm activities, use of inputs and agricultural practices, as well as access to government services and migrational experiences.

They have in common a relatively low productivity, and difficulties to compete with capitalist forms of agriculture. The primary condition for the peasantry's survival is the availability of good land.

Three groups are distinguished:

-Peasants in older settled areas. these are smallholders, with small plots often under 5 ha, who combine farm work with labour on plantations and estates. They may grow perennials for cash, and basic grains for own consumption, with low input use.

-Peasants in marginal areas. Farming is the main source of income. Some farmers produce essentially for own consumption ("precaristas"), others combine food crops with perennials. Input use is low. Extension nor credit can be used.

-Peasants organized in settlement schemes are strongly market orientated. They are often very innovative, and may seek specialization in either dairy farming, or diversify into new crops. Settlers have access to credit and extension. (DE VRIES 1986)

Because of the number and the diversity, two illustrations will be given. One of a farmer in the old settled area, one in a more remote area.

The first farm is situated near Rio Jimenez. It has an area of 8 ha, of which 4.5 ha of maize, 1.8 ha of cocoa, 0.8 ha of pasture and 1 ha of other crops like fruit trees, beans, bananas, cassava, yam, mainly used for auto-consumption. The farm is owned by Mr Maire, he came in the

area 55 years ago. Originally a jamaican, he travelled with his family to Costa Rica to join his father. Mr Maire cleared the land with a "machete" and started his farm. He married his second wife 30 years ago, she was born in Turrialba. They have 15 children of whom 7 live in Rio Jimenez. Some of his sons work on banana plantations. Mr Maire has several houses, some used by his children, some rented to neighbours.

The main farming activities are done by his son Henri, Mr Maire himself is rather old, and only works in the cocoa field. The trees are old, and the fruits suffer from Monilia. For sentimental reasons, and because of his religion, he does not want to cut the cocoa trees. This will change, when his son Henry and another son succeed. They will plant hybrid cocoa trees under coconut trees, and cut down the old cocoa trees.

Maize is the most important cash crop, it is sold to the CNP in Guacimo. Herbicides are used and sometimes some fertilizer. Fermentated and dried cocoa is sold to a chinese merchant in Guacimo, fruits are sold in Rio Jimenez. (interview 14)

The second farm is situated between Bribri and Shiroles. It has an area of about 25 ha, mainly improved pastures, plantain and some food crops. It is owned by Gabriel Zapata, he originates from Limon, where his mother has a cattle farm. His father died when he was thirteen, he more or less had to take over his fathers role. His eldest brother, already married, spent his own part of the inheritance in parties, and came back to the farm to work. There were many frictions, so Gabriel decided to leave the house, when he was 23, without having anything. He worked with a veterinarian from who he learned a lot and earned money. He started his farm to be independant, a very important objective to him is to prove himself. So he wants to work alone, without accepting gifts or help.

He wants to specialize in cattle. He started with two cows, he sometimes sells one old cow to buy two calves. In this way and by fertility of his own cows, his stock extends. His stock now is dual-purpose, but he wants to specialize in either milk or beef. He fattens his male stock on improved pastures. Besides he feeds plantains, salt, and sugarcane sirop when cows are in production.

He has to extend gradually, because he can not invest all his money in cattle without neglecting his foodcrops and plantains. He now has 12 animals. His wife helps him in the crops, but does not work with cattle. Gabriel works on other farms as well. He said he works in a sort of rotation of one month elsewhere followed by 2 weeks on his own farm.

Because middlemen do not offer good prices for his cattle, he made a contract with a man to deliver carcasses. therefore he wants to buy calves in Guapiles or Guacimo to fatten them on his grassland. (interview 37)

5.3. Remarks and amplifications

We will discuss the typology of the systems and the practical use chronologically.

The way de Vries describes capital agriculture it might be a small plantation or a big commercial farm. It can not be distinguished clearly from other systems. It might be better to change his typology; to restrict plantations to only banana plantations and to classify other plantations in capital agriculture. So in this way we distinguish the banana plantation system, a very important system for the area, with its typical market integration, from the capital agriculture system, which involves pejobaye-, macadamia- and pepper plantations, ornamentals, big pig farms etc. ,which more recently are set up. The latter system as well has good accessibility to capital, uses many inputs but is not controlled by multinationals as banana plantations are, so do not have market control.

Cattle-estates indeed use few inputs, but not as few as DE VRIES suggests. Most of the cattle-estates have commercial interests, only some are set up for land speculation.

In the commercial farming system we think only the dairy-cattle farms are really specialized. Other farms usually have a main crop, but are not really specialized. Besides, almost every family farm has foodcrops. Caution should be taken to pretend that labour use is relatively low compared to peasant farms. This might be true in other areas, but as very little mechanization is used, and input use is high, labour is far more important than capital; many labourers are used.

DE VRIES does not give clear statements of differences between commercial farmers and peasants. For example, peasants organized in settlement schemes fit perfectly in his typology of commercial farming. He emphasizes different criteria. For peasants in older settled areas he emphasizes off-farm work, for peasants in marginal areas little input use, and for peasants in settlements market orientation. Besides there are many peasants in old settled areas who do not have off-farm labour, input use differs and almost every farmer without off-farm labour is marked orientated. Differences are gradual.

We think an extra type of a farming-system should be made for people who derive their main income from off-farm work. They have little farms to grow foodcrops, or as a hobby. This people can not be called peasants.

This brings us to the last remark. The word peasant for us has got the meaning of a very poor farmer. We think this term is too humble. It is better to talk about smallholders.

Thus we distinguish the following systems:

- off-farm-worker farming (OF)
- smallholder agriculture (S)
- commercial family farming (C)
- cattle-estates (CE)
- capitalist agriculture (CA)
- banana plantations (B)

An overview and summary of characteristics can be given by using a scheme. We want to emphasize that averages are used.

farming system	input use/ha	use of labour	access to finance knowledge markets	market orientation	area	land quality
OF	-	f*	-	-	--	-
S	o	f	-	o	-	-
C	+	fh	o	+	o	o
CE	-	h	o	+	++	-
CA	++	h	+	++	+	+
B	++	h	++	++	+	++

-- very low/very small
 - low/small
 o reasonable/medium
 + high/large
 ++ very high/very large

f family labour
 h hired labour
 * emphasis on off farm work

It is still hard to place farmers in this typology. Especially differences between smallholders and commercial farmers are gradual. To make this distinction we used some characteristics which for us were most surveyable, however rather subjective:

-Amounts of output produced. This covers size, intensity of the land-use and market orientation.

-Prosperity and equipment. The richer the more commercial, the poorer the more smallholder.

-Attitude of the farmer. Some farmers have a real commercial attitude. They have clear objectives and know how to reach these objectives.

Although subjective we have classified the 34 visited farms; 1 banana plantation, 1 capitalist agricultural farm, 3 cattle estates, 4 commercial farms of which two nearly smallholders, 15 smallholders of which two nearly commercial farmers, 6 off-farm workers, and 2 farmers for whom both off-farm work and on-farm work was of great importance, they do not really fit in one of these types. (see table 5.3) Because

these farms were not chosen aselective, this division of farms can not be considered representative for the whole study area.

Table 5.3 Overview of visited farms

Number of interview	input use/ha	use of labour	access to		market orientation	area(ha)	land quality	farming system
			finance markets	knowledge				
1	-	h	+	++	300	-	CE	
2	+	f	-	+	2	-	S	
3	++	h	++	++	321	++	B	
4	o	h	+	+	60	-	C	
5	o	f ¹	-	-	<10	o	OF/S	
6	++	h	++	++	10	+	CA	
7	-	f	-	o	9	-	S	
8	-	f ¹	-	-	2	-	OF	
9	-	h	-	o	70	-	CE	
10	-	f	-	o	14	-	S	
11	-	f	o	+	30	-	S ^b	
12	-	f ¹	o	-	1/8	-	OF	
13	-	h	o	+	119	o	CE	
14	o	f	-	o	8	o	S	
15	o	f	-	-	12	-	S	
16		f		o	ca10		S	
17	--	f	-	-	a	-	S	
18	-	f	-	o	a	-	S	
19	--	h	-	o	250	-	CE	
20	-	f	-	-	1/4	+	OF	
21	o	fh	o	+	60	++	C	
22	o	fh	o	+	17	+	S ^b	
23	-	f	-	o	32	-	S	
24	-	fh	o	+	30	-	C ^c	
25	-	f ¹	-	-	1	-	OF	
26	-	f	-	o	7	-	OF	
27	+	f	o	+	15	o	C ^c	
28	-	f	o	-	10	-	S	
29	o	f	-	o		o	S	
30	-	f ¹	-	-	<2	-	OF	
31	-	f	-	-	<2	-	OF	
32	o	f		+	13.5	o	S	
33	-	f	-	o	11	-	S	
37	-	f ¹	-	o	37	-	OF/S	

++ very high/very large
 + high/large
 o reasonable/medium
 - low/small
 -- very low/very small

f family labour
 h hired labour
 l emphasis on
 off farm work

a shifting cultivator
 b nearly commercial
 c nearly smallholder

6 SUB-SYSTEMS

6.1. Cropping systems

6.1.1. Introduction

In the following chapter we will mention the cropping systems of the study areas. First we show the link between farming system and cropping system and next we will try to tell something about the different cropping systems. Each crop is considered a separate cropping system because each forms a clear unit within a farm.

We do not intend to mention all crops nor to give a complete overview of the cultivation of each crop. We only want to report what we learned about the most important crops during our investigation.

In our inquiry we emphasize the importance of the different crops for farmer and region, the use of the crop and the most striking problems farmers have to deal with. The amount of information differs greatly per crop. This is due to two reasons. First to the number of times we met a farmer with a certain crop. Second to the importance of the crop according to the farmer. A farmer is inclined to tell more about his cash crops than about his foodcrops. For this reason the sections about maize, cocoa and plantain are rather long compared to the others.

6.1.2. Farming systems

Table 6.1. contains a summary of the activities of the farmers we interviewed. It demonstrates the mentioned importance of maize as cash crop for smallholders in Pococi/Guacimo and the importance of cocoa and plantain as cash crops in Talamanca. The table also shows a connection between farming systems and crops grown. Roughly the relation is as follows.

Smallholders main cash crops are maize (Pococi/Guacimo), cocoa and plantain (Talamanca). Usually smallholders grow a lot of different crops. Crops are used on farm or sometimes sold. Examples are rice, beans, citrus, cassava, etc..

Commercial family farms usually grow the regional cash crops in a more intensive way than smallholders do.

Of capitalist agricultural enterprises we interviewed only one representative, an ornamental growing company (interview 16). Other crops grown by capitalist agriculture farms are macadamia, pejibaye, spices, etc..

The products of the other distinguished farming systems, cattle estates and banana plantations go without saying. Off-farm working labourers grow the same crops as smallholders.

Table 6.1 Survey of crops of each interviewed farmer in Pococi/Guacimo study area

umber of nterview	area	farming system	cattle	maize	cocoa	plantain	cassava	coconut	banana	beans	rice	yam	xantosoma	colocasia	citrus	others
16	10 ha	S	+	+	4 ha ^k	+ ^k	+			+						
17	?	S		+	+ ^k		+		+ ^k	+	+	+			+	+
18	?	S				+ ^k				+	+					
19	250 ha	CE	+	+	+ ^k		+		+	+	+				+	+
20	0.25 ha	OF					+		+							
21	60 ha	C	+	+	+ ^k	+ ^k		+	+	+	+	+ ^k			+	+
22	17 ha	S		+	+ ^k	+ ^k	+	+	+	+	+		+		+	+
23	32 ha	S			+ ^k	3 ha	+	+	+	+		+	+		+	+
24	30 ha	C			30 ha ^k											
25	< 1 ha	OF			+										+	+
26	7 ha	OF			7 ha ^k											

Not all farmers are listed in this table, because of insufficient dates.

Farming system
 C = commercial family farm
 S = smallholder
 CE = cattle estate

B = banana plantation
 CA = capitalist agriculture
 OF = off farm working farmer

k = cash crop

6.1.3. Cropping systems

In the following paragraph we want to describe globally the most important cropping systems of the study areas. The systems described are:

- 1_Maize
- 2_Cocoa
- 3_Plantain
- 4_Cassava
- 5_Coconut
- 6_Banana
- 7_Beans
- 8_Rice
- 9_Yam
- 10_Xanthosoma and Colocasia
- 11_citrus
- 12_Pejibaye

We give first the english, next the latin and in the end the local name of each crop.

ad 1_Maize Zea mays Mais

Maize is the most important cashcrop for smallholders in the Pococi/Guacimo study area. It is sold to CNP (Consejo Nacional de Produccion) which offers high, subsidized prices. Maize is as well grown for on-farm use, e.g. to fodder the chickens and to make tortilla's.

Inputs

The size of the maize plots of the farmers we visited varied from a quarter to 9 hectares. A white grained cultivar is grown ("criollo") of which the seed is sometimes bought. More often farmers use own seed. Fertilizer is used by some farmers. It is applied when needed and in a quantity the farmer thinks fit. Insecticide is usually thought to be useful but too expensive.

We met two farmers who complained about the labour requirement of maize. Though according to the table of annex 4.1.B this requirement is not high compared to other crops. These complaints might be due to personal reasons like illness (lack of labour) and preference to cattle. One farmer (interview 14) avoided labour peaks in maize by sewing about a hectare and a half each fortnight.

Outputs

The average production in Huetar Atlantica is 1.630 Tm/ha, see annex 6.1.B. . The CNP offers C 13.= 1) a kg. The CNP prices will probably drop (see marketing 4.6). This will require adaptations from the farmer, e.g. lowering of the production costs or shifting to another cashcrop.

Management

The preparation of the land before sewing is usually done by killing the weeds with herbicide ("gramoxone") or with the "machete". Sewing is done by hand at 1 m row distance and about 0.75 m distance between plants in a row. Usually more seeds are put in one hole.

During the growing period weeds are removed once or twice, either by "gramoxone" or by "machete". In the ripening stage the crop receives a treatment called "doblar". Doblar is meant to prevent the rain to enter the ear and cause rotting. It is done by bending the stem under the ear. The growing period of maize is about four months. Though planting can be done all over the year, two periods can be distinguished: february and august. Harvesting takes place in may and in december, see also annex 6.1.C .

Problems

- Abundant rainfall and bad drainage cause water logging and stimulate fungus diseases.
- Plagues.
- Expensive inputs.
- Difficulty in obtaining credits; see 4.5 .
- Expected dropping of the maize price, what will happen?; see 4.6.

ad 2_Cocoa

Theobroma cacao cacao

Cocoa can be found in both study areas though it is more important in Talamanca. It's importance as cashcrop is diminishing because the cocoa plantations are suffering from monilia and neglect.

Monilia disease (Monilia rozeri) arrived in Costa Rica in 1978 causing a catastrophe in the cocoa growing areas. It seems however that before the arrival of Monilia the cultivation of cocoa already was declining. The plantations were old and very few were being renewed. Today many of the cocoa plantations are neglected. Large cocoa drying installations ("barbecue") are no longer used and people try to make an income by other means.

Monilia control is possible by using resistant cultivars, reducing shade, pruning, spraying and removing infected pods (ENRIQUEZ & PAREDES,1985). But planting trees is expensive (unproductive period, credit) and new management methodes are labour intensive. Besides there are a lot of farmers who do not know how to apply these methodes and who are not convinced that it really works.

Inputs

The size of the cocoa areas of the farms we visited varied from 0.125 ha to 30 ha. Larger plantations exist as well, especially in Talamanca (commercial family farms). As told above, the quality of the plantations was not very good.

Some farmers wanted to plant Monilia-resistant trees but no one actually had planted them.

The input level varied highly. Some farmers did nothing more than harvesting and some clearing (e.g. the off-farm working farmer of interview 26). But we also met a commercial farmer who applied fertilizer, sprayed against fungus diseases and did all the clearing and pruning advised for Monilia control (interview 27).

Outputs

The average production of cocoa was in 1973 220 kg/ha, see also annex 6.1.A. This production rate has probably dropped because of Monilia. The prices offered for dry cocoa varied from C 40.= per kg 1) (interview 17) till C 98.= per kg (interview 26). Most farmers received about C 90.= per kg for dry cocoa. Wet cocoa valued half the price of dry cocoa.

Management

Young plants are usually grown in plastic bags in nurseries. They are planted under the shade of trees left in a newly deforested area or under, e.g. plantain. The plantation is cleared, when the farmer thinks this is necessary, and the shade can be removed as the canopy has closed. Some farmers use management techniques to control Monilia, as mentioned above. Sometimes fertilizer is applied.

Harvest is done with the "machete". Pods are cut off, opened and the beans are put in a box or on a pile to fermentate. After three days of fermentation they are spread out in the sun to dry.

Problems

- Various diseases, especially Monilia.
- Why is the Monilia controlling management technique not generally accepted? Is it not paying to use them (interview 27), is it because of lack of extension or is it because of some other reason?
- Lack of successors on cocoa farms in Talamanca.
- Are abandoned cocoa plantations serious infection sources?

ad 3 Plantain Musa paradisiaca Platano

Plantain is an important cashcrop in Talamanca, grown by both smallholders and commercial family farmers. Plantain is the most important cash crop of the Amerindians in the reserves. In Pococi/Guacimo it is grown for own consumption on small scale by some smallholders.

Plantain is sold to merchants who come to collect the harvest, e.g. along the ferry place near Suretka where the Amerindians bring their plantains from across Rio Telire.

Inputs

Plantain is grown on different scales, varying from a small number of trees for self consumption (interview 5) via a limited number of hectares as cashcrop for smallholders (interview 22) to large commercial farms (interview 20). The level of inputs, like the amount of hired labour or the use of different kinds of chemicals, is variable as well.

Outputs

The average annual yield is 10.900 kg per ha, see annex 6.1.A . The prices farmers receive differ greatly. A farmers son, living at the other side of Rio Telire, told us they get C 105.= a bunch 2) at the Suretka ferry place (interview 16), while a Hone Creek family selling plantain to a related shop in Limon, received C 4.= 1) for a green and C 10.= for a ripe plantain (interview 23); that is about C 100 for a bunch of green plantains and about C 250.= for a bunch of ripe ones. A farmer along the road Bribri-Sixaola near Margarita, gets C 40.= till C 80.= for a bunch depending on quality and size of the bunch (interview 22).

Management

Clearing of weeds is done by hand or with use of herbicides. The crop needs pruning to remove superficial suckers and old stems.

Problems

- Plantain suffers from Sigatoka negra (Mycosphearilla jijiensis var difformis).
- Dependency from middleman.

ad 4 Cassava Manihot esculenta Yuca

Many farmers grow cassava for own use, on small scale (0.01-0.5ha). Cassava is also grown on larger scale as cash crop and bought by middleman, to be sold on the national market, or by exporting enterprizes as e.g. Pratsa SA . Cassava is exported fresh or frozen to Europe and the USA 3).

The input level of cassava grown by smallholders for auto-consumption is low. No fertilizer was applied by the farmers we met. Common cultivars are Valencia and Nanji.

Yields are 6,400 kg/ha according to annex 6.1.A . We met a hobby-farmer however who estimated his yield at 5 kg a plant, while a cassava plant used one square metre (interview 12). He was probably boasting because a yield of 50,000 kg/ha is extremely high. Prices are about C 350.= 1) till C 400.= per quintal 4).

Smallholders use own breed planting material. The growing period is 8 a 10 months. The crop receives clearing by "machete" or with herbicides. Harvest is done by hand and the tubers are sold fresh.

ad 5 Coconut Cocos nucifera Coco

Coconuts are grown by smallholders along the coast. They can also be found on estates landinwards. Nearly all smallholders possess some trees for own use. Coconuts are used fresh as a drink ("pipa") and the copra is used for cooking. There are trials to export coconuts. Some small scale local industries exist which use coconuts (ANDERSON & BREURE, 1983).

Since 4 years the coconutpalms in the area suffer from a disease that causes yellowing of the leaves and deforming and premature dropping of the nuts5) (lethal yellowing?).

ad 6 Banana Musa spp. Banano

About the influence of the banana companies in the Atlantic zone you can read something in 4.7. Inputs, outputs, management and problems are described in WAAIJENBERG (1986) p. 12.

As amplification on this work we mention that bananas are not only grown on large plantations but as well as smallholders crop for auto-consumption (interview 20) or to be sold on the national market (interview 17). The input level is considerably lower when banana is grown by smallholders, and probably the output is lower as well.

ad 7 Beans Phaseolus vulgaris Frijoles

Beans are usually grown for auto-consumption on rather small scale. Most farmers we met grew less as a hectare. Two varieties are grown: red and black beans. Table in annex 6.1.B shows the production rates of beans in the Huetar Atlantica.

In our field work period a lot of farmers did not grow beans because it had been too wet to sow them, so we hardly saw the crop. Growing seasons are shown in a figure in annex 6.1.C.

ad 8 Rice Oryza sativa Arroz

In the study areas rice is, like beans, grown for own consumption by smallholders. The rice growing farmers we have visited, had about 1 ha of Indica variety upland rice.

The table in annex 6.1.B shows the production rates of rice. It may be taken in account that in Huetar Atlantica rice is as well grown on commercial scale. The mentioned rates might therefore not correspond with the actual production rates of smallholders. For growing seasons see annex 6.1.C.

ad 9 Yam Dioscorea spp. Ñame

Yams are grown by smallholders for own consumption and also for sale. According to a farmer we met, yam requires a lot of labour (interview 21). This farmer was growing yam with help of CATIE. CATIE is doing investment into yam

cultivation on farms in the Sixaola valley. Yams are sold on the national market or as well exported. The price is C 12.= per kg 1).

ad 10 Xanthosoma saggitifolium

Colocasia esculenta

Tiquisque
Malanga blanca
Malanga
Chamol

Malanga and Tiquisque are usually grown on smallscale for own consumption. They grow as well in the verges. Tiquisque is preferred above Malanga. It can be sold to e.g. Pratsa SA, a tuber exporting company.

ad 11 Citrus

Citrus spp.

Citrus

Citrus trees are grown near the farmers' houses or on larger plantations (Pococi/Guacimo study area). Different kinds are grown. We saw orange ("naranja"), lemon ("limon"), mandarine ("mandarina") and grapefruit ("toronja"). Fruits are used for own consumption, sold on streetmarkets or to Dos Pinos. During harvest time Dos Pinos vans are crossing the area collecting citrus fruits.

ad 12

Bactris gasipaes

Pejibaye

Pejibayes are palmfruits traditionally used by the indigenous population. They make for example "chicha" liquor from the fruits. (SALAZAR, 1980). It has recently been introduced as a commercial crop for both fruits and palmheart ("palmito"). Palmheart is canned and usually exported.

- Notes: 1) US\$ 1.= values C 60.= (december 1986)
2) One bunch contains 15-10 plantains and weights 10-25 kg (estimated values).
3) Discussion with M. Castro of Pratsa SA, Guapiles, 30-6-1986, Exploratory Survey.
4) 1 quintal values 46 kg.
5) Small scale Manzanillo farmers 26-6-'85 Exploratory Survey.

6.2 Animal production

6.2.1. Introduction

In the contribution of tropical animal production in the WAU Exploratory Survey 7 farm types are distinguished in the whole atlantic zone (VAN DER WEIDE '86):

- a_dual purpose cattle farming with on farm consumption of milk.
- b_dual purpose cattle farming with sale of milk (derivates).
- c_specialized dairy farming.
- d_fattening of cattle.
- e_rearing of cattle in cow calf operations.
- f_extremely extensive rearing of cattle.
- g_pig holdings.

For some reasons we will not stick to this classification: First we think it is important to consider animal production as a part of agriculture. To distinguish several ways of animal production, it is better to use the typology of systems as has been done in chapter 5. Second, the importance of the described farms in the study areas Talamanca and Pococi/Guacimo are taken into account. We do not think there is an important difference between the farms described under a and b. Differences are gradual and production and thus sale depend on the season.

Extremely extensive rearing of cattle is an extensive form of cow calf operations. Fattening of cattle as a system apart is rare, it is mostly integrated with cow calf operations, it is better not to separate these sub systems. Pig holdings too are very rare. Pigs are mostly kept beside other agricultural activities. As we did not visit any pig holding, they will not be described.

For these reasons distinguished are:

- Beef cattle farming (cattle estate system)
- Dual purpose cattle farming (smallholders and off-farm workers)
- Dairy farming (commercial farming)

6.2.2. Beef cattle farming.

This is by far the most important sub system within animal production, and has great importance in Pococi/Guacimo qua area and economic value. Beef cattle farms are almost medium size (ca 50 ha) up to very large size (>1000 ha).

Beef cattle farms usually are specialized in meat production. However some small cattle farms produce foodcrops like maize as well, and for example in hacienda Bremen (>1000 ha) there is a big banana plantation besides cattle.

Beef cattle farms can be found throughout the Pococi/Guacimo area and in the hills of Talamanca.

There are many differences within this group of farms, not only size but as well the intensivity differ greatly, from extensive with only cow-calf operations to rather intensive with an important role for fattening. Very extensive farms can be found in the deforestation zones in as well Pococi/Guacimo as Talamanca. Here farmers extract commercial tree species, cut down many other trees and clear bushes. A very poor native pasture is developed, with still many trees in it. These pastures are only suitable for cow-calf operations. For these farmers cattle often is not a very important sub system, more important is land speculation. Cattle only adds a little income, cleans the forests, and is the cheapest way to demonstrate land occupation.

More intensive cattle farms can be found in the older settled areas. Here land prices are relatively high, more inputs are used. Besides time made it possible to develop toward a more intensive way of cattle farming. Investments often are made by rich Costaricans or foreigners, who live elsewhere. They often own more farms, and have a commercial attitude, so management is optimized. There is a good labour division, and some specialists like veterinarians are engaged.

Still beef farming is not an intensive way of land use. Besides pure land speculation, some other reasons are mentioned for beef cattle production. One can invest in concentrating land, whilst not having high costs and still reasonable yields, agricultural crops demand much labour and other expensive inputs. Another reason mentioned was land condition; bad drainage, low fertility and slopes. Agricultural crops have more risks due to plant diseases and market insecurities. Further, one likes working with cattle. And, an advantage of cattle is that when one needs money one can always sell some animals.

Because there are many differences between farms there are many differences in management as well. In the very extensive farms little attention is paid to animals and pastures. Sometimes a labourer looks after the animals. Cattle is sold to be fattened elsewhere.

In more intensive farms management is more advanced. Especially big farms have finances that allow investments. These farms do not use family labour, but hired labour. Knowledge can be used efficiently, because labourers have a good labour division, and some educated employees are engaged.

Attention is paid to pastures, almost every farm has some plots of improved pastures. Still the share of improved pastures is not very high, it depends on the importance of fattening. Cows to grow calves are usually kept on native grasslands (<1.5 LU/ha), animals to be fattened are kept on improved pastures. Estrella, Guinea, and Brachiaria are often mentioned. Cleaning weeds is done by using a "machete" or

"gramoxone". No fertilizers are used.

Cows are rotated to other plots, separated by live fences of "madero negro" (Gliricidia sepium) and "poro" (Erythrina sp). These legumes are seldom used for supplementation on purpose. Salt and sugarcane sirop are used commonly. Animals are kept in different production groups. Just born calves are separated from the herd, for some hours they are joined with their mothers to drink. Calves are weaned at about 7 months to be fattened, to be sold, or to replace cows culled. Bulls are bought on cattle markets, or are exchanged. The best bulls are selected to use for breeding. One farmer even used A.I.. The most important breed used is Brahman.

Fertility does not seem to be a problem. A calf every year and first calf at about 2.5 years of age is said to be common.

Some farmers milk some of their cows or have some special dairy cows. This milk is mostly only used for auto-consumption of farm employees.

6.2.3. Dual purpose cattle farms

These farms belong to smallholder and off farm workers. The number of these farms is big, the size is small (<10 ha of pasture) Animal production is one of the sub-systems of these farms, but certainly not the most important one. Cash crops and off-farm work have the biggest contribution to family income. Some people say; "Cattle is for rich people, to us it does not pay very well".

Milk is primarily used for auto-consumption, remainders are used to produce cheese, or are sold to neighbours for low prices (ca C 8.-/litre). Young bulls are sold to middlemen, before being mature (ca C 5000.-/200 kg live weight), sometimes old cows are sold.

Dual purpose cattle farming develops slowly, because of lack of finance and knowledge. Investments in cash crops are considered more important. However, some farmers, especially those who live in IDA settlement schemes, have possibilities to obtain extension and credit, and do want to invest much money in becoming specialized dairy farmers.

Reasons for this rather extensive land use are: Lack of finance and knowledge as explained before. Selling bigger amounts of milk, without investing a lot of money, is difficult, because of market problems. Specialized dairy farming demands besides a lot of investments a lot of extra labour as well. Land condition is often too bad for growing crops. Milk production for auto-consumption is a kind of tradition to be independent of other milk producers.

Management differs, but in general few inputs are used. Cattle often can be found on native grasslands and in verges. Some pastures are improved with Estrella or Ratana. There is neither division in production groups, nor rotation over plots.

Integration with cropping systems is low. Nearly no waste products of crops are used to feed cattle, nor animal labour or dung used in agriculture. Some farmers feed bananas, salt supplementation is common.

Cows to be milked are separated from their calves during the night to be milked in the morning.

Not much attention is paid to breeding. Races used are mixtures of Brahman, Criollo, Jersey, Guernsey, Holstein-Friesian, Brown-Swiss, etc. Farmers use bulls of neighbours, or have an own bull, often pure bred.

Health problems are not really mentioned, ticks sometimes are washed by hand. Though, this does not mean all animals look very healthy.

6.2.4 Dairy cattle farms

Dairy farming is a way of commercial farming. The number of dairy farms is small, the size varies from about 10 ha to over 100 ha, however the smaller the farm the more intensive, and the more specialized in milk production.

Dairy farms are concentrated in the settled areas of Pococi/Guacimo. They are dependent on good infrastructure like roads, electricity, and water supply. In these areas land prices are high.

Dairy farming develops rapidly, because of the arrival of Borden 3 years ago. This milk processing company demands high milk quality. Dairy farmers have to adapt to new technologies to produce clean milk with high fat levels in big quantities. To be able to do this, Borden supports by giving extension and by mediating in credit supply. This credit is needed to invest in stables with concrete floors, dairy cattle, pastures, milking equipment, etc.

Not all farms sell their milk to Borden, some are situated in remote areas, or do not want to adapt to or invest in new technologies. These farms produce cheese or sell their milk to middlemen.

Reasons for dairy farming are: Using the expensive land intensively. Land is not suitable for growing crops. The sale of milk is secure, because of fixed milk prices.

Dairy farmers have a commercial attitude, they are prepared to take risks, and to work hard. Especially small farms have to specialize, because the high investments done, require high outputs.

The technology proposed by Borden demands good management. Much attention is paid to hygiene during milking, which usually occurs twice daily. Animals then receive minerals and either concentrates or sugarcane sirop. Nearly all animals are supplemented with salt. Milk production is about 6 litres a cow a day (VAN DER WEIDE '86). Production is highest in march. Pastures are in better condition, and animals have less health problems, because of less rain.

Many improved pastures are used, cows are rotated over

plots, sometimes fertilizers are used. A few farmers use "semi-estabulacion"; animals enter in pastures (Estrella) at night, at day time they remain in a corral fed with chopped king grass, poro, or madero negro, and bananas. During night calves are kept apart.

Many farmers have an administration of production and fertility. The most important races used are Jersey, Guernsey, and Holstein-Friesian. Borden suggests to use Jersey bulls. Jerseys are highly productive with high fat levels, and do not have many feet problems. Some big farmers use Brahman bulls, they want stronger calves, with more meat production. They do not have to specialize like small farmers have to do. They think inputs are very expensive, especially labour, and so use land more extensively.

Dairy farmers are very aware of health problems. Mastitis, feetproblems and weak calves are most obvious.

6.3 Household systems

In this chapter we want to point out the background as well as the type, composition and aims of the households. Further we want to describe the labour division in the households with special attention to the role and position of women. As worked out before several farming systems exist in the area: plantations, capitalist enterprises, cattle estates, commercial farming, smallholders and off farm workers. In this chapter we want to restrict ourselves to the last three systems, being the only ones based on household systems.

In the paragraph about migration (4.2) already two illustrations are drawn about the background of households in the study areas, coming from various parts of Costa Rica and from outside the country. This is a typical characteristic of both Pococi/Guacimo and Talamanca: almost all households moved into these areas in search for better conditions of life.

The opening-up of the Pococi/Guacimo area however, started much earlier than the entering into the Talamanca area. Before the bridge across the Estrella river was built Talamanca was very difficult to reach and besides, the need for opening-up Talamanca was not urgently felt, being sufficient land available in the north.

The households we met almost all were nuclear families, composed of man, wife and several children. In some cases the man alone traveled beforehand, his family coming up later. It occurred as well that a man came in alone, not only in search for a job or a plot of land but also looking for a wife to start a family. In other cases we spoke to people of the "second generation", having moved in with their parents or being born in the area. Extended families, very few in number, are only to be found when this second generation keeps staying in their parent's households. We did not meet any migration of extended families as a whole.

The labour division within the household seems to be rather traditional: the man working with the crops, the woman working around the house. We met, however, a lot of differences which will be illustrated with a few examples.

North of Campo Dos, Agua Fria, lives a family consisting of a man a woman and four young children. The man is working on a banana plantation during the week. Around the house they have about 6 hectares of cash- and food crops like cocoa, maize, plantains, cassava, sugarcane etc. Several days a week the woman is busy with the crops, harvesting and weeding, sometimes assisted by her brother-in-law. Her husband spends time on the finca as well sowing maize and so on. (interview 5)

Another family is living on the road from Bribri to Sixaola. A woman with her two grown-up sons and her brother.

They have a farm of 17 hectares where they cultivate plantains and cocoa as cash crops, and cassava, maize, frijoles and citrus for own use. The three men do most of the Agricultural work, the woman works around the house, feeds the chickens etc. Although this resembles the "traditional" division of labour, it is obviously clear to us that the woman's share in the cause of events and in the decision making is considerable: she commands her son to look after the cocoa, orders a labourer to tell us something about the cultivation of yam, keeping an eye on everything going on. (interview 22)

The third example applies a family of a woman, a man and three children, living in the neighbourhood of La Rita. They own 2 hectares: a plot with maize and a plot with other foodcrops. The labour in this case was rather sharp. The man works in the crops, the woman keeps the house and looks after the children. She told us she hardly ever leaves the farm, only for some shopping in the near-by village. (interview 3)

The fact, however, that these examples only refer to families, does not imply this is the only way of living together in the area. Undoubtedly there exist other types of households, consisting of a single man or woman. Yet we do not have examples of these in the range of interviews. Partly because of our method, being exploratory and probably selective. Partly because we only once have visited the marginal areas of the zone, where we expect the incomplete families to occur most. This leaves a large and interesting field of research.

6.4. Forestry

6.4.1. Introduction

Though the forestry part of this investigation is not large and certainly not complete, a view of some aspects can be given.

Originally the whole of Costa Rica was covered with forest. Until 1940 it still occupied about 2/3 of the country. The deforestation then was executed at the west side of the central cordillera. Nowadays the Pococi canton contains Costa Rica's last easy accessible source of natural forest stands that have come under heavy pressure. After the removal of that, the Talamanca range will be the only remnant of this once great resource.

The direct road San Jose - Guapiles which is being in it's last stage of construction will heavily increase the pressure on the zone because of much lower transport costs. These costs are still the major part of the price of lumber. The stumpage value however is very low, in the range of some percents of the consumer's price. But as shortage develops the stumpage value will probably increase. According to several sources like Hartshorn and Flores Rodas (ROMEIJN & STAUDT, 1986) there will be a production gap starting ten years from now. The estimations of the deforestation rate differ but an annual rate of 60.000 ha seems reasonable (ROMEIJN, 1986) The rate of reforestation is very low compared to the quick deforestation rate but the government is supporting reforestation projects e.g. with the new Ley Forestal no. 7032.

One of the characteristics of Costarican "forestry" is the enormous waste of natural resources, for a great deal caused by the hunger for arable land. On the other hand there is also a waste of wood in the succeeding stages of producing lumber (e.g. at the stump, at the logging road, at the sawmill).

An other aspect of this zone is the growing concern about the natural resources. (see 6.4.3.).

6.4.2. Causes of deforestation

There are several forces behind the process of deforestation, often mutual related. An incomplete list:

- a_policies of the government
- b_search for new arable land
- c_non-rational use of natural resources
- d_export market of wood

ad_a Policies of the government

The Costarican law states that landowners who do not exploit their land, may loose their right of ownership. In order to obtain legal rights over a new piece of land, it was obligatory to show the intention of improving the site by removal of the original forest cover. The concept of landexploitation however is not defined. Monetary institutions like banks do not concider forest as an economic resource and it is very hard to finance forest management.

A secondary problem is the absence of a strong supervision aparatus on forest law performance. There are no efficacious actions. (See interview 39).

ad_b Search for new arable land

Land pressure was and still is becoming more and more a problem in the Central Valley and in the western part of the country. The government stimulates, indirectly, the migration into the Atlantic zone by an agricultural fomenting policy, a settlement policy and by infrastructural projects. (DE VRIES, 1986). But also institutions like RECOPE and JAPDEVA open up areas.

Agricultural expansion is very much a spontaneous process by groups or individuals. It is not part of an integrated land-use or feasibility study. It is rather easy to enter the forest frontier and to put a claim on a piece of land, which can be already cleared or under forest. Large landowners and land speculators cut or let cut their forest so that the land gets a higher value. Often they deceive the law (interview 39) or use squatters to do the job. Squatting is not strictly illegal. Improvement through deforestation is obligatory, in spite of any forest law, and a full claim can be made in some ten years of occupation. See DE VRIES (1986) and ROMEIJN & STAUDT (1986) for more about precarism.

ad_c Non-rational use of natural resources

There is not yet a full awareness about nature and environment. Many people think nature is a violent and dangerous element of live. A forestry tradition based on the principle of sustained yield is absent. The pace of deforestation is very high, pessimists speak of total disapperance of natural forest at the end of this century. See map Deforestation in Costa Rica between 1940 and 1983, annex 6.4.B.

Much loss of the timber occurs during the felling whereas only the best quality timber will be extracted. Non-commercial species, smaller trees, upper parts of the stem and timber with small defects are abandoned. Only a few trees per ha are removed but a disproportional area of the forest is severely disturbed, due to heavy equipment and bad

managment. The selected forest is not able to recover itself. Often the remaining woods will be converted into farmland.

But also at the wood processing industries the waste of materials is enormous. This is illustrated by the smouldering piles of sawdust and the large amounts of rejects at the sawmill yards.

ad_d_Export market of wood

Practically all wooden products originate from primary and secondary, natural forests. The value of the total forestry sector generates near 20% of the agricultural GNP in 1983 (ROMEIJN, 1986). Large amounts of processed wood and wood products are exported. Precise data were not available.

6.4.3. Effects of deforestation

The impact on the environment is tremendous. Exploitation leads to a threatening reduction of the number of species and in the end to the disappearance of natural forest. See also diagram with the consequences for the environment caused by deforestation, annex 6.4.3.A.

On logging sites, roads are the first points of attack of erosion. We saw very steep, muddy roads often with gullies. On rainy days it is impossible for timber trucks to enter a hilly deforestation area.

During site clearing soil compaction is caused when heavy equipment is used, e.g. in IDA settlement Neguev. Soil compaction can get worse when cattle tramples down pasture. Degradation of topsoil with increased erosion and the loss of fertility will non the less diminish future production possibilities to a great extent.

Erosion on a larger scale is evident. The lurching Sixaola river has become very violent and threatens the village of Bribri. Many streams are clogged with logs leading to bad drainage. Already a large part of the coral reefs south of Cahuita is dead. Among others this is caused by sedimentation of material conveyed on rivers (interview 35).

6.4.4. Agroforestry

We want to describe three aspects of agroforestry:

- a_trees in pasture
- b_live fences
- c_trees supporting crops.

ad_a_Trees in pasture

Laurel is an important representative of trees growing in pasture. Species like Laurel (Cordia alliodora) appear in natural forest only in low density. Most of the Laurel in pastures has grown after deforestation. On the clearcutting plots, Laurel is establishing rapidly and cattle does not destroy all the young trees. Laurel is a fast grower, within ten years the dbh can be 20 cm.

There is some regeneration in pasture. Some farmers do protect seedlings from cattle by fencing. It is probably the only help the trees get. At last they will be cut as timber for own use e.g. firewood and lumber, or as a source of income.

ad_b_Live fences

On many farms live fences can be found as marking out pastures. These fences are formed by a single row of trees with stems up to 2 m, with barbed wire stretched along them. The branches are regularly trimmed with machetes. The leaves can be used as protein rich fodder. Main species are Poro (Erythrina sp.) and Madero negro (Gliricidia sepium).

ad_c_Trees supporting crops

In some crop systems like coffee and cocoa farmers use certain trees for shading and fixating nitrogen. Often cocoa has been planted under the shade of trees left in a newly deforested area. The problems caused by the Monilia fungus (Monilia rozeri) partially can be solved by reducing the amount of shade. Poro (Erythrina sp.) and Madero negro (Gliricidia sepium) are also used to support pepper.

7. SUB AREAS

7.1. Introduction

The CATIE-MAG-WAU project will start more profound studies in January '87. Because the two study areas are too large, small subareas have to be chosen. The chosen sub-areas have to be representative for larger zones within the study areas and for the Atlantic zone as a whole.

In both the Pococi/Guacimo area as the Talamanca area, some zones can be distinguished.

7.2. Pococi/Guacimo

In the Pococi/Guacimo area roughly 4 zones can be distinguished.

- I The old settled zone along the old roads from Guapiles to Rio Jimenez.
- II The banana zone from Ticaban to Villa Franca.
- III The cattle zone north east of the banana area.
- IV The deforestation zone: Barra del Colorado, Lomas de Sierpes, and the Turrialba-Irazu slopes.

The old settled zone, with good infrastructure, services and access to consumers markets, constitutes the centre of the study area. The other zones are fixed on one hand by their distance to this centre and on the other hand by the time that passed since the clearing of the forest.

When the forest disappears the zone passes through a development. Timber loggers, squatters and cattle estates make room for more intensive land use. Going from the centre to the periphery is a bit like going back in time.

Two roads exist that cross the "frontiers" of the zones perpendicular. These roads are the long road Guapiles - Cariari into Barra del Colorado and the shorter road Guacimo - Rio Jimenez - Pueblo Nuevo into the Lomas de Sierpe. Along these rapid developments can be seen.

The different zones are described below. One extra "zone" is added because of its unquestionable own nature: the IDA settlement zone (V). IDA settlements are concentrated around Pocora.

I The old settled zone

This zone is characterized by the great amount of small holders and commercial farms. Off-farm work is of great importance, often some family members work off farm, others work on the farm full time.

This area is rather densely populated, and contains the urban centres Guapiles, Jimenez, Guacimo and Rio Jimenez. Some people have had farms for over 50 years. Because many people are born here, many second generation farmers can be found.

Infrastructure is rather good. People certainly do not live isolated. There are good roads, there is electricity, water works, good health services, many schools, etc. Land price is rather high, forcing farmers to use land rather intensively. Important products are the cash crops maize, cocoa and cassava, dairy products, fruit trees and other foodcrops.

II The banana zone

Most of the people who live here are dependent on the banana plantations. The plantation labourers do not own much land, the majority has at most a homegarden. Since the return of the banana companies, about 20 years ago, this area as well is densely populated and settled. There are many good roads, railroads, electricity, schools, etc.

Bananas are by far the most important crop. The remaining land is rather extensively used. Most of this land is used as pasture, there are many beef- and dual-purpose cattle farms. In the latter farms some maize and foodcrops are grown. Bananas are sometimes used to feed dairy cattle and pigs.

III The cattle zone

In this area many cattle farms can be found. They vary from large beef cattle farms to small holdings with some dual-purpose cattle, maize and other foodcrops. The biggest part of the land is used as pasture. Native and improved pastures are used. Some "Madero negro" and "Poro" fences can be found, and many trees can be seen scattered in the pasture.

This area is thinly populated. Infrastructure is not good. Roads are not really bad, but services are worse than in the former zones. The zone is inhabited for about 10 to 20 years.

IV The deforestation zone

In this zone commercial tree species are extracted from the forests. Much of the forest is converted into pastures, only little into crop land. Cattle estates here use very little inputs, pastures are of bad quality, and the soil is degrading. Land speculation is of account.

Besides cattle estates there are many smallholders, who recently came to the area. Many have strong objectives toward commercial farming, and think perspectives are good. Many farmers do not have titles to their land.

This zone is rather isolated, and very thinly populated. Infrastructure is bad. Roads are built by loggers to transport timber. They often are in bad shape.

Two areas can be distinguished:

IVa The Turrialba/Irazu slopes

IVb Lomas de Sierpe and Barra del Colorado.

V IDA settlements

Although found throughout the whole area, settlement schemes are concentrated around Pocora. Between 1978 and 1982 many cattle estates were occupied. IDA mediates between squatters and owners. After some time squatters get titles 1) to the land. Via IDA they have access to knowledge and credit. All families have 10-12 ha of land (see 5.2 peasants organized in settlement schemes). Settlements are rather homogenous.

Note: 1) Whether this means the farmer owns the IDA land or gets the right to use it is not very clear.

7.3. Talamanca

The Talamanca sub area can be divided into three geographic units: the coastal plains, the river valleys and the foothills and mountain slopes. Within these units a further division is made according to land use, topography and institutional aspects.

Coastal plains

Via Coastal plains

The coastal plain is inhabited by a majority of anglophone negroes. The main activities are fishery, tourism and agriculture. Some cattle farms can be found. Coconut is grown along the beaches and cocoa further land inward. Both these crops suffer from disease. Especially the arrival of the cocoa disease Monilia, caused or quickened the deterioration of the zone. Nowadays many young people are leaving the area because of lack of perspectives.

Vib Refugio

The southern part of the coastal plain, from Manzanillo up to the Panamese border, has been declared "Refugio" a year ago to protect the coral reef ecosystem that is threatened by mud and chemical pollution (see 6.4.3). The "refugio" is a project of ANAI (see 4.4. and interviews 36 and 38) and the Costarican government. It has to deal with opposition of the inhabitants and land speculators who fear restrictions.

This part always has been more isolated than other parts of the coastal plain. The road from Puerto Viejo to Manzanillo is only a year old and to Gandoca only a muddy trail exists.

River valleys

The river valleys in the Talamanca study area are the valleys of the Rio Estrella, Rio Sixaola and the Rio Telire (Talamanca valley). Until the 1930's these valleys were used for banana plantations by United Fruit Company (later United Brands). In 1935 the company withdrew the bananas from the area (MAILLARD, 1985). Nowadays the land use of the valleys differ greatly.

VIIa Estrella valley

In the Estrella valley the banana plantations returned. The owner is now Standard Fruit. The bananas dominate the valley. The inhabitants are banana labourers. The infrastructure is good; there are shops and (rail) roads. Smallholders live uphill and along the road into the valley. Along this road we also saw young macadamia and coconut plantations.

VIIb Sixaola valley

A big United Brand banana plantation dominates the southern part of the Sixaola valley. In the other parts there are more middle- and small scale farmers, growing plantain, cocoa, tubers and other crops. IDA settlements and landtenure struggles between "precaristas" and the banana company can be found.

VIIc Talamanca valley

After the banana company had left, the indians returned to this valley. Nowadays Talamanca valley is part of indian reserves. The people grow subsistence crops, like maize, beans and rice. The disappearance of the bridge across Rio Telire caused isolation of the area. The cash crop plantain has to be brought to the Suretka ferry place by boat, to be sold to middlemen.

Foothills and mountain slopes

This is the part, that is not occupied by the coastal plain or the river valleys, here hills and mountain slopes can be found. The hills are usually covered with forests. Timber, logging, and shifting cultivation by smallholders are main activities.

VIIIa Hills near Bribri

These hills are thinly populated, mostly by amer-indians, living from agriculture. This situation might change with the opening of the area by the national mining company Recope. Actually the opening up of the area has already brought alterations, like the arrival of timber loggers and squatters.

VIIIb Mountain slopes

The mountain slopes of the Cordillera de Talamanca occupy the major part of the Talamanca canton. The slopes are very thinly populated.

7.4 Choice of sub-areas

To guarantee representativeness, it sounds reasonable to choose sub-areas in every described zone. However some practical demands have been considered:

- One should try to concentrate the sub-areas in a study area.
- One should restrict the amount of sub-areas.
- Sub-areas should be chosen within the IDA project area (information available).
- Several departments of the Wageningen Agricultural University should have possibilities for indept studies.

7.4.1. Pococi/Guacimo

Sub-areas suggested in this zone are from south to north:

- The slopes of Turrialba/Irazu between Guacimo and Guapiles, part of the deforestation zone (see 7.2.IV) it is relatively close to the old settled centre of Pococi/Guacimo.
- Guacimo - Rio Jimenez, part of the old settled zone (see 7.2.III)
- Roxana - Villa Franca, part of the banana zone (see 7.2.II). In this area many "gringo" capitalist agricultural farms exist.
- Lomas de Sierpe part of the deforestation zone (see 7.2.IV). This area is isolated.
- IDA settlement (see 7.2.V)

In these areas many beef cattle farms can be found, varying from rather intensive to very extensive. A special sub-area chosen within the cattle zone is not necessary.

The suggested sub-areas form a representative slice of the Pococi/Guacimo study area; from the deforestation zone in the south, through the old settled zone, the banana zone, the cattle zone, into the deforestation zone in the north.

These areas are linked by one of the main routes through the mentioned zones. Because this route is rather short, the sub-areas are concentrated. This makes it possible to study interactions between and within the different zones. Besides, these sub-areas will be situated within the IDA project area.

7.4.2 Talamanca

Out of the zones described in 7.3, two sub-areas are suggested: Hone creek and Margarita - Paraiso. Why only these two areas are suggested will be explained below.

- The refugio (VIb) might be interesting for some indepth studies. For example into the possibilities of the government and other organisations to protect nature reserves.
- in the Estrella valley (VIIa) no sub-area has been suggested because the Pococi/Guacimo area Roxana - Villa Franca covers already a zone dominated by banana plantations.
- Margarita - Paraiso represents the northern part of the Sixaola valley (VIIb)
- Whether in the Talamanca valley (VIIC) a sub-area has to be chosen is still a question. First because the area might not be representative for the rest of the Atlantic zone. Nowadays very few people live like the indians in this valley. Second because the people are said to be reluctant towards investigations. However some indepth studies might be interesting, for example about shifting cultivation.
- The hills near Bribri zone (VIIIa) is an interesting representative of an area that will go through rapid changes, like deforestation and pouring in of migrants. This subject is possibly already covered by the Pococi/Guacimo sub-areas in the deforestation zone.
- The mountain slopes (VIIIb) are too thinly populated and too remote to choose a sub-area.

8. EPILOGUE

To make a more detailed description of the Pococi/Guacimo- and Talamanca study areas, we were asked to collect information on farmers level. To do so we had to interview many farmers in an informal way.

As in the beginning our terms of reference were not very clear and our spanish certainly not perfect, we rather stuck to a checklist given to us as a guideline (see annex 8A). Conversations in the first weeks were not always very fluent. Fortunately this was a matter of experience, and after a while we could recognize what was on a farmer's mind. Interviews became more than gathering quantitative information. The checklist then was used as a guideline for reporting.

Maybe there would have been less problems, when we had had more time to know the areas and to prepare ourselves to do the interviews. It is certainly advisable to break in future students for some time to avoid these problems. Clear objectives are very important.

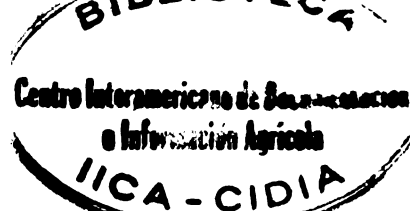
We were working as a team of four persons. Most farmers did not have any problems talking to such an amount of foreign students, but some were rather timid. We tried to judge the situation, whether it was necessary to split up or not, and if needed in which composition.

In approaching a farmer it was better to introduce ourselves as some ignorant students, wanting to learn something about agriculture, than to explain in which framework we were working. Thus preventing the arising of a formal sphere. For others, who will work with a very well defined questionnaire, the contrary might be true. The latter method can not be considered as a companiable chat, but demands many efforts from a farmer. Explanations should be given, why this defined information is needed.

In both ways of approaching, it is hard to explain what the project can do to help the farmer, after everything the farmer did to help the project. Maybe in the latter approach the farmer has higher expectations. One should prepare to answer this question.

We learned that interviewing a person in the working surroundings was better than interviewing him or her elsewhere. For a farmer this often was in the field or near a stable. The farmer could show crops or animals, some visable problems and what to do about it. We could point out something and ask for reasons, etc. In this way always having a key to continue a conversation.

The owner can explain best what reasons he or she has for the choice of products and the technology used. However, some of the farmers, especially those owning larger farms, do not live near the farm. There information was obtained from employees. This will remain a problem in future interviews.



Often it is known when the owner will visit the farm, but whether an interview at that moment fits in his/her and interviewer's time schedule is a question.

Farmers could not be chosen aselective, because no dates were available beforehand. Often we were driving around, and when seeing somebody or a place of interest we stopped. This was rather subjective. In the beginning, partly due to not having clear terms of reference, we sometimes consciously ignored farmers we thought were not representative.

We sometimes interviewed three or four farmers a day. We almost spent two months on fieldwork and only three weeks on reporting. Relatively too much time was spent in the field. We suggest to interview only in the morning, to have plenty of time to elaborate in the afternoon. Much time should be taken for final reporting.

9. LITERATURE

- Anderson and Breure, Coconut feasibility study. London, Harrisons Fleming Advisory Services Ltd, 1983. 49p.
- Anonymus, Agricultural compendium for the rural development in the tropics and subtropics. Amsterdam, Elsevier scientific publishing company, 1981. 739p.
- Anonymus, Encuesta de Hogares. San José, Edificio de Estadística y Cencos. 1985.
- Biesanz R. et al., The Costa Ricans. Englewood Cliffs, New Jersey, Prentice-Hall. 1982. 246 p.
- Boerboom, J. H. A. et al., De Atlantische zone van Costa Rica. Wageningen, LH, 1986. 30p.
- Enriques, G. & A. Paredes, El cultivo del cocoa. Cultivos mayores no 4, 1985. 61p.
- Flores Rodas, J. G. Diagnostico del sector industrial forestal. San José, EUED, 1985. 116p.
- Jacobs, M. Het tropisch regenwoud, een eerste kennismaking. Muiderberg, Coutinho, 1981. 318p.
- Kloosterman, H. & J. Slijkhuis & W. Wielemaker Contribution of the land-group for the INCEPCION-report. Wageningen, LH, 1986. 39p.
- Maillard, J. C. Le marché international de la banane, etude géographique d'un système commercial. Fruit vol 40 no 2, 1985. p 75-95.
- Palmer P. "What Happen", San José, Ecodesarrollados, 1977. 351p.
- Romeijn, P. Concept report forestry contribution exploratory survey. Not published, 1986. 31p.
- Romeijn, P. & F. Staudt, Forestry contribution to the conception report regarding the exploratory survey. Wageningen, LH Hinkeloord, 1986. 16p.
- Salazar, R. El indio costarricense. 1980.
- Thrupp, L. A. Deforestation, agricultural development and cattle expansion in Costa Rica. 1980. 160p.

Vries, P. A. de Sociological report, exploratory survey, Atlantic zone, Costa Rica. Wageningen, LH, 1986. 32p.

Waijnenberg, H. Cropping systems in the Atlantic zone of Costa Rica. Wageningen, LH, 1986. 35p.

Weide, A. P. A. van der Animal production in the Atlantic zone of Costa Rica. Wageningen, LH, 1986. 86p.

CONTENTS OF ANNEX

- 2A List of collected maps
- 2B Map Pococi/Guacimo study area
- 2C Map Talamanca study area
- 2D List of interviews
- 2E Abbreviations of Institutions
- 3.3 Monthly precipitation at Los Diamantes Guapiles
- 4.3 Poblacion por region Huetar Atlantica
- 4.8 Labour requirements for agricultural activities in Costa Rica
- 6.1.A Table main crops in Limon province
- 6.1.B Yield tables sorghum, maize, rice and beans
- 6.1.C Growing seasons of maize, rice and beans in Cariari
- 6.4.A Diagram with the consequences for the environment of deforestation
- 6.4.B Deforestation in Costa Rica between 1940 and 1983
- 8 Checklist

ANNEX 2A

COLLECTED INFORMATION

List of maps found at IDA-office, San José, at Mervin Aspedes U., draughtsman. All these maps are made for the " Proyecto desarrollo agricola en la zona atlantica":

* available in Guapiles

Mapas de zonificacion agropecuaria de cultivos, scale 1/200.000 :

- macadamia
- banano
- cacao
- yuca
- pejibaye
- palma africana
- arroz
- coco.

Araes aptas escala 1/200.000 para
- banano.

Mapa de areas prioritarias para ganaderia, escala 1/200.000.*

Area prioritaria para cacao, escala 1/200.000 .

Mapa de fincas menores de 100 ha en area recomendada para coco, escala 1/200.000 .

Mapa de division politica en area recomendada para coco 1/200.000 .

Forestras (no terminado), escala 1/100.000 .

Mapa de uso actual 1981, escala 1/50.000 :

- zona norte *
- zona central
- zona sur *

Mapa de uso actual 1981, escala 1/200.000 .

Mapa de topografia, escala 1/200.000 .

Mapa de isoyetas, escala 1/200.000 .

Mapa de isoyetas, zona norte y central, escala 1/100.000 .

Drenajes naturales, escala 1/200.000 .

Suelos, escala 1/200.000 .

Hidrografia zona sur, escala 1/50.000 .

Hidrografia zona norte y central, escala 1/100.000 .

Geomorfologico zona norte y central, escala 1/100.000 .

Geomorfologico zona sur, escala 1/50.000 .

Infraestructura vial 1984, escala 1/200.000 . *

Infraestructura vial 1981 zona sur, escala 1/50.000 .

Infraestructura vial zona norte y central 1/100.000 . *

Infraestructura vial propuesta 1/200.000 . *

Distribucion de poblacion zona sur, escala 1/50.000 .

Distribucion de poblacion zona norte y central, escala 1/100.000 . *

Fincas o asentamientos del IDA 1984, escala 1/200.000 . *

Fincas o asentamientos del ICTO 1981 zona norte y central 1/100.000 . *

Fincas o asentamientos del ICTO 1981 zona sur, escala 1/50.000 .

Tenencia de la tierra zona norte y central, escala 1/100.000 *

Division politica 1981 zona norte y central, escala 1/100.000 *

Acuaductos - red electrica y telefonica 1981, escala 1/100.000 zona norte y central *

Centros de salud, escala 1/100.000. zona norte y central *

Educacion, escala 1/100.000. zona norte y central *

Note:

Zona norte: Rio Guapiles hasta Siquirres

Zona central: Siquirres - Rio Banano

Zona sur: Rio Banano - Rio Sixaola

Census maps obtained from DGEC (all available in Guapiles):

Canton 6 Guacimo:	map number	scale	year of issue
distrito 1 Guacimo	706001	1/15.000	'82
distrito 2 Mercedes	706002	1/10.000	'82
distrito 3 Pocora	706003	1/25.000	'82
distrito 4 Rio Jiménez	706004	1/15.000	'82
distrito 5 Duacari	706005	1/15.000	'82

Canton 2 Pococi:			
distrito 1 Guapiles	702001	1/25.000	'82
distrito 2 Jimenez	702002	1/15.000	'82
distrito 3 Rita (norte)	702003N	1/15.000	'82
distrito 3 Rita (sur)	702003S	1/15.000	'82
distrito 4 Roxana	702004	1/12.500	'82
distrito 5 Cariari	702005	1/15.000	'82
distrito 6 Colorado (n)	702006N	1/50.000	'72
distrito 6 Colorado (s)	702006S	1/50.000	'72

Canton 6 Guácimo			
Cuadrante de Guacimo	706001C	1/2.000	'82
Cuadrante de Pocora	706003C	1/2.000	'82

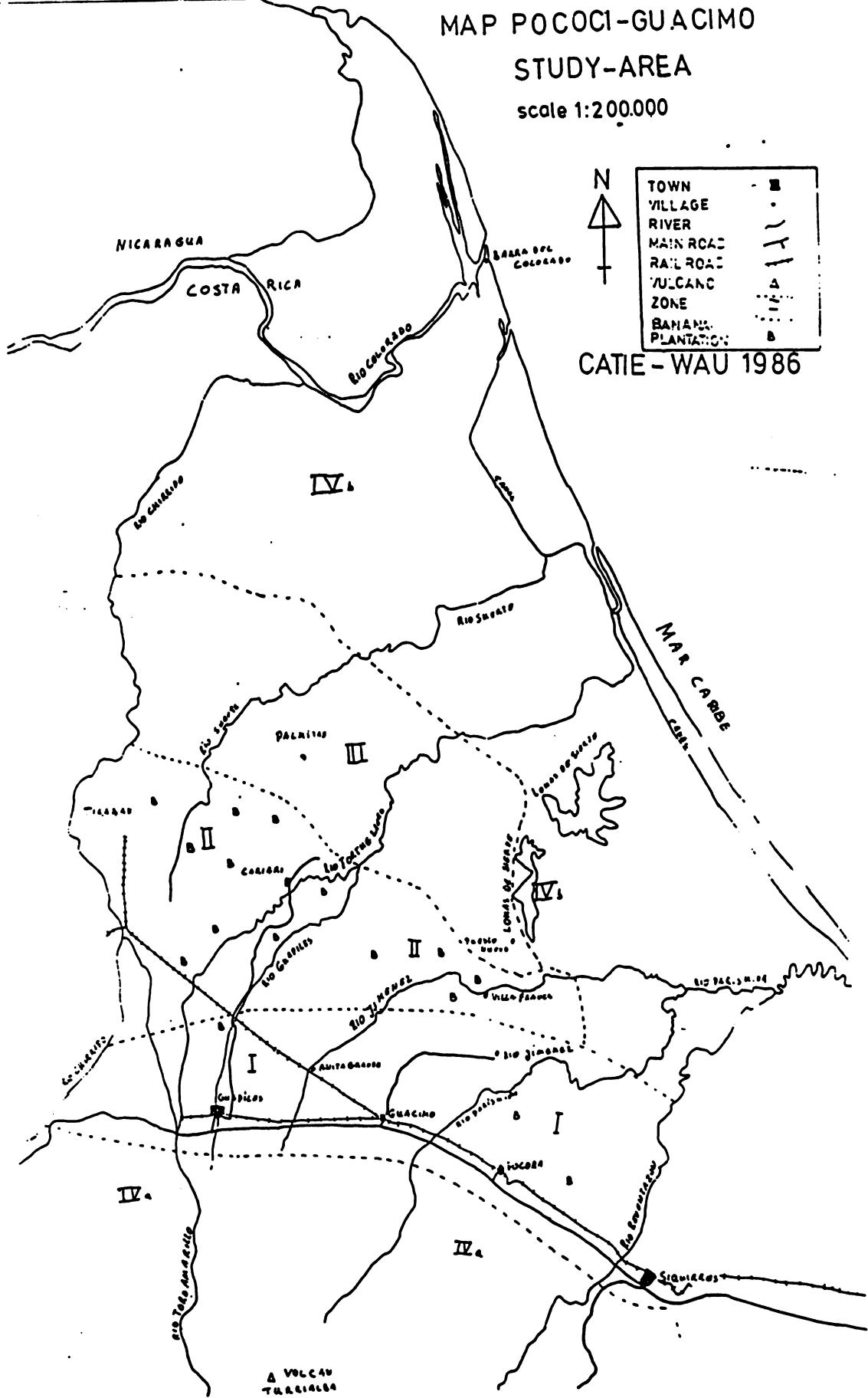
Canton 2 Pococi			
Cuadrante de Guapiles	706001C	1/2.000	'70
Cuadrante de Jimenez	706002C	1/3.000	'82

Canton 4 Talamanca			
distrito 1 Bratsi oeste	704001 1/2	1/50.000	'69
distrito 1 Bratsi este	704001 2/2	1/50.000	'84
distrito 2 Sixaola	704002	1/25.000	'84
distrito 3 Cahuita	704003	1/25.000	'84
Cuadrante de Cahuita	704003C	1/2.000	'84

Transparent traces with census data, obtained at census office in San Jose.

MAP POCOCI-GUACIMO
STUDY-AREA

scale 1:200,000



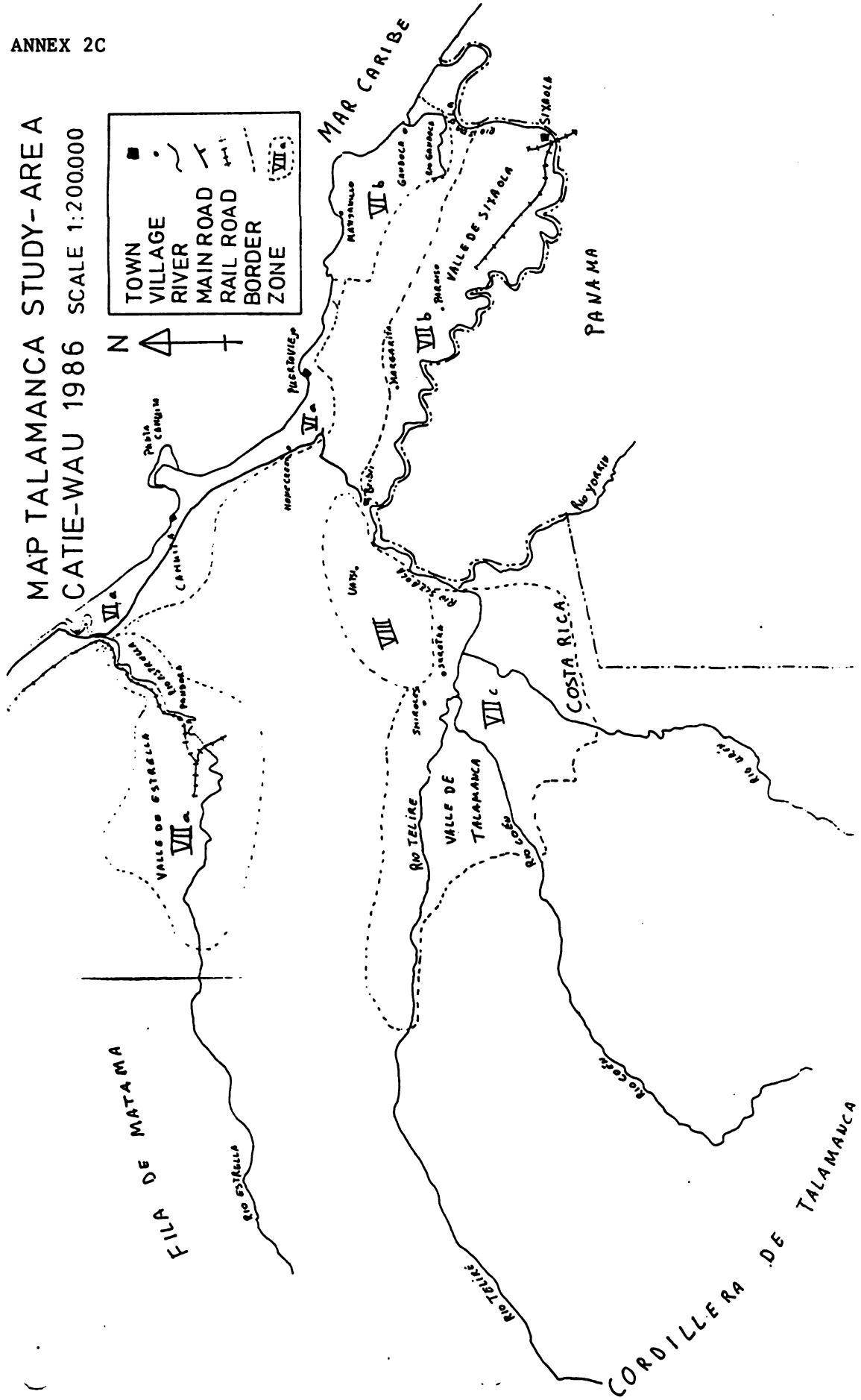
N

TOWN	■
VILLAGE	●
RIVER	~
MAIN ROAD	—+—
RAIL ROAD	—+—+—
VULCANO	▲
ZONE	---
BANANA PLANTATION	□

CATIE - WAU 1986

▲ VOLCANO
TURRIALBA

MAP TALAMANCA STUDY-AREA
CATIE-WAU 1986 SCALE 1:200000



2D List of interviews

Nr	Description
1	Cattle farm San Elias near Guapiles. Sheet 3446 IV Guapiles, 244.0N, 562.5 E, 13-10-1986.
2	Smallholder with maize, used to work on a banana plantation, near Finca Lago Azul. Sheet 3447 II Agua Fria, 267.4 N, 566.2 E, 14-10-1986.
3	Commercial banana plantation, west of Carolina Tica. Sheet 3447 II Agua Fria, 267.8 N, 566.0 E, 14-10-1986.
4	Dairy farm, north of Campo Dos. Sheet 3447 II Agua Fria, 266.7 N, 570.8 E, 14-10-1986.
5	Smallholder, self-supporting with rice, maize, beans, etc, cocoa as cash crop, north of Canta Rana. Sheet 3447 II Agua Fria, 269.2 N, 571.6 E, 14-10-1986.
6	Small horticulture nursery, south of Cariari. Sheet 3446 IV Guapiles, 254.0 N, 562.1 E, 15-10-1986.
7	Smallholder with cattle and maize, Santa Elena. Sheet 3447 III Rio Sucio, 262.6 N, 558.5 E, 15-10-1986.
8	Small self-supporting farmer, works also as van driver, Santa Elena. Sheet 3447 III Rio Sucio, 262.5 N, 558.2 E, 15-10-1986.
9	Dual-purpose/ beef cattle farm, north of Guapiles. Sheet 3446 IV Guapiles, 2247.2 N, 560.2 E, 15-10-1986.
10	Smallholder with maize, beans, cattle, rather remote, near Millon. Sheet 3447 II Agua Fria, 265.0 N, 576.5 E, 13-10-1986.
11	Small farmer with beef cattle and 8 ha maize, east of Campo Dos. Sheet 3447 II Agua Fria, 264.0 N, 572.0 E, 13-10-1986.
12	Bar owner with small cassava plot, south of Carolina Tica. Sheet 3447 II Agua Fria, 267.0 N, 566.7 E, 14-10-1986.
13	Cattle farmer on well kept farm at Frut de Pan. Sheet 3446 I Guacimo, 25.45 N, 576.4 E, 16-10-1986.
14	Old negro farmer with son, mainly maize and some cocoa, etc, near Rio Jimenez. Sheet 3446 I Guacimo, 248.0 N, 579.6 E, 17-10-1986.

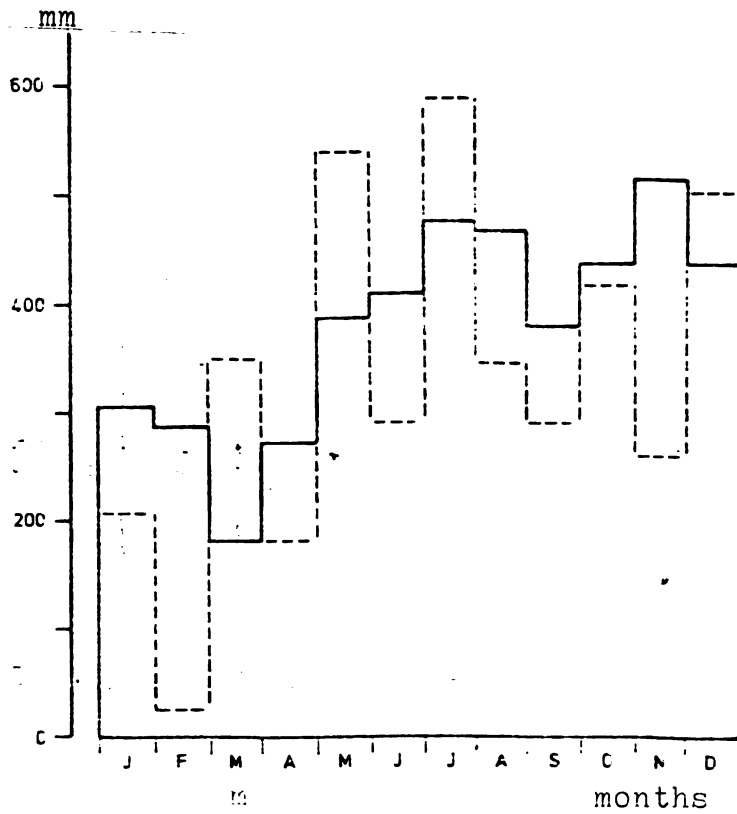
- | Nr | Description |
|----|--|
| 15 | Smallholder with cattle and mixed crops, west of Rio Jimenez. Sheet 3446 I Guacimo, 248.1 N, 578.2 E, 17-10-1986. |
| 16 | Young farmer's son, living off Suretka on opposite side of Rio Telire. Sheet 3644 IV Amubri, aprox. 390 N, 580 E, 21-10-1986. |
| 17 | Shifting cultivator with permanent housing, in hills west of Bribri. Sheet 3644 IV Amubri, aprox. 396.7 N, 583 E, 21-10 1986. |
| 18 | Amerindian family of Bribri tribe, mainly plantain, west of Bratsi Sheet 3644 IV Amubri, aprox. 390N, 583 E, 23-10-1986. |
| 19 | Very extensive cattle farm in hills near Refugio. Sheet 3644 I Sixaola, aprox. 396N, 608E, 23-10-1986. |
| 20 | Man working on small farm of a friend in Sixaola valley. Sheet 3644 IV Amubri, aprox. 397 N, 593 E, 22-10-1986. |
| 21 | Plantain and yam farmer with fruit stall in Sixaola valley. Sheet 3644 IV Amubri, aprox. 394 N, 600 E, 22-10-1986. |
| 22 | Smallholder with many crops, originating from Guanacaste. Sheet 3644 IV Amubri, aprox. 395 N, 598 E, 22-10-1986. |
| 23 | Farm with cashcrops (cucumber and plantain) near Hone Creek. Sheet 3645 III Cahuita, aprox. 184 N, 668 E, 24-10-1986. |
| 24 | Cocoa farm near Hone Creek. Sheet 3645 III Cahuita; aprox. 187 N, 666 E, 24-10-1986. |
| 25 | Remote little farm in hills near Cahuita. Farmer works on cocoa plantation elsewhere. Sheet 3645 III Cahuita, aprox. 188 N, 664 E, 24-10-1986. |
| 26 | Part time smallholder, cocoa . |
| 27 | Cocoa farmer with some ornamentals, north of Jimenez. Sheet 3446 I Guacimo, aprox. 245 N, 565 E, 10-11-1986. |
| 28 | Smallholder with coffee, cocoa, diary cattle, north of Jimenez. Sheet 3446 I Guacimo, aprox. 245.3 N, 565.5 E, 10-11-1986. |
| 29 | Smallholder with fruit trees ; told background story, south of Anita Grande. Sheet 3446 I Guacimo, aprox. 246.0 N, 565.7 E, 10-11-1986. |
| 30 | Young man with hangover; works on farm north of Anita Grande. Sheet 3446 I Guacimo, aprox. 247.5 N, 566.2 E, 10-11-1986. |
| 31 | Family looking after houses on finca La Gregoria, north of Jimenez Sheet 3446 I Guacimo, aprox. 245.7 N, 565.5 E, 10-11-1986. |

- | Nr | Description |
|----|---|
| 32 | Man waiting for merchants to buy his cassava, north of Jimenez.
Sheet 3446 I Guacimo 245 N, 565.2 E, 10-11-1986. |
| 33 | Family with lumber and food crops, Lomas de Sierpe . Sheet 3447 II
Agua Fria, aprox. 259.0 N, 583.0 E, 13-11-1986 |
| 34 | Talk with extensionist at IDA office at Neguev. 18-11-1986 |
| 35 | Talk with Alfonsina, midwife in Manzanillo. 18-11-1986. |
| 36 | Talk with wife of ANAI worker, who lives near Punta Cocles.
21-11-1986. |
| 37 | Labourer with dual purpose cattle farm, south west of Bribri.
Sheet 3644 IV Amubri, aprox. 396.0 N, 588.0 E, 21-11-1986. |
| 38 | Visit of ANAI nursery, San Rafael. |
| 39 | Talk with Charles Veiman, a forestry scientist working at CATIE
Turrialba, 7-11-1986. |

2E Abbreviations of Institutions

ANAI	Asociacion Nuevos Alquimistas Inc
CAR	Centro Agricola Regional
CATIE	Centro Agronomico Tropical de Investigacion Y Ensenanza
CNP	Consejo Nacional de Produccion
DGF	Direccion General Forestal
IDA	Institito de Desarrollo Agrario
JAPDEVA	Junta de Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica
MAG	Ministerio de Agricultura y Ganaderia
Borden	Dairy and fruitjuices processing company, half British half Costarican
Dos Pinos	Dairy and fruitjuices processing company, Costarican
Recope	State mining company

3.3 Monthly precipitation at Los Diamantes, Guapiles



--- driest year
total 3999 mm
— average of 18 years
total 4560 mm

**4.3 Poblacion por Region Huetar Atlantica
por cantones
Censo junio de 1984**

Provincia de Limon	168.076
Limon	52.602
Pococi	44.187
Siquirres	29.079
Talamanca	11.013
Matina	14.723
Guacimo	16.472
Provincia de Heredia	10.351
Horguetas	10.351
Huetar Atlantica	178.427 personas

**Source: Carpeta Datos Varios Poblacion, Edificio de Estadistica
y Censos.**

4.8 Labour requirements for agricultural activities in Costa Rica

Activity	Relative labour requirement per ha
coffee	0.554
banana	0.736
sugarcane	0.271
cocoa	0.175
rice	0.175
beans	0.121
corn	0.136
cotton	0.429
tobacco	0.679
potatoes	0.636
beef cattle	0.023

Source: Thrupp in Romeijn 1986

6.1.A Main crops in Limon Province, 1973 (DGEC, 1974)

Crop	Maize	Rice	Cassava	Beans	Sugarcane
Total area	5245	753	566	171	146
Number of farms	1532	474	553	189	122
Av. crop area/ farm	3.4	1.6	1.0	0.9	1.2
Modal crop area/ farm	2-10	1-2	1-2	0.5-1.0	1-2
Modal farm size	5-100	10-50	5-50	10-100	5-100
Av. yield kg/ha	1100	900	6400	350	16100
Main cantons	Pococi	Matina	-	Pococi	Pococi

Crop	Banana	Cocoa	Plantain	Coconut	Coffee
Total area	20698	17224	1551	940	485
Number of farms	802	1935	664	781	343
Av. crop area/ farm	25.8	8.9	2.3	1.2	1.4
Modal crop area/ farm	>20	5-100	2-5	1-3	1-3
Modal farm size	100-1000	5-500	5-50	5-50	5-100
Av. yield kg/ha	32600	220	10900	2700	1600
Main cantons	Pococi	Talamanca Matina	Matina Talamanca	Limon Talamanca	Siquirres

Notes

- All areas are in ha.
- Yields were calculated as total production/total area.
- Coconut yield expressed as nuts/ha.
- Figures refer to compact plantations. Dispersed plants e.g. coconut and plantain are not included.

Source : DGEC in Waaijenberg (1986)

6.1.B Yield table sorghum,maize, rice and beans.

Region Huetar Atlantica

		area	produccion	rend. promedio
		(ha)	(Tm)	(Tm/ha)
Sorgo	(a)	230	690	3.00
Maiz	(b)	18.200	29.670	1.63
Arroz	(b)	9.233	35.969	3.80
Frijol	(b)	250	160	0.64

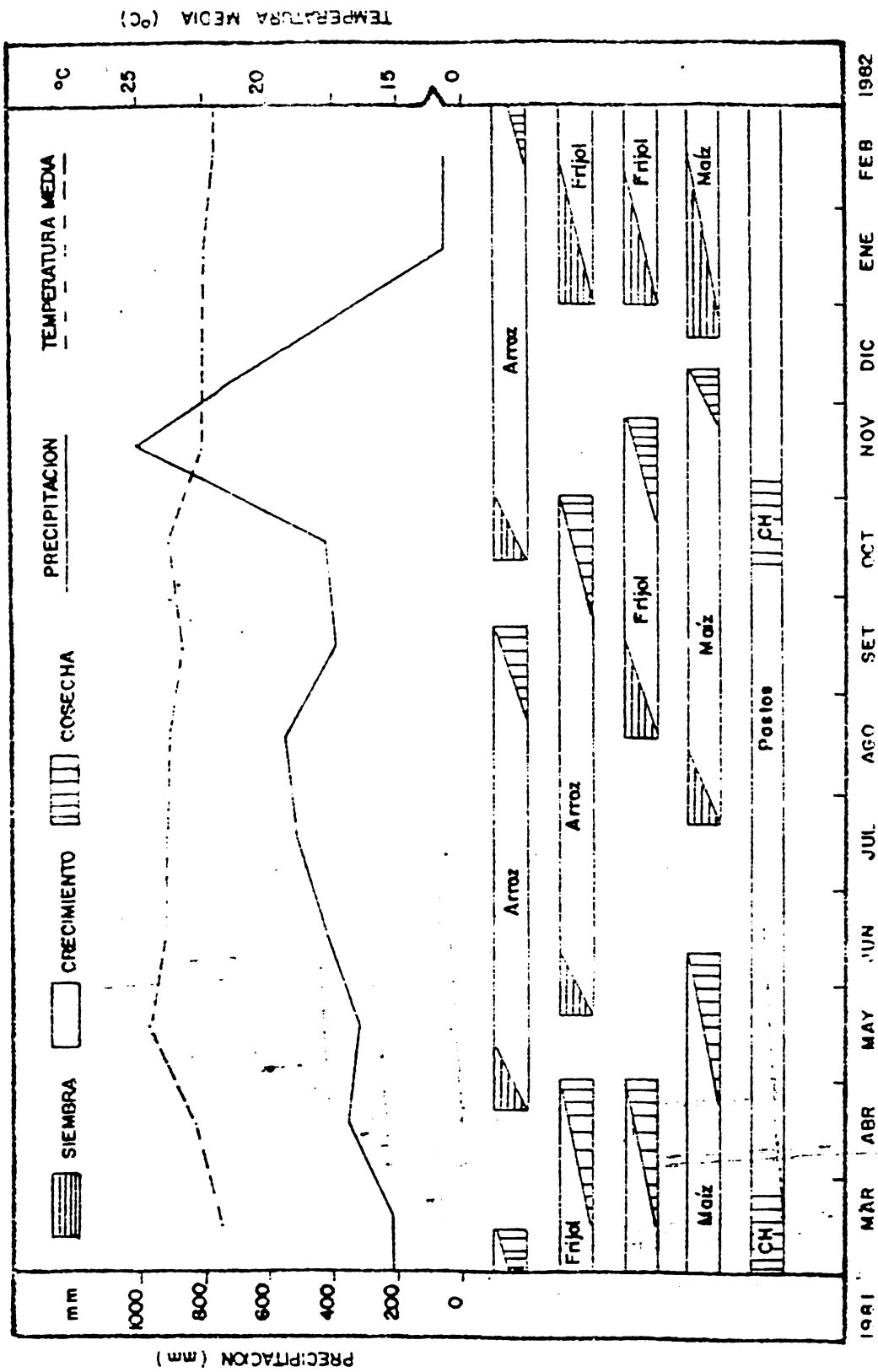
(a) : comportamiento de la actividad en el periodo 1984-1985.

(b) : comportamiento de la actividad en el periodo 1985-1986.

Total yields, Costa Rica 1985-1986.

		area	produccion	rend. promedio
		(ha)	(Tm)	(Tm/ha)
Sorgo		32.010	73.025	2.28
Maiz		65.892	114.514	1.738
Arroz		70.970	229.197	3.23
Frijol		41.261	22.000	0.53

Source: SEPSA con base en informacion obtenida en el CNP instituciones del sector agropecuario en el nivel regional.



6.1.C Growing seasons of maize, rice and beans in Cariari (W. Gutierrez Arrese 1983)

6.4.A Diagram with the consequences for the environment of deforestation

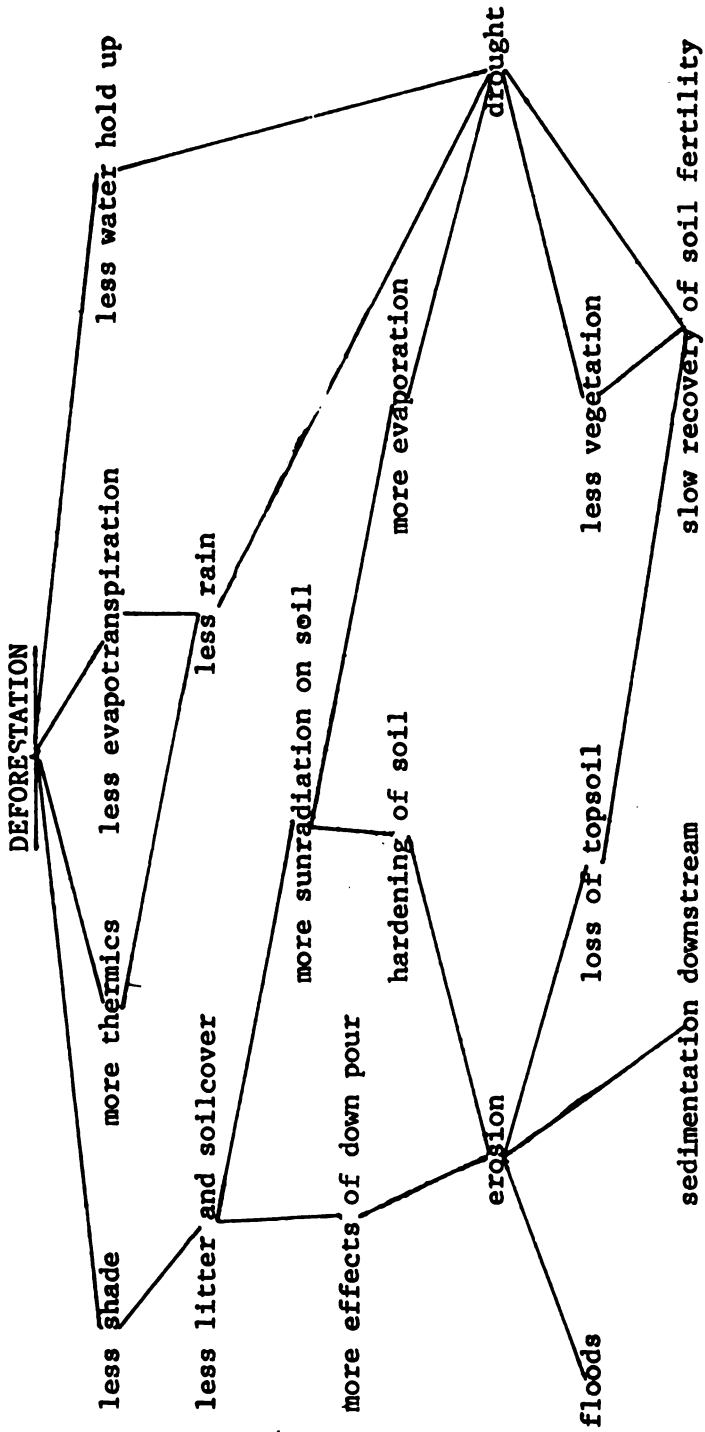
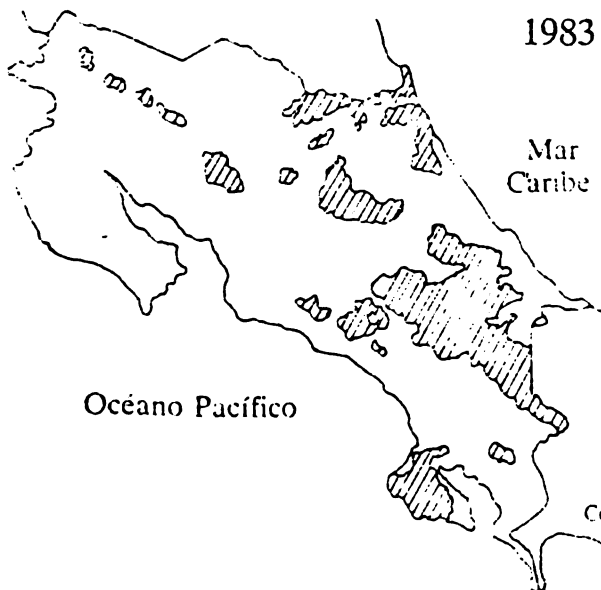
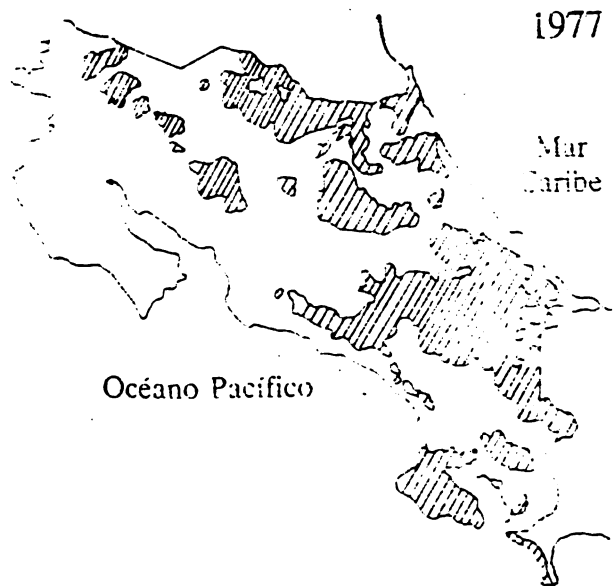
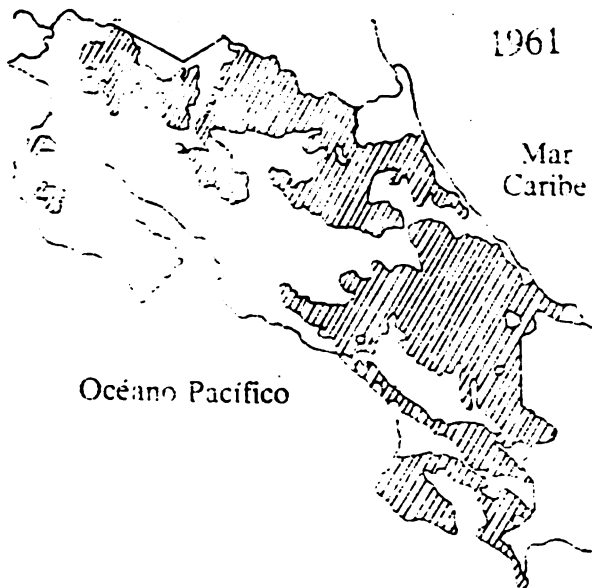
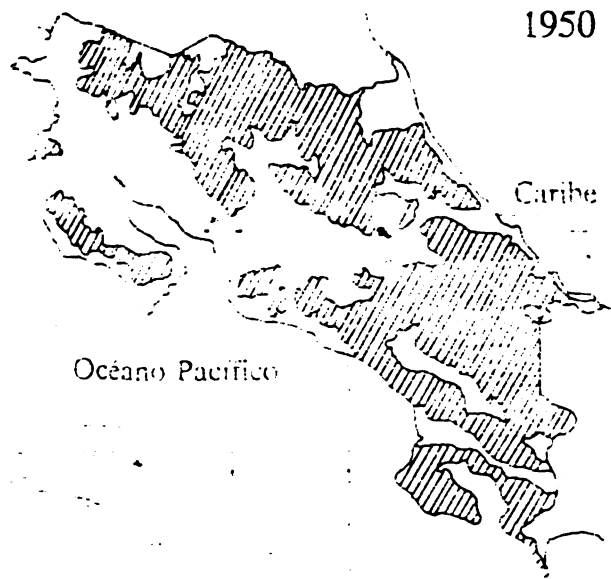
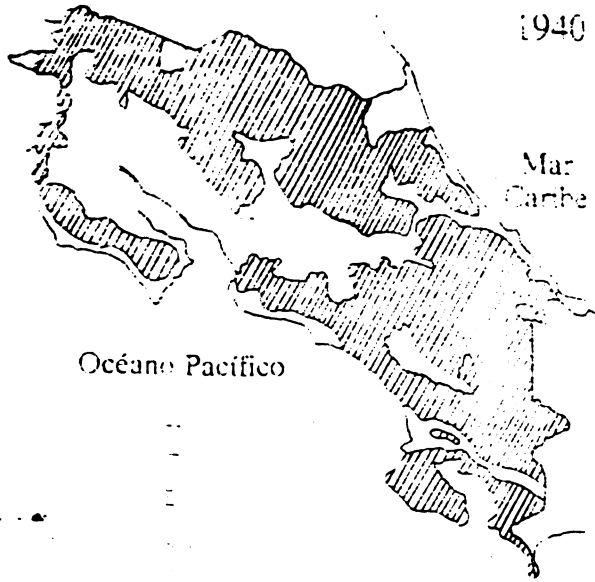


Diagram with the consequences for the environment caused by deforestation.

Source : free to Goodland & Irwin in JACOBS (1981).

Annex 6.4.B. Deforestation in Costa Rica between 1940 and 1983.



Source: Flores Rodas (1985)

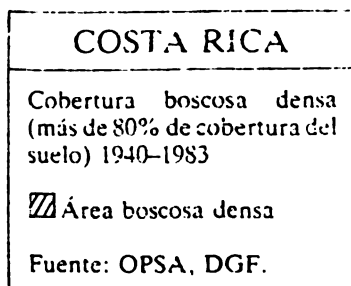


Figura 1.

Cobertura boscosa densa (80-100% de cobertura del suelo) en Costa Rica en los años 1940, 1950, 1961, 1977 y 1983

Annex 8

CHECKLIST A (farm and household)

1 Description	short characteristic of farm.
2 Name of farmer	
3 Place	
4 Accessibility	
5 Land	physical, economical, social aspects.
6 Labour	household, hired labour, labour division.
7 Equipment/tools	
8 Permanent structures	e.g. buildings.
9 Other capital	e.g. livestock, trees.
10 Background/history household	e.g. where they come from.
11 Type and composition household	e.g. nuclear or extended family, numbers of men, women, children.
12 Education of members	
13 Aims/orientation	what the household expects from farm.
14 Decision making	
15 Labour division	
16 Income	from farm and off/non-farm, natura and cash.
17 Use of income	
18 Farmers perspectives	
19 Relations with outside world	extension, credit, markets, health services, education etc.
20 Cooperation between households	
21 Reasons	
22 Problems and solutions	
23 References	sources of information.
24 Remarks	anything relevant not mentioned above.

CHECKLIST B (off-farm/non-farm work and income)

- 1 Identification
- 2 Description
- 3 Number of people involved
- 4 Importance
- 5 Aim and decision making
- 6 Inputs
- 7 Kind of work/activity
- 8 Where
- 9 When and how long
- 10 Outputs/income

- 11 Relations with other systems
- 12 Education
- 13 Reasons
- 14 Problems and solutions
- 15 References
- 16 Remarks

CHECKLISTS for cropping, livestock and (agro)forestry systems.

- C for cattle
- D for maize
- E for rice
- F for beans
- G for bananas
- H for cocoa

- 1 Identification
- 2 Description
- 3 Where
- 4 Size/scale/number
- 5 Importance
- 6 Aims and decision making
- 7 Inputs
- 8 Management/technology/methods
- 9 Outputs
- 10 Performance
- 11 Relations with other systems
- 12 Input supply
- 13 Marketing
- 14 Extension
- 15 Credit
- 16 Reasons
- 17 Problems and solutions
- 18 References
- 19 Remarks.