AGRICULTURAL PRODUCTION IN JINOTEGA, NICARAGUA

Physico-biological and socio-economic conditions. Preliminary study

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- the farmers who participated in the survey

AGRICULTURAL PRODUCTION IN JINOTEGA, NICARAGUA
PHYSICO-BIOLOGICAL AND SOCIO-ECONOMIC CONDITIONS

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A B B R E V I A T I O N S

BND:	National Development Bank
CCS:	Credit and Service Cooperatives
CAS:	Sandinista Agricultural Cooperatives
ENABAS:	National Enterprise of Basic Grain Supply
ENCAFE:	National Coffee Enterprise
IRENA:	Nicaraguan Institute of Natural Resources and Environment
DGTA:	Nicaraguan Institute of Agricultural Technology
INRA:	Nicaraguan Institute of Agrarian Reform
INE:	Nicaraguan Electricity Institution
MIDINRA:	Ministry of Agricultural Development and Agrarian Reform
PROAGRO:	(Organization responsible for the distribution of agricultural inputs)
PROCAMPO:	(Organization responsible for the agricultural extension for small and average farmers)
TANIC:	Nicaraguan Tobacco Plant Organization
SMN:	National Meteorological Service

CONVERSION RATES

10 Córdobas = 1 US $
1 qq (quintal) = 45,4 kg
1 mz (manzana) = 0,7 hectares

1. Introduction

Johannes Lagemann[1)]

The objectives of CATIE are to generate and diffuse production systems that can increase the present production, and consequently, the general welfare of the small farmer in Central America. The CATIE-GTZ Project "Farming Systems in Central America" works within this approach and is carrying out research in two regions of Central America. One region is the Jinotega area which is situated approximately 160 Kms north of Managua, Nicaragua (see Map Nº 1).

A schematic framework of the sequential project stages is given in Figure 1. The second stage of the project - "Description of Areas" - has the following objectives:

1. Identification of the resources and main farm enterprises.
2. A brief description of the technology used in the more important agricultural enterprises.
3. Identification of the principal problems encountered by farmers.
4. Identification of the limitations evident in the physico-biological and socio-economic environment and in current farming practices.

This information will be used to design exploratory experiments during the first year of field work, to prepare a multi-visit survey with 70 farmers in the zone and to assist national institutions in the preparation of an Agricultural Extension and Development Project.

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1) Agricultural Economist and Coordinator of the CATIE-GTZ Project.

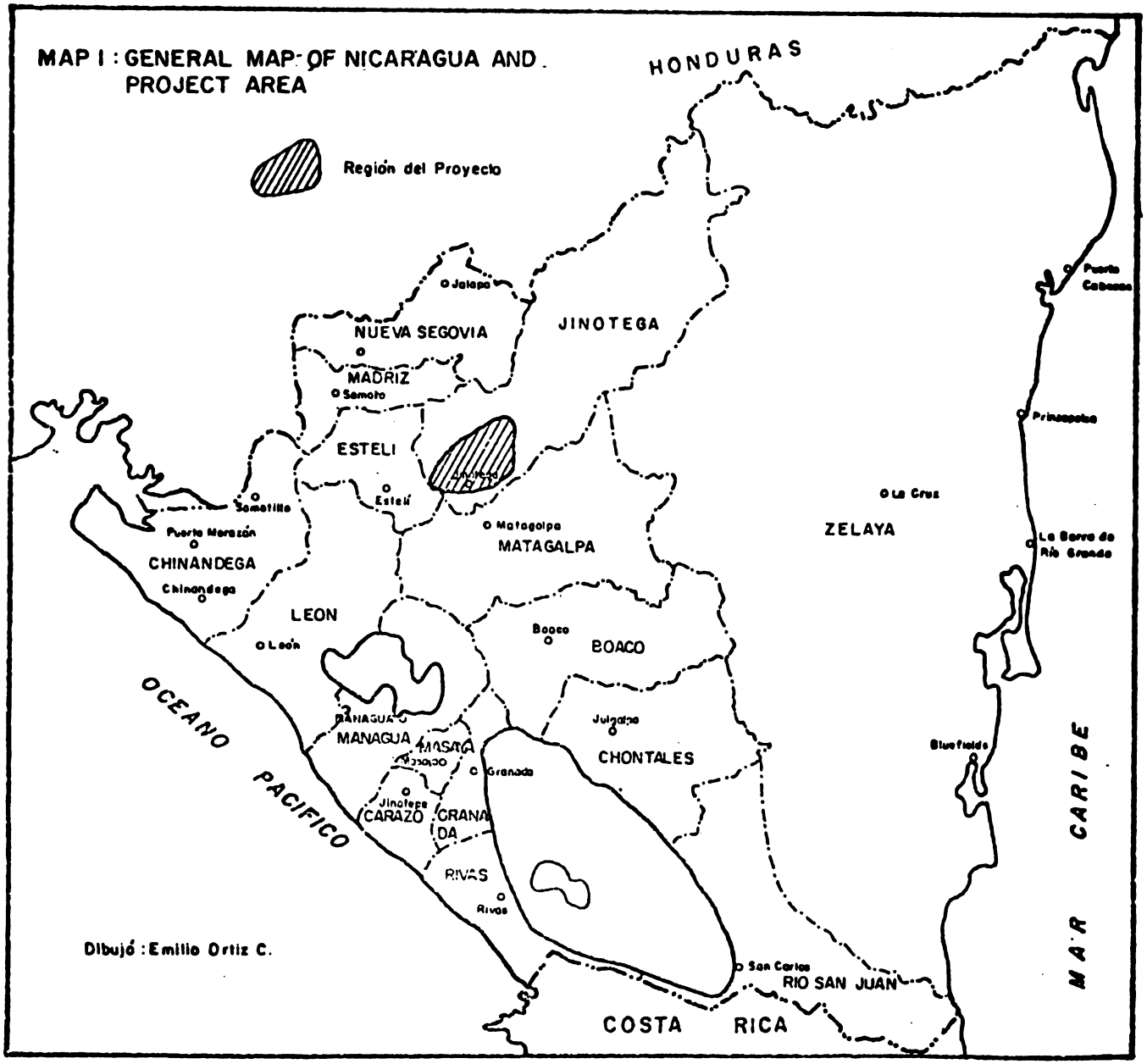
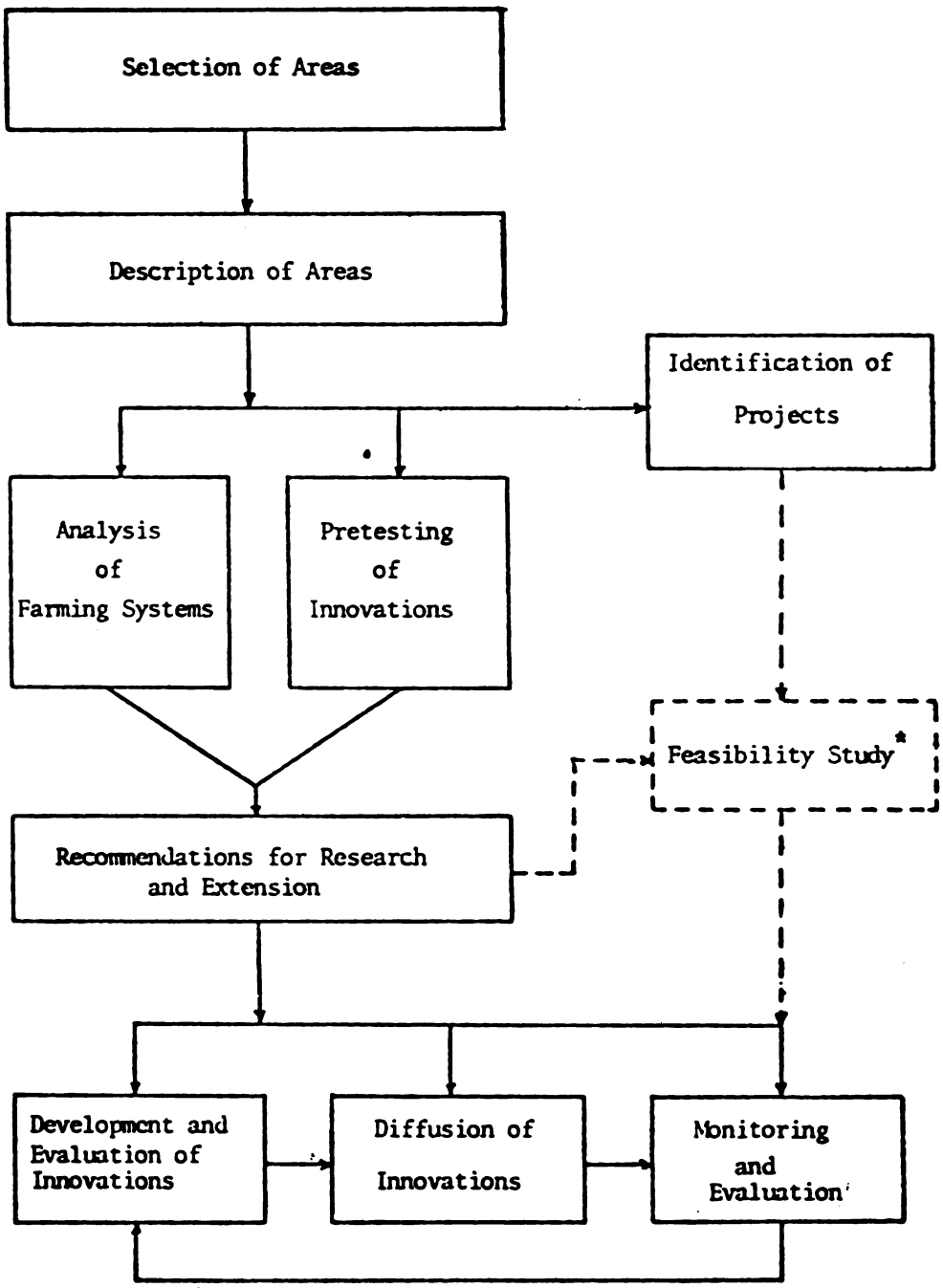

MAP I : GENERAL MAP OF NICARAGUA AND PROJECT AREA
Región del Proyecto
HONDURAS
Jalapa
NUEVA SEGOVIA
JINOTEGA
MADRIZ
Somoto
ESTELI
Esteli
Somotillo
Puerto Morazán
CHINANDEGA
Chinandega
Matagalpa
MATAGALPA
La Cruz
ZELAYA
Puerto Cabezas
Prinzapolka
La Barra de Río Grande
LEON
León
Boaco
BOACO
OCEANO PACIFICO
MANAGUA
MASAYA
Masaya
Granada
Jinotepe
CARAZO
GRANADA
Juigalpa
CHONTALES
Bluefields
RIVAS
Rivas
MAR CARIBE
San Carlos
RIO SAN JUAN
COSTA RICA
Dibujó : Emilio Ortiz C.

Figure 1: Sequential stages of the Farming Systems Project



* A feasibility study will not be conducted by the research team, but assistance could be given.

2. Methodology

Johannes Lagemann[1)]

In order to gather the necessary information about environment, farm characteristics and the various limitations, the following methods have been used: visits to the study region with scientists of different disciplines, meetings with regional and local institutions, execution of a preliminary survey, and collection of soil samples.

2.1 Visits to the study region

The purpose of visiting the region with various specialists from CATIE and DGTA was to obtain a detailed geographic knowledge of the region in order to stratify it according to a few factors that most strongly influence the type of farming systems[2)], to check the accessibility of each area and to identify limiting factors on the farm (for example: use of improved seeds, weed and pest control). Information was obtained by informal interviews with both farmers and personnel of national institutions. At the same time, these interviews provided the opportunity to explain to farmers and national personnel the objectives and different activities planned for the project.

2.2 Meetings with local and regional institutions

The knowledge of technicians and other persons who work in the zone is a very important source for the collection of data. Much information about farm management and the physico-biological and socio-economic environment is derived from these meetings. Another benefit was the active participation of DGTA technicians in the elaboration of this study.

2.3 Preliminary survey

The objective of the preliminary survey was the identification of resources, land use, inputs, principal farm enterprises, maximum labor

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1) Agricultural Economist and Coordinator of CATIE-GTZ Project.

2) The region is very heterogeneous in respect to the precipitation, topography, soils, farm resources, and land usage. The stratification was made according to the precipitation and land usage.

demand, relative importance of income from agricultural products and problems encountered by farmers. The questionnaire was precoded to permit a direct transfer of the data to the computer pretested with some farmers in the work area.

2.3.1 Sampling methods

The first stage was to identify the districts and villages within the areas chosen for sampling. The main factors determining the choise of these areas were: a) the concentration of small farmers, and b) access to the villages during the year. The next stage required a complete list of farms in the villages in order to draw a random sample. Because of lack of this information, an alternative used was to interview every fourth or fifth farmer along the road, in accordance with the number of farms in the area and the size of the required sample.

With the budget and the time available, 233 farmers were visited which represents approximately 5% of the farmers in the southeastern part of the Department of Jinotega. Sample distribution in the various areas and villages can be seen in Table 2.1.

Table 2.1 Sample Distribution

Sampling area	Villages	Number of Observations
Suní	Suní, El Espino, San Marco, La Ermita and Namanjí	61
Sisle	Sasle, Sisle, El Mojón, San Antonio	62
Pantasma	Las Cruces, Los Limones, El Malecón, Wale	59
Los Robles	Los Robles, Datanlí, and Venecia	42
		224

Furthermore, 9 farmers were interviewed in the Las Lomas area. However, many parameters in this area have a large variation and consequently the data from Las Lomas is not interpreted in the text.

2.3.2 Execution of the survey

The preliminary survey was carried out in October, 1980, with the help of 10 enumerators all from the same region. These enumerators received training in the office and in the field. Much emphasis was placed on the explanation of project objectives, technical terminology, work description, confidential information, and explanation of the questionnaire.

Before the survey was conducted, its objectives and the areas to be visited were announced on the radio and at various meetings in the majority of the villages. The ten enumerators were sent to the different areas and were able to visit four to five farmers per day. Two supervisors controlled the questionnaires daily. The collaboration of the farmers was very good; only three farmers did not want to participate.

2.3.3 Data analysis

The first analysis of the data was made with a mini-computer (IBM 5150) and a program in the BASIC language[1)]. The averages and distributions of all the variables were calculated for the sampling areas and villages. In the second stage the data was analyzed using variance analysis, cross tabulations, correlations, and regressions.

2.4 Soil samples

During the execution of the survey, the supervisors collected a total of 21 samples in the different locations, each composed of 2 subsamples per site, at a depth of 0-25 cms. The samples were analyzed in the Soil Fertility Laboratory of DGTA in Managua.

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1) Elaborated by H. von Platen; the questionnaire and the program are available to other institutions and persons.

3. Physico-Biological Environment

Nico van Tienhoven[1)]

3.1 Climate

Generally speaking, rainfall in Nicaragua decreases from the east to the west. Thus in the project area, the precipitation increases from the southeast to the northeast from about 850 mm (Sunî) to 2000 mm (Sisle). Figures 3.1.1 to 3.1.4 show the great variation in precipitation across the project areas.

There are only 2 meteorological stations with temperature data in the area: Los Robles and La Porfia. Mean temperatures do not change much during the year, the difference between the coldest and the hottest month being only 3°C. To estimate the temperatures for the other stations, the existing data can be corrected by 1°C for each 100 m difference in altitude.

The existing data on evapotranspiration and relative humidity for Jinotega are given in Appendix I.

Based on the information of La Porfia and La Concordia, both neighbors of Sunî, it can be seen that Sunî has the lowest precipitation in the four study areas.

The average annual precipitation in La Porfia and La Concordia is about 823 and 890 mm, with a range of 621-981 mm, and 404-1594 mm respectively (6 and 10 years of data respectively). From this data, the enormous variation of the annual precipitations (especially in La Concordia) can be seen, which results in the farmers of the area exposed to the danger of an abundance or more frequently to the scarcity of water. Only in the month of September does mean rainfall exceed potential evapotranspiration.

The rainy season normally occurs from May to October with a short dry period in July. The months December to April experience severe drought.

Temperatures in the area of Sunî are 2°C-4°C higher than those in La Porfia, which has an annual average of about 21.6°C with oscillations

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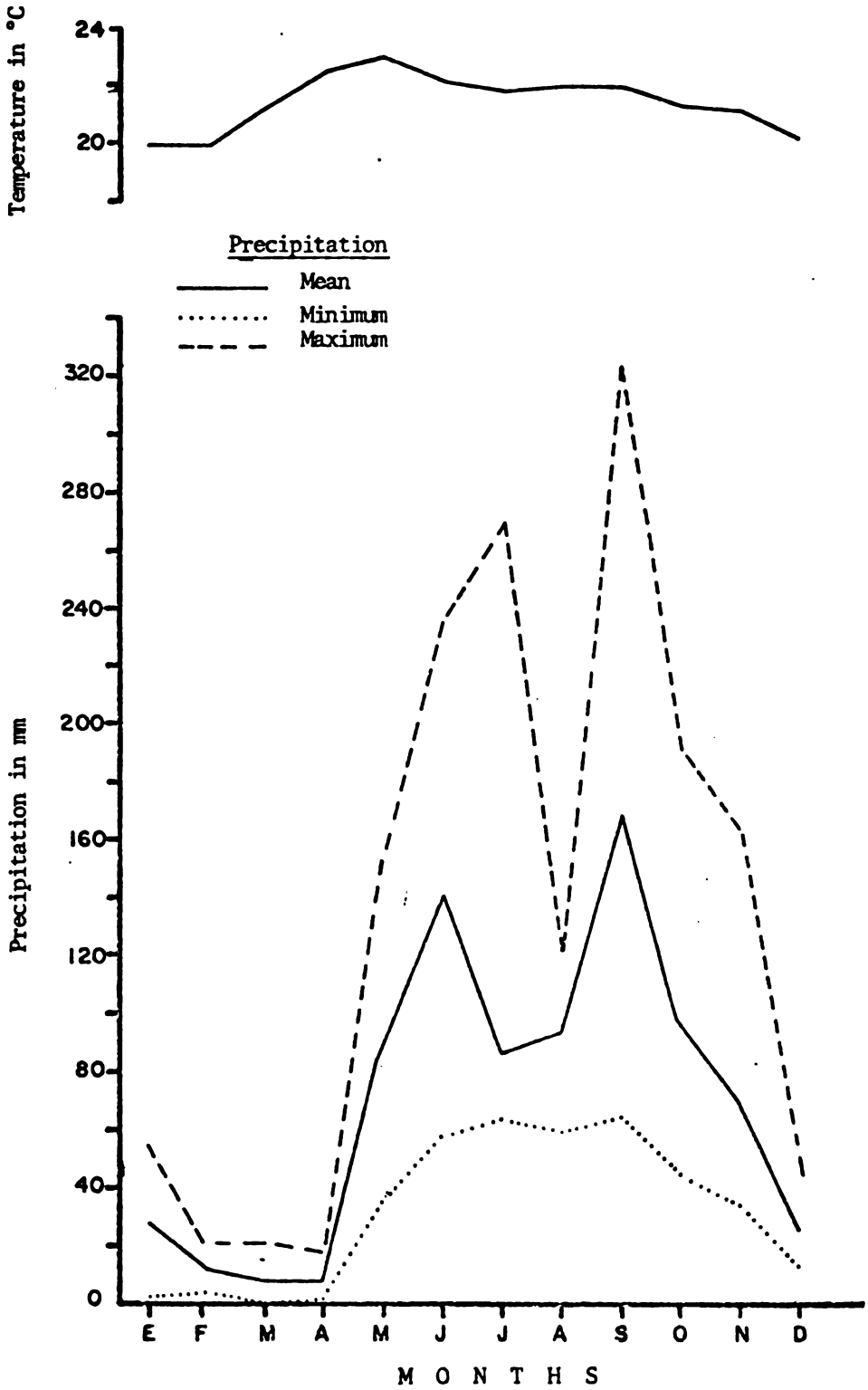
1) Agricultural Economist for CATIE-GTZ Project in Jinotega, Nicaragua.

Figure 3.1.1. Precipitation and temperatures in the area of Sunî

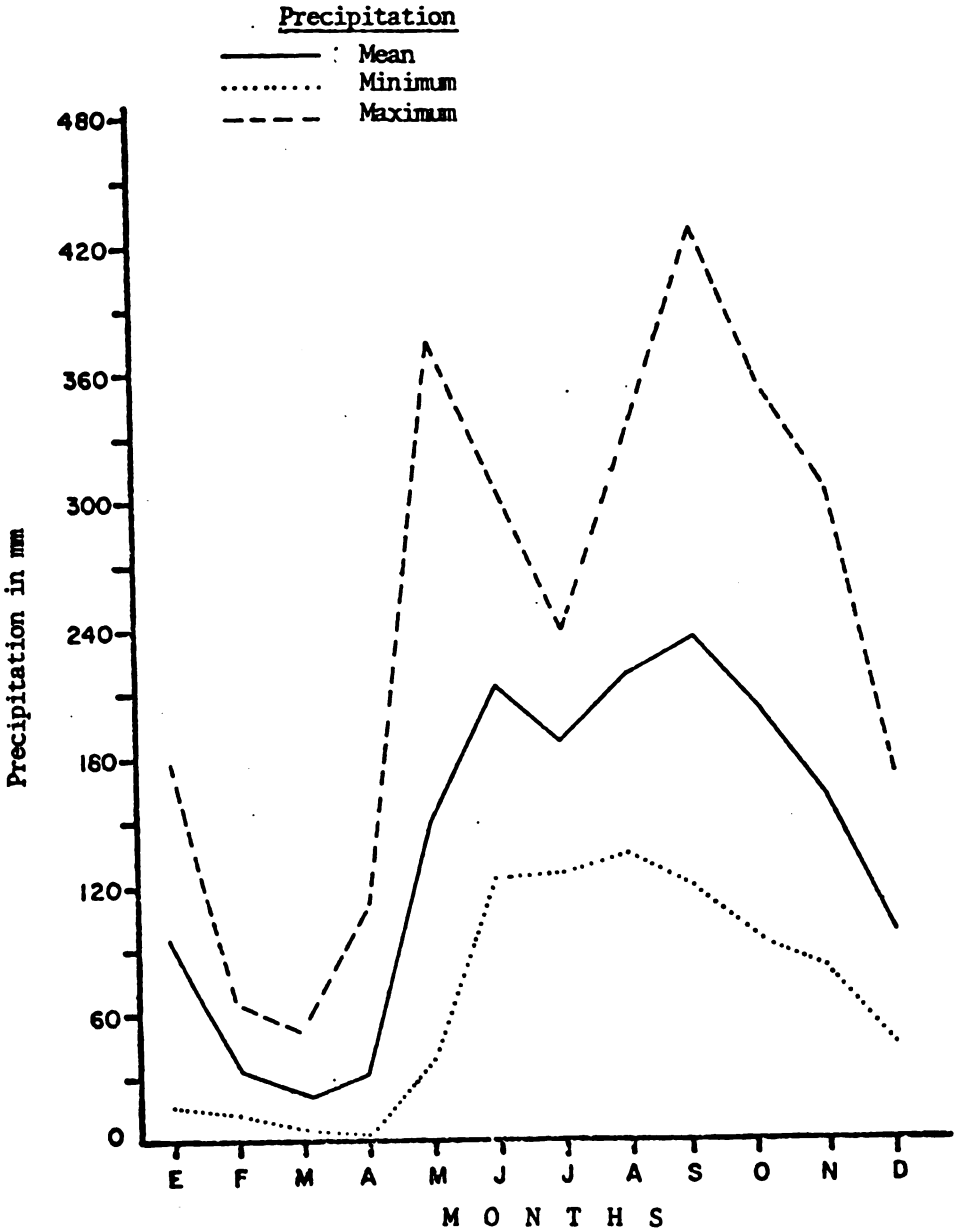
Station: La Porfia (altitude: 970 m); years of observation



Source: INE

Figure 3.1.2 Precipitation in the area of Sisle-El Mojón

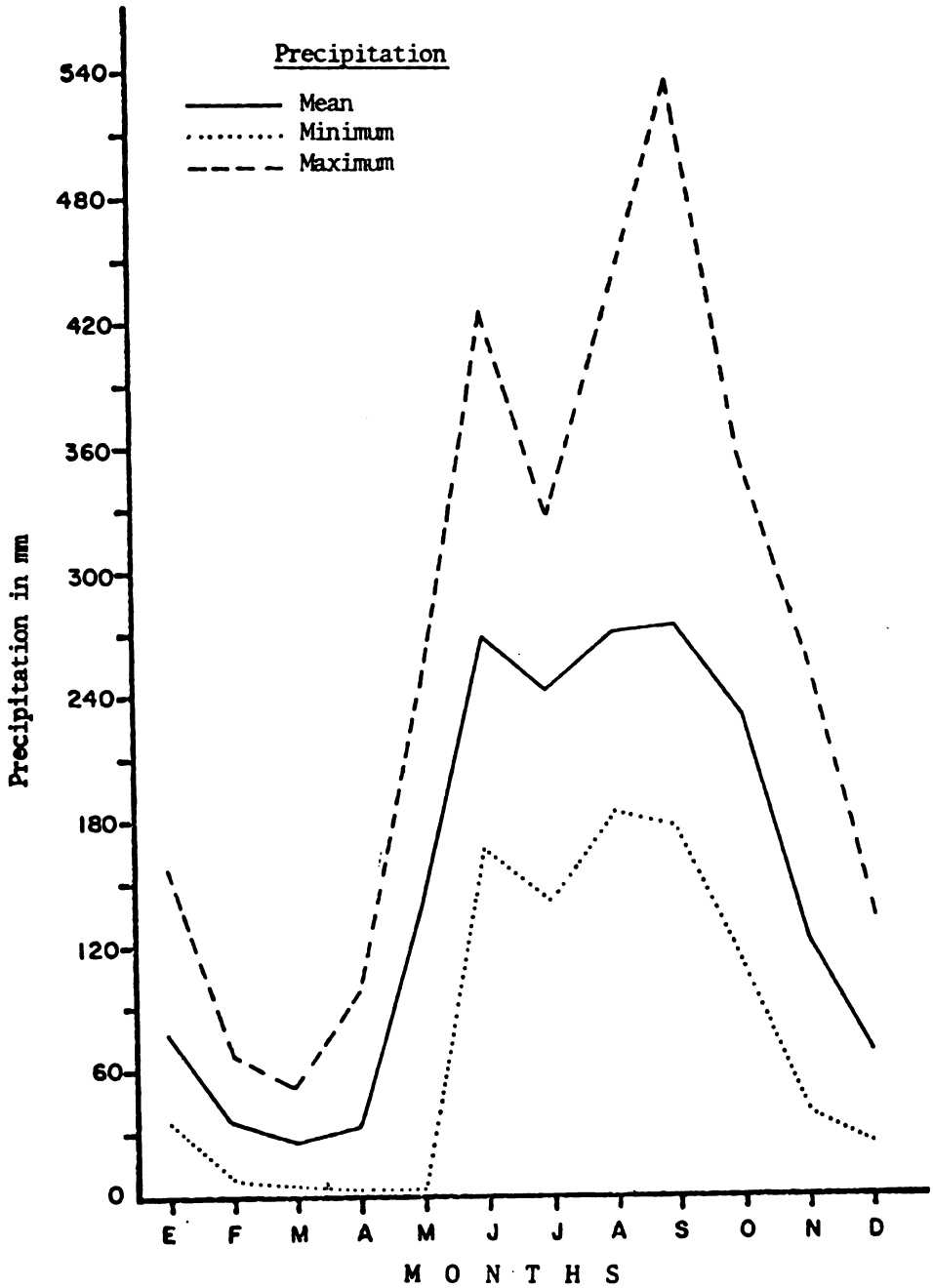
Station: Los Horcones (altitude: 1320 m); years of observation



Source: INE

Figure 3.1.3 Precipitation in the area of Pantasma

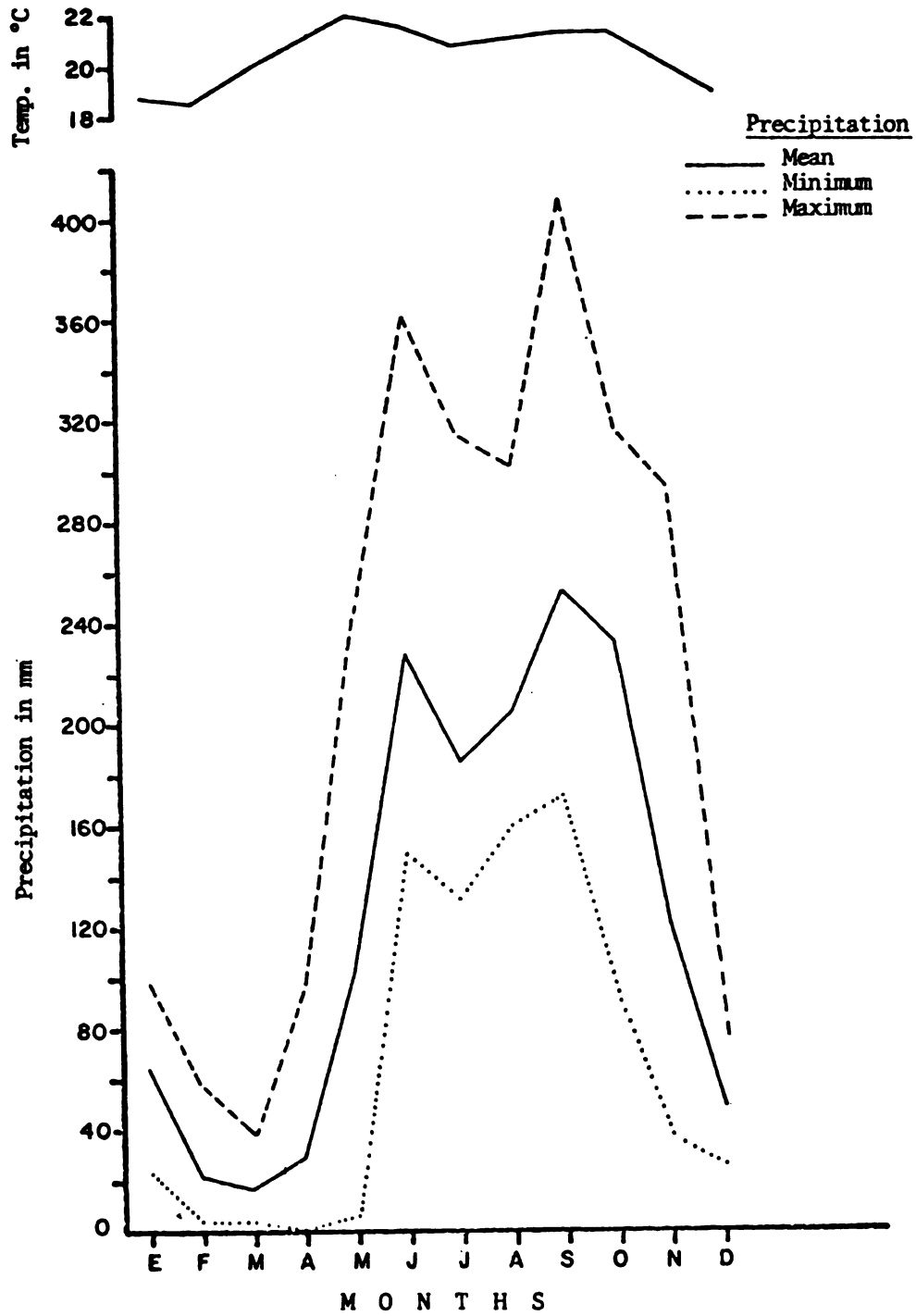
Station: El Mancotal (altitude: 960 m); years of observation: 11



Source: SMN

Figure 3.1.4 Precipitation and temperatures in the area of Los Robles

Station: Los Robles (altitude: 970 m); years of observation: 10



Source: INE

of about 1.5°C. The higher temperatures in Suní occur due to its location in a closed valley, with an altitude of 300 m less than La Porfia.

The climate in the Sisle area is quite different from that of Suní. There are significant differences not only in the annual average rainfall, but also in the distribution during the year. Average annual precipitation in Los Horcones and La Porra is about 1656 and 1915 mm respectively. Over a period of 5 to 10 years, the range of annual rainfall recorded was 1395 to 1978 mm in Los Horcones, and 1577 m to 2896 m in La Porra. (see Appendix I). The majority of the rain falls from May or July until November. This rainy season is long in comparison with the other areas. The amounts of maximum precipitation per month show a considerable danger of an excess of water between September and November. Consequently, the seeding of the second harvest in this area is carried out later than in other areas, at the end of November to avoid the water damaging the seed. In Sisle, there is no prolonged dry season as in other areas. The dry season extends from January or February until April. During this time, precipitation is less than 20 mm per month. However, drought in this area is less important than the danger of excess water during the rainy season.

The temperature varies considerable from one part of Sisle to another due to the considerable variation in altitude. Despite the lack of data for the area, an average temperature of about 20°- 21°C can be estimated, taking as a base the information of Los Robles. In the highest part, temperatures are cooler and suitable for growing potatoes.

There is no climatological data available for the Pantasma Valley, therefore, the observations of El Mancotal, situated at the edge of the valley serve as a base for the following description: Data of 11 years rainfall show a mean of 1781 mm, and a range of 1412-2092 mm.

The rainfall distribution during the year shows a dry season in February, March, and April with the possibility of a prolongation until May. Although the monthly average during the dry season is generally greater, less than 10 mm monthly is very possible in dry years. The rainy period occurs from June until October with a short dry spell in July and this is accompanied with the danger of an excess of water, especially in September.

Another very important climatological feature of the Pantasma Valley are the very high temperatures. This is due to the location of the area in a closed valley, situated at an altitude of about 500 m.

At Los Robles mean annual rainfall recorded is 1508 mm, with a range of 1150-1810 mm (10 years data). Rainfall distribution is similar to El Mancotal. Los Robles has a mean annual temperature of 20.5°C. However, the area includes elevations up to 200 m higher than the meteorological station, and temperatures here will thus be 1-2°C lower.

3.2 Topography

Topography is very variable in the region both in altitude and inclination. Surface configuration is generally flat in Pantasma and Sunî, but more broken in Sisle. Altitude varies between 500 m in Pantasma and 1500 m in Sisle. The area is characterized by Lake Apanás which is one of the biggest reservoirs in the country.

A more detailed description of the topography according to the four areas of the project is given below:

The Sunî Valley lies between 700 m (Namanjî) and 1000 m (Sunî). The surface descends from the east to the west, but shows a few pronounced slopes around Namanjî. The east of the work area is completely flat. Surface water consists of some rivers, which grow rapidly during the rainy season and are almost completely dry in the summer.

The Sisle area, situated between 1000 and 1500 m includes the highest parts of the work areas in Jinotega. Some flat and other scalloped parts exist at the shores of Lake Apanás. Almost all of the rest of the area is quite broken with considerable inclinations. Lake Apanás forms a boundary to this area, and there are various rivers.

Pantasma is located at the bottom of the valley which is the lowest part of the project area, with an altitude of 500 m. Within the valley, vary flat extensive plains predominate. The surface at the edges of the valley is completely different since there are very pronounced slopes and the altitude reaches 1050 m. The Pantasma river and its tributaries have water all year.

The Los Robles area has a surface configuration which is very uneven. The villages of Los Robles and its neighborhood are situated on the flat shores of Lake Apanás at about 970 m. Venecia, farther east, is at about 1050 m and has an undulating surface. The third village of this area is Datanlí, with an altitude between 1000 and 1150 m and has a rolling to very rolling relief.

Lake Apanás is the most important water source in the area, besides a few rivers which have water all year round.

3.3 Soils

Roberto Díaz-Romeu[1)]

Soil analysis shows that in the Sunî area, the soils are lightly acid, with one that is moderately acid. Phosphorus was low in three samples and high in two, while potassium, calcium and magnesium are high in all the area. The iron content varies from marginal or average to very high, copper from low to marginal, and zinc is marginal in all soil samples except in one which is adequate. Copper is adequate in all of the area. The ratios $\frac{Ca + Mg}{K}$ and $\frac{Mg}{K}$ are quite variable, but can be observed adequate to high in the entire zone. The relation $\frac{Ca}{Mg}$ is adequate in all soil samples in the area.

The soils in the Sisle area are moderate to lightly acid, with suitable contents of calcium and magnesium, except in a part of El Mojón where this nutrient is encountered at an average level. Phosphorus is low to marginal, with the exception of part of El Mojón where the phosphorus content is very high. Potassium is adequate in all the area, except in Sisle where it is very low. The copper content is adequate and zinc and manganese are encountered at moderate to adequate levels. Iron content is high. The ratios $\frac{Ca + Mg}{K}$ and $\frac{Mg}{K}$ are variable but adequate, with the exception of part of Sisle where they are high, due to a low content of potassium. The relation $\frac{Ca}{Mg}$ is adequate in all the area.

The soils in the Pantasma area are moderately acid, deficient in phosphorus, and with adequate contents of calcium, magnesium, potassium, copper, and zinc. Iron is high, manganese varies from moderate to adequate. The ratios $\frac{Ca + Mg}{K}$, $\frac{Ca}{K}$ and $\frac{Mg}{K}$ are adequate.

The soils of the Los Robles area are for the most part moderately acid, and in Datanlí slightly acid. Calcium, magnesium, and potassium are adequate in the area, with Datanlí presenting the highest contents in the area. Zinc and copper are adequate and manganese is average only in part

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1) Soil Specialist M.Sc., Head of Soil Laboratory, CATIE, Turrialba, Costa Rica.

Table 3.3.1 Chemical characteristics of soils in the Department of Jinotega, Nicaragua.

		PH	P ug/ml	K me/100ml	Ca me/100ml	Mg me/100ml	Fe ug/ml	Cu ug/ml	Mn ug/ml	Zn ug/ml
SUNI	Ermita-San Marcos	5.6	3	0.87	9.5	3.1	116	3	6	4.0
	Namanjí	6.4	46	1.61	21.0	10.1	24	4	4	4.0
	San Marcos	6.3	3	0.74	25.5	9.5	28	4	8	3.0
	San Marcos	6.1	7	0.74	25.0	9.0	16	5	4	3.0
	Suní	6.1	30	1.10	16.5	4.6	80	5	6	11.5
SISLE	El Mojón	6.6	100	1.87	26.5	7.5	100	5	6	16.0
	El Mojón	5.7	6	0.38	8.0	1.5	116	12	12	5.5
	Sasle	5.8	7	0.41	17.0	4.9	108	8	12	6.0
	Sisle	5.6	21	0.20	13.0	3.0	112	9	30	7.0
PANTASMA	Sisle	6.1	13	1.12	24.0	6.4	88	6	8	7.0
	Las Cruces	5.6	5	0.66	15.5	3.8	108	7	8	7.5
	Las Cruces	5.7	8	0.82	11.0	3.4	110	9	26	15.5
	Las Cruces	5.9	6	0.72	17.5	3.1	114	7	6	11.0
LOS ROBLES	Venecia	5.7	6	0.84	17.5	5.4	96	6	6	7.0
	Venecia	5.7	7	0.56	14.5	4.8	112	9	10	8.0
	Los Robles	5.8	7	0.64	19.0	6.9	108	10	6	7.5
	Los Robles	5.8	11	0.56	17.5	4.7	114	7	12	9.0
	Los Robles	5.5	8	0.61	13.5	5.1	118	8	24	10.0
	Datanlí	6.3	7	1.61	31.0	9.6	98	7	12	6.5
	Tomatoya	6.1	5	0.69	22.0	8.6	20	5	8	4.0
	Las Lomas	5.8	9	0.51	18.5	6.8	96	6	10	5.0

Soil-chemistry analysis conducted by Soil Fertility Laboratory, Chemical Section, DGTA, Managua.

of the Los Robles area. Iron is high in all of the area. The ratio $\frac{Ca + Mg}{K}$, $\frac{Ca}{Mg}$ are adequate, while $\frac{Mg}{K}$ is average in the area.

3.4 Pests and Diseases

Javier Icaza G., Francisco Dávila F.
and Guadalupe Rivera[1)]

In general, the pests and diseases that will be described in this section are common to the crops in each of the areas in the Jinotega region.

3.4.1 Pests

Maize: *Spodoptera* sp., *Mocis latipes*, *Phyllophaga* sp., *Spodoptera subterránea*, *Aphis maidis*, *Diabrotica* sp.

Beans: *Diabrotica* sp, *Cerotoma*, *Bemisia tabaci*, *Phyllophaga* sp., *Apion godmani*. Of all the pests, the slug (*Vaginulus plebeius*) presents an especially serious problem for the bean crop particularly in the second cultivation period.

Sugarcane: *Agrotis* sp. and termites.

Potatoes: Among the insects that inhabit the soil during the larva phase, there are: *Phyllophaga* sp., *Spodoptera subterránea* and Wireworms, which affects the quality of the tubers. In the second season, severe attacks of aphids can be observed.

Coffee: Leaf miner, aphids, leaf cutting ants, ants, slugs and nematodes.

3.4.2 Diseases

Maize: Diseases of great importance have not yet been detected.

Beans: *Diabrotica*, Bean rust (*Uromyces* sp.), *Sclerotium rolfsii*, and Angular Leaf Spot (*Isariopsis griseola*).

Potatoes: Late Blight (*Phytophtora infestans*), Early Blight (*Alternari solani*) and mosaic which is transmitted by aphids. *Erwinia*, *Pseudomonas* and *Corynebacterium*.

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1) Agronomist of the CATIE/GTZ Project, Agronomist from DGTA (Horticultural Section), and Agronomist from DGTA (Coffee Section).

Coffee: American leaf spot (*Mycena citricolor*), *Stilbella flanida*, *Phylosticta coffeicola*, *Fusarium* sp., Coffee Blight (*Pellicularia koleroga*), *Corticium salmonicolor*, and Anthracnose.

3.5 Weeds

Myron Shenk[1)]

AREA	PRINCIPAL CROPS	PRINCIPAL WEEDS (families)
Suní	sorghum, maize, millet, onions, beans, tobacco	*Broadleaf* *Convolvulus* *Compositae*
Sisle	Basic grains, fruits and vegetables, coffee	*Compositae* *Convolvulus* *Grasses*[1)]
Los Robles	coffee, maize	*Commelinaceae*[2)] *Compositae* *Grasses*[3)]

1) The annual grass, *Artraxon quartinianus*, is invading thousands of hectares in the Jinotega area. The situation is more serious especially in the fields in Sisle and Los Robles. Urgent action is necessary in order to combat this weed.

2) *White flowered commelina*, which is resistent to paraquat, is found widely scattered in this region.

3) *Setaria palmifolia* is very prominent in this area, especially where manual weeding has been practiced or where there is less shade. The mixture of dalapon + oxyfluorfen (goal) seems to provide good control for this coffee weed. Goal + paraquat has also given very promising results.

The situation of Weed Management

With the present high cost of manual labor in this region, two manual weedings cost a minimum of $60.00 US/ha. It appears that the implementation of technical improvements in weed management would be agronomically and economically advisable. A great scarcity of manual labor for weeding, especially for the second planting, due to the extensive coffee production in the area, and a general salary of $3.50 U.S. per man work day, are the principal

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1) Specialist in Weed Control, CATIE, Turrialba, Costa Rica.

factors of the high labor cost. Thus, inadequate weed management is often practiced.

Ample use of herbicides is practiced with coffee and potatoes, but very little with other crops.

Most important weeds observed:

- *Artraxun quartinianus*
- *Ipomoea* spp.
- *Melantherum* sp.
- *Melanpodium* sp.
- *Borreria* sp.
- *Digitaria* spp.
- *Paspalum conjugatum*
- *Agemone mexicanum*
- *Ageratum conyzodies*
- *Baltimora* spp.
- *Paspalum virgatum*
- *Paspalum paniculatum*
- *Acanthospermum hisbidum*
- *Marspianthes chamaedrys*
- *Amaranthus dubius*
- *Cyperus* spp.
- *Synedrella modiflora*
- *Elusine indica*
- *Browallia americana*
- *Euphorbia* sp.
- *Hemidiodia ocimifolia*

4. Socio-Economic Environment

Nico van Tienhoven[1)]

4.1 Infrastructure

The best access to the area is the Panamerican Highway going toward Sébaco and then by way of Matagalpa to Jinotega. The condition of this highway is very good and the road from Sébaco to Jinotega is also paved, although the ground is very broken and generally in a bad condition. The project region can also be reached by way of Estelí-La Concordia and by way of Matagalpa-Tuma, but it is possible to circulate without problems only in the dry season.

Within the project region (see Map Nº2) the roads to the areas of Los Robles and Sisle are the best and are passable during the whole year. The distance to Jinotega is about 30 Kms from both areas. A continuation of the road to Los Robles which is presently being repaired reaches Pantasma (about 50 Kms from Jinotega). What is still lacking are bridges in the Pantasma Valley which will permit an access to the valley during the entire year. However, some bridges are now being constructed and will be finished in 1981. Besides the access to the project area by way of the south of Lake Apanás, Pantasma can be reached going north of the lake by way of Sisle. This road merges in Las Cruces at the edge of the Pantasma Valley with the road that comes from Los Robles. From Jinotega there is a road about 35 Kms to Suní which lacks bridges in the Suní Valley and causes problems in the rainy season.

Generalizing, it can be said that access to Los Robles, Sisle, and Pantasma is almost always possible, while access to the Suní Valley is difficult in the rainy season. But in spite of this, access to particular farms is often complicated in all of the work areas because the farms are scattered throughout the area and many times are located far from passable roads. This situation refers to all of the four areas, although the situation in Los Robles appears to be a little better.

Electricity: There is no electricity in any of the regions. The

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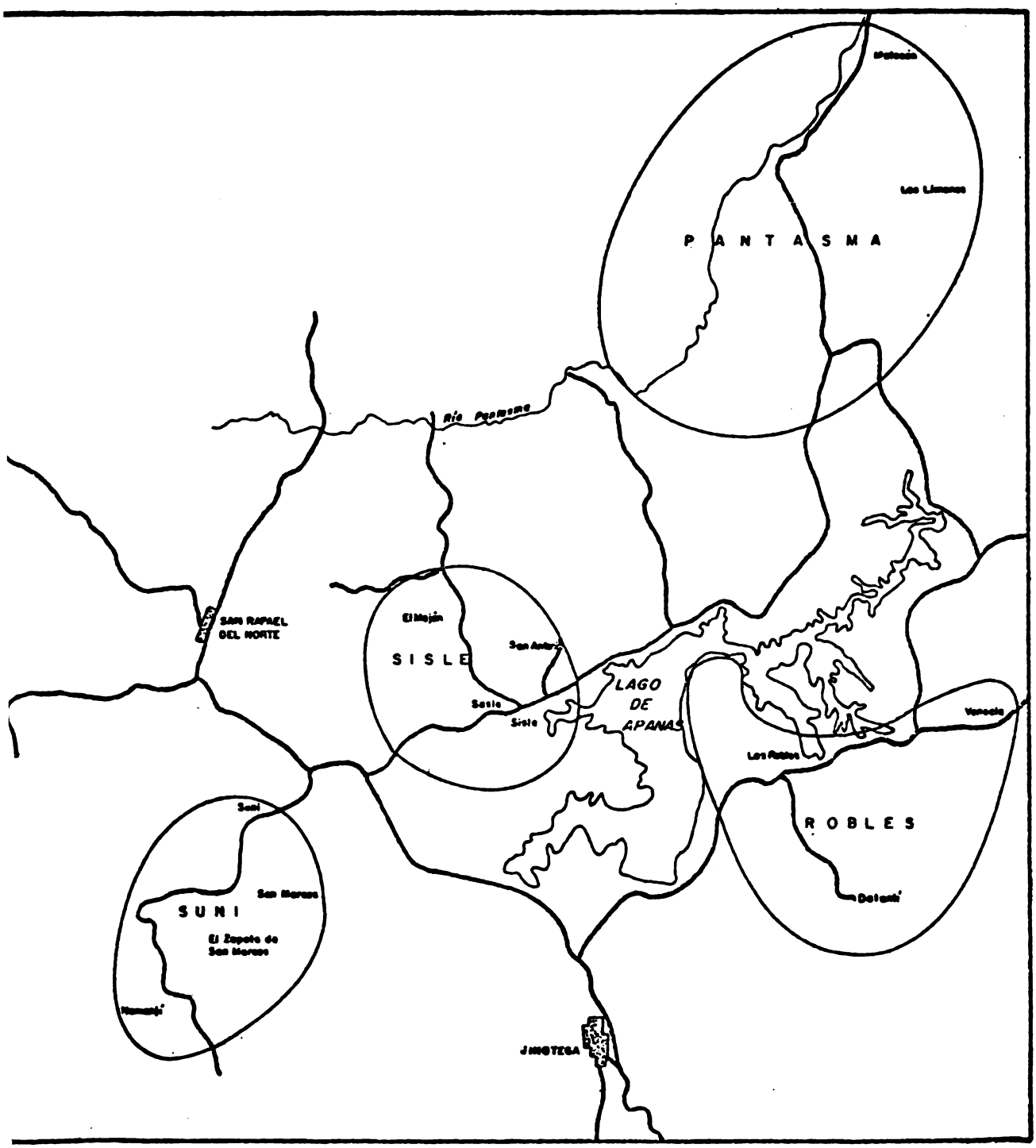
1) Agricultural Economist of CATIE-GTZ Project in Jinotega, Nicaragua.

Map 2: Infrastructure in the area of Jinotega



existence of small electrical plants is rare. Up until the present moment no plans have been confirmed referring to the development of an electrical network.

Sanitation: Health centers are lacking since these are limited to the big towns (Jinotega and San Rafael). The bad supply of drinkable water affects health in the area, especially in Suní.

Education: Many towns are in need of schools and especially teachers. Presently there is considerable effort to improve the educational system.

4.2 Market location

The regional market situated in Jinotega does not play a very important role in the sale of the products. Here, basic grains (beans, maize) and vegetables (carrots, cabbage, lettuce and potatoes) are sold for local consumption. The middle men who buy products for sale in Managua get them directly from the farmers.

The majority of Jinotega's agricultural surplus is sold to the consumers of Managua and its outskirts. Consequently, the prices paid in Managua mainly determine the prices paid to the farmer in Jinotega.

4.3 Marketing

The marketing of the agricultural products of the area is carried out by various channels. For the marketing of coffee, ENCAFE, which is a government office under the control of the Ministry of Exterior Commerce, is in charge of marketing the total production. ENCAFE fixes minimum prices guaranteed by the government. This price is currently fixed at C$1,000.00 per qq/oro (per quintal of coffee in oro) less taxes[1)]. The farmers normally sell sun-dried coffee to a coffee processing plant, private or governmental, which in turn sells the coffee to ENCAFE.

Basic grains are marketed principally by two channels: independent middle men and the governmental office ENABAS, which operates under the regime of the Ministry of Interior Commerce. The objectives of ENABAS is

1) December 1980

the control of 40% of the commerce of basic grains, this is carried out with fixed prices by the government. But in spite of these fixed prices, private buyers often pay a better price than that of ENABAS. The different sales channels that exist in the marketing of annual crops as identified by the preliminary survey are given in Table 4.3.1.

Marketing of vegetables from the Jinotega area, which contributes more than 50% of the national vegetables production, is carried out completely by independent buyers, although here exists scattered efforts by governmental institutions to fund a marketing cooperative.

The marketing of tobacco, which is cultivated especially in Pantasma and Suní, is carried out exclusively with TANIC.

Table 4.3.1 Sales destination of annual crops (basic grains, fruits and vegetables) in percentage of farmers (multiple answer).

AREA / DESTINATION	SUNI	SISLE	PANTASMA	LOS ROBLES	TOTAL
Buyers	49	69	40	44	53
ENABAS	51	17	53	22	40
Direct	15	22	14	22	16
Others	2	3	7	11	4

4.4. Storage of Products

Agricultural products are stored on and off the farm. ENABAS storehouses have sufficient capacity. They can store 24,000 qq in silos and 5,000 qq[1)] in the storehouses, both in Jinotega as in Pantasma. Also significant is the use of storage capacity in Managua and other urban conglomerates. Private commerce does not maintain warehouses worthy of mention. Farmers are accustomed to store a great part of their basic grains for self-

1) Personal communication with ENABAS, Jinotega. 1 qq = 45,4 Kg.

consumption and for future seed, and considerable losses occur according to information from farmers in the area. In order to reduce this type of loss, FAO started a project in the region to introduce small silos with a capacity of about a ton at farm level. The sale of these silos is done throughout PROCAMPO.

The biggest storage problems occur with fruits and vegetables. On the farm, storage is not possible at a reasonable cost, and off farm storage capacity (for example refrigerated storage) does not exist. There is no processing of fruits and vegetables to storable products (drying, freezing, juices) in the region. As a consequence of this lack of storage capacity for the products, there is a very high variation in the daily prices.

No grave problems arise with the storage of coffee. This results as much from the capacity of ENCAFE as it does from the type of the product which is suitable for storage.

4.5 Availability of Credit and Interest Rates

Credit is arranged through the National Development Bank (BND). This bank gives credit to small farmers mainly through the mediation and supervision of PROCAMPO while the other big producers carry out their operations with BND directly.

Interest rates vary according to the type of organization that solicits the loan; in accordance with the present politics of the government, the interests are very low for the farmers organized in cooperatives. In more detail, the interest for the agricultural year 79/80 was about 11% for individuals, 8% for CCS and the clubs, and about 7% for CAS respectively. (for a better description of the types of organizations, see 4.8).

From January to August 1980, the total sum of nearly 32 million cordobas was given under supervision of PROCAMPO in the work area (Table 4.5.1).

Table 4.5.1 Credit given to small farmers from January to August 1980 (in thousands of Cordobas)

	JINOTEGA[1] Total	area in Mz	PANTASMA[1] total	area in Mz	LA CONCORDIA[1] Total	area in Mz	TOTAL Total	area in Mz
Individual	3823	1024	1399	697	343	254	5025	1925
CAS	187	122	65	44	-	-	252	166
CCS	586	314	4668	2563	-	-	524	2877
Club	19895	5069	-	-	1629	1000	21525	6069
Total	23952	6529	6132	3304	1972	1254	32056	11087

Source: PROCAMPO, Jinotega, August 1980.

1) The three zones include a wider area than the project area; they are derived from PROCAMPO's zonification, in which Jinotega includes the areas of Sisle and Los Robles and La Concordia includes Sunî.

The crops considered most worthy of credit are beans and maize in La Concordia, maize and coffee in Pantasma, and coffee, maize, fruits and vegetables (especially cabbage and carrots) in Jinotega. The type of crop financed through credit also varies from one year to another.

4.6 Service Institutions

In the region, two governmental institutions exist that work in agricultural extension and investigation respectively: DGTA and PROCAMPO.

DGTA - Jinotega is dedicated principally to the investigation of coffee, fruit and vegetables. For research into coffee, an experimental field station is maintained in Bonetillo, situated to the east of Lake Apanás; while fruit and vegetable investigation is carried out principally in cooperation with farmers in various places. In regards to personnel and vehicles, DGTA has the following resources:

Personnel: 3 Agricultural Engineers[1)]
2 Agronomists

Vehicles: 2 Jeeps

PROCAMPO, active in agricultural extension and in distributing credits to the small farmers, maintains three offices in the project area: in Jinotega, La Concordia, and Pantasma.

In all branches, warehouses exist for the sale of agricultural inputs, tools, and small silos promoted by FAO. PROCAMPO employs the following personnel whose especialization and experience, together with the vehicles at their disposal, are shown in Table 4.6.1.

Table 4.6.1 PROCAMPO's personnel and vehicles in the Jinotega Department

	LA CONCORDIA	PANTASMA	JINOTEGA
Personnel	4	5	9
Especialization	3 in agronomy 1 in marketing	4 in agronomy 1 in marketing	8 in agronomy 1 in marketing
Experience	4 do not have any	2 do not have any 3 between 5-8 years	4 do not have any 5 between 4-5 yrs.
Type of vehicle	1 pick-up truck 2 motorcycles	1 pick-up truck	3 pick-up trucks 2 motorcycles 1 truck

According to the information provided by the PROCAMPO office - Jinotega, the professional level of many of the extension workers is not sufficient. Another factor that limits the efficiency of the service is the frequent absence of the extension workers to attend different courses and seminars. The relationship between extension workers and farmers, counting

1) University graduates in Agriculture.

only those that receive credit by PROCAMPO, is the following:

Table 4.6.2 Extension worker-farmers relationship in the 3 zones of Jinotega

	PERSONNEL	FARMERS	RELATIONSHIP EXTENSION WORKERS/FARMERS
La Concordia	4	577	144
Pantasma	5	954	190
Jinotega	9	2225	247

Source: PROCAMPO, Jinotega.

The relationship between the farmers and the extension workers is in reality worse that what is shown in the table due to the fact that only farmers that receive credit are included.

4.7 Cooperatives

The administration of the present government intends to promote the formation of agricultural cooperatives. In this, two types of organizations can be distinguished: the Sandinista Agricultural Cooperatives (CAS) and the Credit and Service Cooperatives (CCS). The basic difference between the two, is that the members of CAS work together on common parcels of land. The members of CCS on the other hand work on their own land. Sometimes the cooperatives (CCS) are formed especially with the objectives to receive credit with better conditions than the individual farmers. This is also valid for the "credit clubs" (an association of farmers whose aim is to facilitate the obtention of credit).

As an incentive for the formation of cooperatives, the present government offers (on behalf of BND) credit with better conditions to the cooperatives.

In the work area, the cooperatives are distributed according to PROCAMPO' districts as seen in Table 4.7.1.

Table 4.7.1 Number of cooperatives and families

	PANTASMA	JINOTEGA incl. LOS ROBLES/SISLE	LA CONCORDIA incl. SUNI	TOTAL
CAS	2(17)[1)]	5(62)	-	(79) 7
CCS	57(850)	10(190)	-	(1040) 67
Clubs		74(1787)	25(512)	(2299) 99
Total	59(867)	89(2039)	25(512)	(3418) 173

1) The number in parentheses refers to the number of families.
Source: PROCAMPO, Jinotega.

4.8 Channels of Communication

Widespread communication by means of television or by the daily press is not possible with the agricultural population in the region. This is due to the lack of television for economic reasons and the low literacy rate.

Consequently, the only means of communication is radio and personal communication. Many farmers have a radio and can be reached by the regional broadcasting station "Radio PANCASAN", which is located in Jinotega.

Direct communication, is done by visits to the farmer because a trip for the farmer to the central regions (Jinotega, San Rafael) would be costly and difficult. It is often possible to locate many of the farmers in the different towns at meetings of the local and rural organizations (CCS, clubs, CAS, etc.). Communication can also be made with the farmer through the schools of the various villages.

5. Farm Characteristics

Nico van Tienhoven[1)]

5.1 Farm Resources

5.1.1 Family Structure and Labor Resources

As can be seen in Figure 5.1.1.1., the families have an average of about seven persons (7.1). The average in Pantasma is a little lower with 6.7 and the highest in Sunî with 7.8 persons per family.

The data from the survey refers only to the family members who normally live on the farm and does not include others that live outside it (e.g. students).

Of the 233 farmers, 53% have more than 6 and 22% between 4 and 6 persons per family (see Appendix). Men provide most of the family labor; women hardly ever work in the field with the exception of the coffee harvest. The relationship between family labor (adult males) and total persons living on the farm is 1:3,6. However, boys often work in the field too, which would change this relationship.

The existence of hired labor from outside the farm was not included in this questionnaire and will be investigated during the multi-visit survey. Between 70% and 77% of the farmers normally do not work outside their own farm (see Figure 5.1.1.2). The rest rarely work off-farm or only occasionally. It is noticeable that Sunî has more farmers who work outside their farms than the rest of the areas; this can be explained by the average small size of the farms, which limits the possibilities on their own property. The long dry season also permits work with coffee in other areas during the harvest in January and February.

5.1.2 Farm Size

This data has to be considered carefully because it is possible that some farmers declared a smaller area than they really have. The reason for

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1) Agricultural Economist of the CATIE-GTZ Project in Jinotega, Nicaragua.

Figure 5.1.1.1 Family structure in four areas of Jinotega

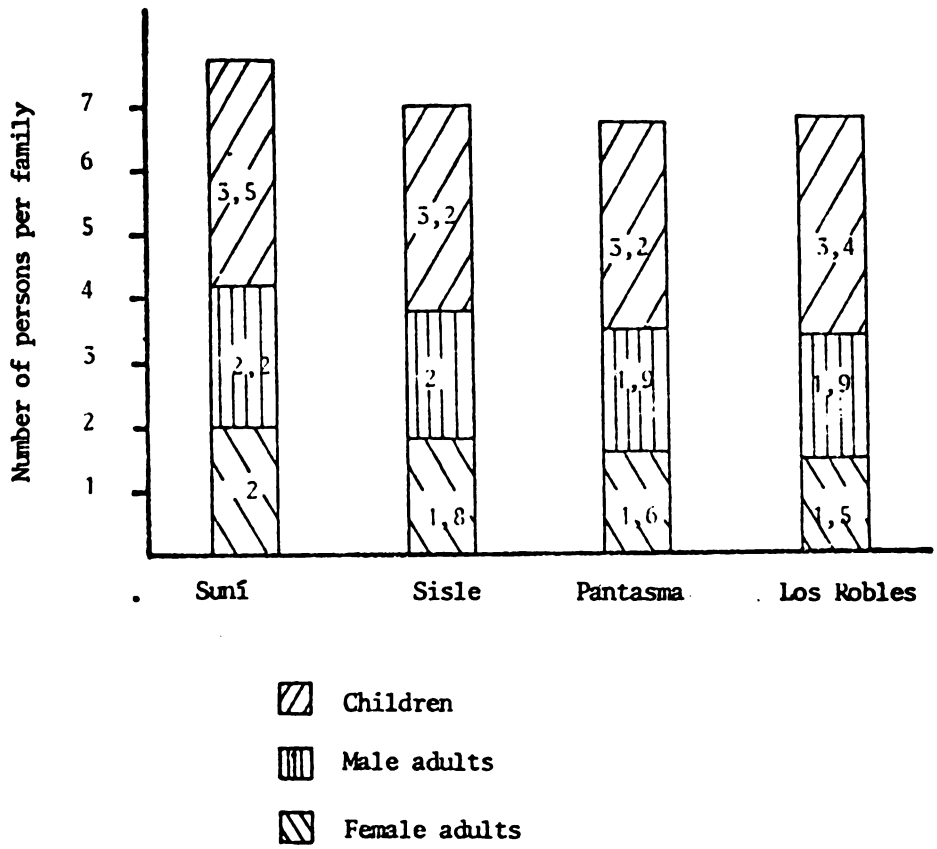
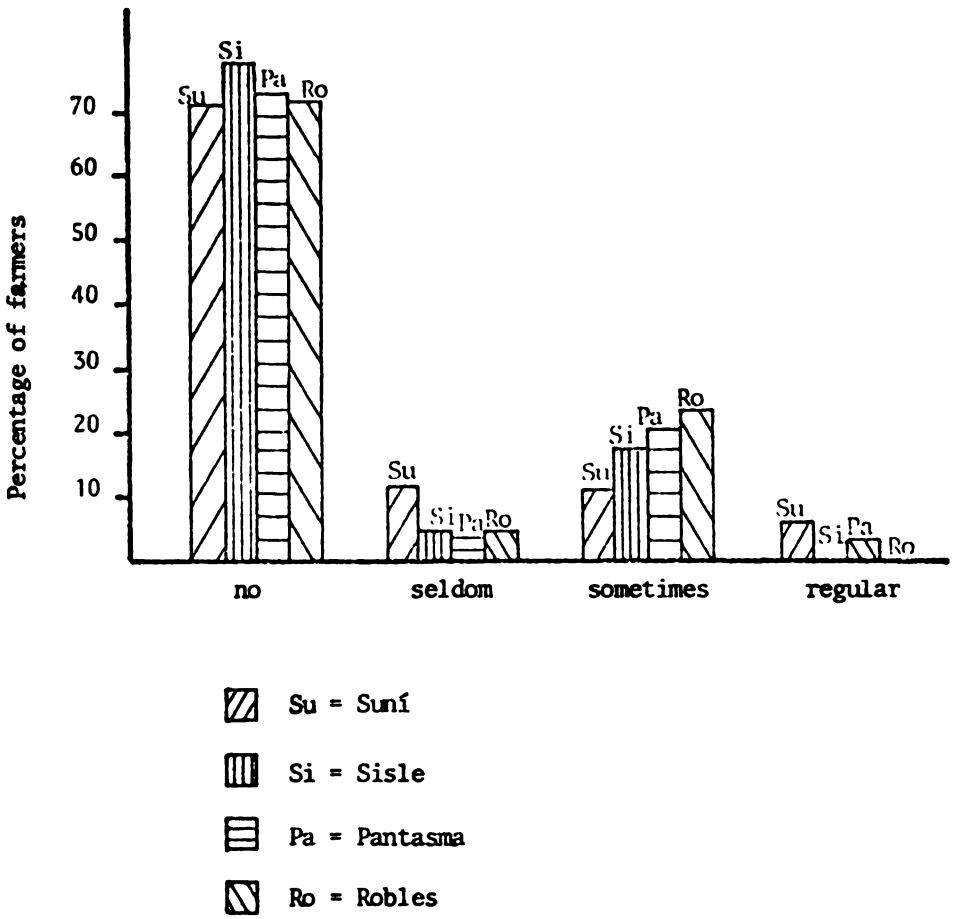


Figure 5.1.1.2 Off-farm work of farmers in four areas of Jinotega



this is their fear that the data would be used to determine taxes. Consequently the data represents minimal size of the farms that in some cases could be larger. On the other hand, the data refers not only to farmer's property but also to the fields under his control, or in other words including the rented land. The size of the farm was obtained from the sum of the parcels and land mentioned by the farmer.

The farmers that were interviewed have an average of 8.7 ha of land. There is a great marked difference between the four areas. The availability of land in the Suní and Sisle areas appears to be similar with an average of about 5 ha per family. This contrasts with that of the Pantasma and Los Robles areas with an average of about 14 has. This information is consistent with results of the analysis about problems encountered by the farmers. "The lack of land" was mentioned many times in Suní and Sisle in comparison to the other two areas of the region (see Chapter 6).

Figure 5.1.2 shows the distribution of the land in the four areas. In Suní, Sisle and Los Robles between 45 and 59% have less than 3 has. The figure for Pantasma is lower with 26%. Great difference exist in the class "more than 10 ha". Only 5% of the farmers of Suní are in this class in comparison with the highest figure of 31% in Pantasma. The land concentration is very great in Los Robles and Pantasma: 17% and 31% respectively have about 80% of the total area.

5.1.3 Farm Capital

Vehicles, machinery, and animal will be considered as capital. Another relatively large inversion is the construction of fences for the pastures and coffee plantations. The collection of data concerning the importance of fences, was not possible during the preliminary survey, but will be included during the multi-visit survey. Figure 5.1.3 shows the percentages of farms that have vehicles and machinery.

Vehicles: There are very few vehicles in the area. For this reason and because of the bad roads, there is a problem with transportation and marketing. Six of the vehicles mentioned are in the Los Robles area, which explains the economic situation of the coffee plantations (95% of the far-

Figure 5.1.2 Frequency distribution of cultivated land in four areas of Jinotega

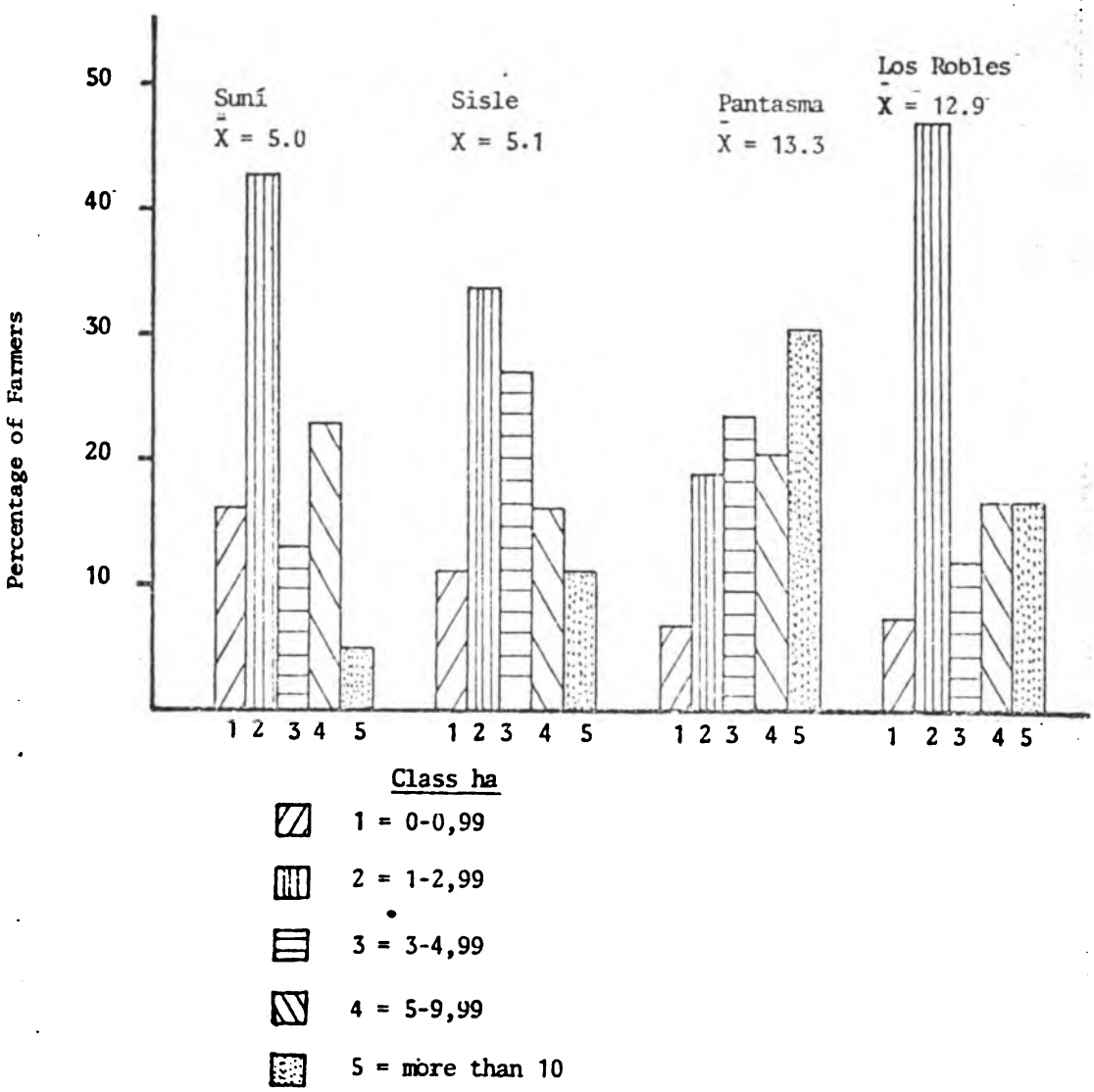
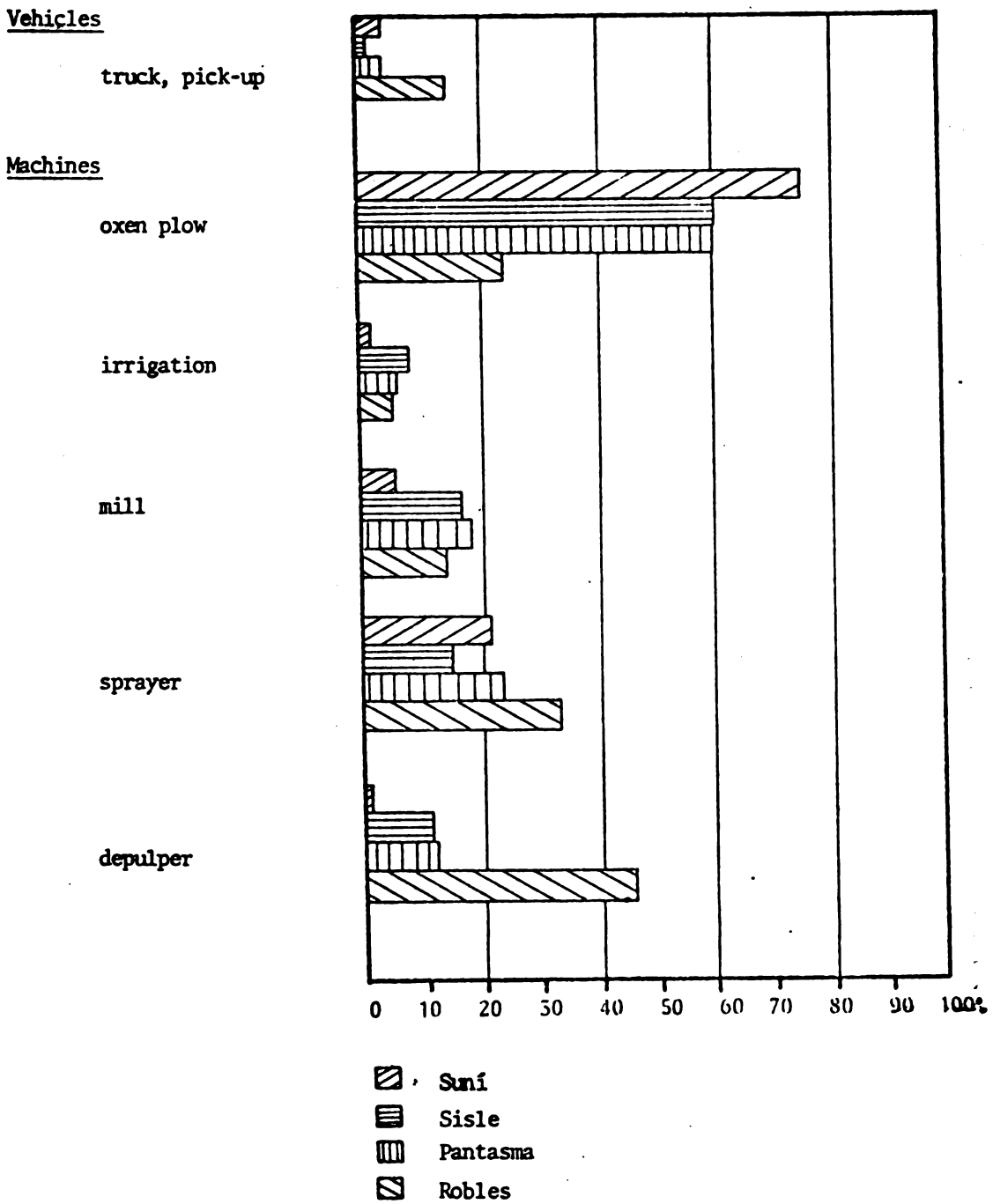


Figure 5.1.3 Percentage of farms that own machines and vehicles in four areas of Jinotega



mers in Los Robles have coffee) that appears to be better than in other areas.

The plow (wooden) is the item of machinery most used except in Los Robles. There the "depulper" is the machine most distributed due to the predominance of the coffee crop. Sprayers are also more common in Los Robles, where the use of inputs (agro-chemicals) is the highest in the region. Furthermore, there are some mills and irrigation installations. There were no tractors in the sample.

Data presented on the number of animals in the areas again represents a minimal figure, rather than actual numbers. This is especially true with regard to pigs and chickens which serve as a form of savings for the farmer, and about which the farmer is reluctant to give information. This assumption is confirmed through the observations of the enumerators.

The distribution of cattle, according to the number of animals per farm is very different among the areas under study (see Table 5.1.3.).

Table 5.1.3 Distribution of cattle per farm in the four areas of Jinotega (in percentages)

Number of animals	A R E A S Suní	Sisle	Pantasma	Los Robles
2 and less	34.4	26.9	16.4	14.3
3-4	34.4	26.9	10.0	21.4
5-7	12.5	15.4	13.3	21.4
8-11	9.4	19.2	26.7	21.4
more than 11	9.4	11.5	33.3	21.4

In Suní and Sisle the most important classes are "2 and less" and "3-4" which shows that the majority own few cattle. The distribution of animals in Los Robles according to number is relatively equal in comparison to Pantasma where the majority of the farmers have more than 8 animals.

5.2 Land Use

5.2.1 General Aspect of Land Use

Sunî: In this area, trees are almost non-existent. Corn, beans, sorghum, millet and onions are the most important crops.

The basic grains are planted in associations. Onions, which were introduced to the area about six years ago, are the most important "cash crop". The pastures in the area are natural and not improved.

Sisle: Although there are trees in the area, there are no big forests. Here a large quantity of different crops are planted. Besides the basic grains (corn, beans) there are a lot of vegetables such as tomatoes, cabbage, peppers, potatoes, and others. Coffee also plays an important role. There is very little pasture in the area. For the crops close to Lake Apanás, irrigation is used. Wheat was introduced during the last few years.

Pantasma: In the Pantasma Valley, corn is the most important crop. There is also tobacco, beans, coffee, and pasture. Near the valley, coffee is very important. There is some forest at the eastern edge of the valley.

Los Robles: Coffee is the most important crop in Los Robles. With this crop, various types of shade trees are used; often banana trees but also various fruit trees. Basic grains are cultivated almost exclusively for home-consumption. In addition, there is a small quantity of sugar cane and some vegetables.

Land use in the four areas studied is found in Table 5.2.1. Annual crops are important in Sunî, Sisle, and Pantasma; between 93% and 98% of the farmers seed an average of 2.4, 2.0, and 4.5 has respectively. The percentage of farmers that cultivate annual crops in Los Robles is a little lower with 71% and an average of 2.1 has.

Coffee and other perennial crops do not exist in the Sunî Valley. The importance of coffee increases from Sisle (58%) to Pantasma (71%) to Los Robles (95%). The cultivated averages of these farmers are 1.2, 1.9, and 2.7 has respectively.

Pastures are very important in all the areas. Between 42 and 49% of

the farmers have grassland of which there is about twice as much in Pantasma and Los Robles as in Suní and Sisle.

Table 5.2.1 Land use in four areas of Jinotega

	SUNI	SISLE	PANTASMA	LOS ROBLES
Annual Crops				
%	95	98	93	71
$\bar{X}$ 1)	2.4	2.0	4.5	2.1
Coffee				
%	-	58	71	95
$\bar{X}$ 1)	-	1.2	1.9	2.7
Other perennial crops				
%	-	11	8	14
$\bar{X}$	-	2.4	2.4	1.0
Pasture				
%	46	42	49	43
$\bar{X}$	5.9	4.3	11.0	12.5
Others				
%	2	8	17	10
$\bar{X}$	0.4	4.3	12.8	35.4

% = percentage of farmers who have this activity

$\bar{X}$ = average area of the farmers who have this activity

1)= the differences between the averages of annual crops and coffee are significant. (F-test)

5.2.2 Annual Crops

The principal annual crops cultivated during the year can be seen in Figure 5.2.2. In Appendix II more detailed information can be found about the area dedicated to each crop and season.

Suní: In the first cropping season, maize, beans, or maize and beans together are planted. The precipitation during the second cropping cycle of the year is lower and uncertain, therefore, the main crops during this season are sorghum and beans. Onions, as a cash crop, are produced in the two cultivation cycles. The dry season is well defined and long, and without irrigation nothing can be produced.

Sisle: In this area, there is not a very pronounced dry season. Consequently, production is possible during the entire year. Maize is sown principally in the first season; in the second season, it does not grow well because there is too much rainfall. Maize stays in the field until October. Beans are planted at the end of November and can be harvested in February.

Vegetables such as cabbage, tomatoes, peppers, lettuce, and potatoes are planted during the 3 planting seasons, although the third season (apante) is less important.

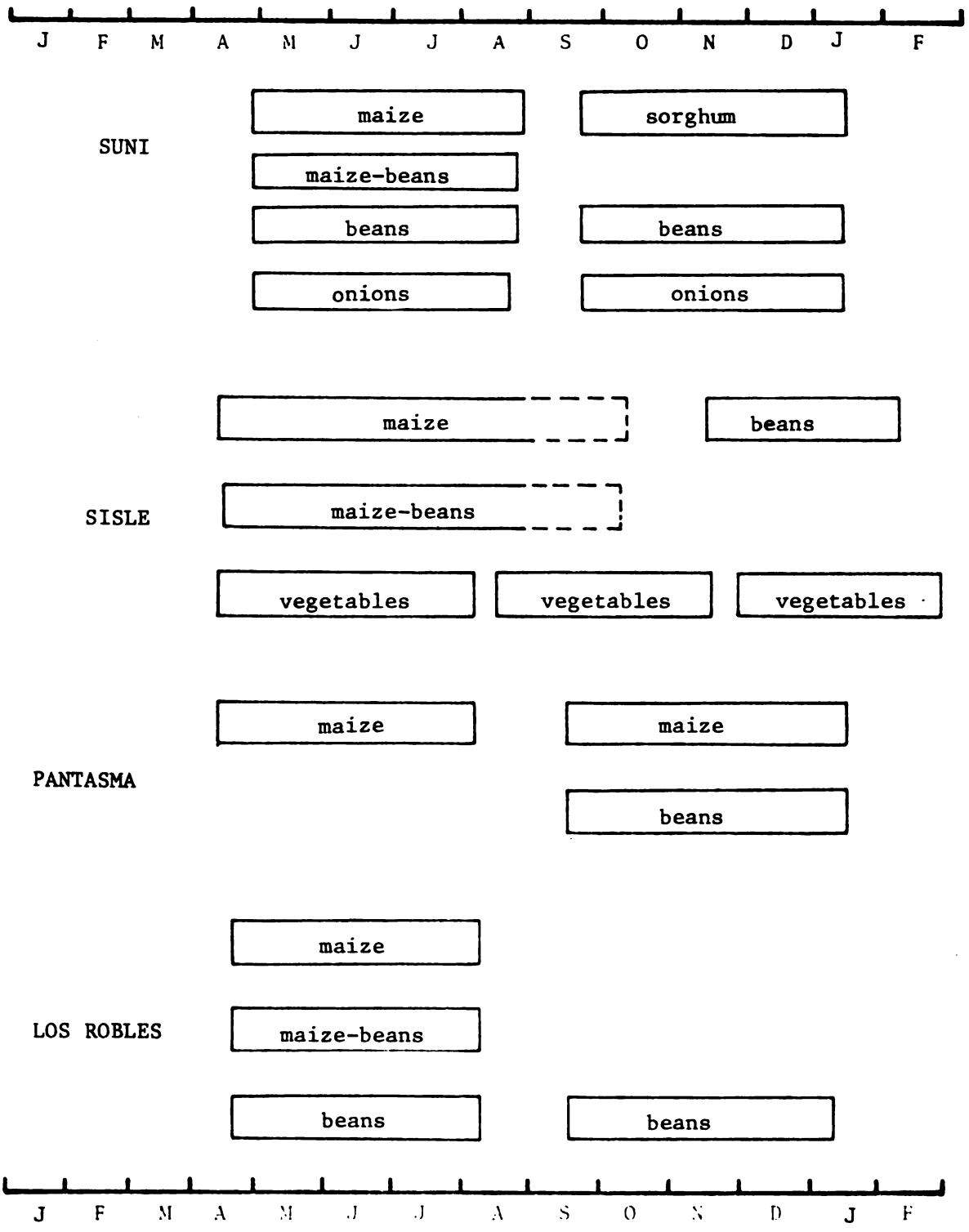
Pantasma: Maize predominates in this area which is sown in April/May by 81% of the farmers and by 61% in September/October. Some also plant maize during the dry season. Beans are the second most important annual crop, which is mainly planted in the second cycle. Planting of maize and beans in association is not common in this area, nor are vegetables.

Los Robles: In general annual crops are not very important in Los Robles. Maize and maize-beans together are planted principally in April/May. Monoculture are planted in the two seasons of the year. There are a few fruits and vegetables around the lake.

5.2.3 Perennial Crops

In Suní, there are no perennial crops, while coffee is the most impor-

Figure 5.2.2 Time sequence of Annual Crops in four areas of Jinotega



tant crop in the other areas; in which about 57% (Sisle) and about 69% (Pantasma) and about 95% (Los Robles) of the farmers grow coffee with an average area per farm of 1.2, 1.9, and 2.7 ha respectively. In Los Robles coffee is the most important of all the crops.

Other permanent crops in the region are bananas, plantains and citrus. All are found as shade trees for coffee especially in gardens near the house. The distribution of bananas, plantains and citrus for the interviewed farmers is about 10% (15%) in Sisle, about 38% (7%) in Pantasma, and about 41% (21%) in Los Robles respectively.

5.3 Technology

Javier Icaza G., Francisco Dávila G., and Guadalupe Rivera G.[1)]

5.3.1 Annual Crops

The technology used for maize and bean production can be distinguished as: traditional and semi-technical.

5.3.1.1 Maize

Planting date: First season (May-August), second season (September-December), and in some places such as El Mojón exists a third season (December-March).

Traditional technological level: Practically 80% of this area corresponds to this technological level. This consists of: clearing and cleaning the land, planting with a stick or with ox and plow, weed control with machete at about 22 or 30 days after planting. Neither fertilizer nor insecticide is applied. The average yield per manzana is low, varying between 15 and 20 quintales.

Semi-technical level: About 20% of the area is at this level. The cultural practices are: clearing the land, plowing with oxen (2 times) manual weeding about a month after planting. Fertilizers and insecticides are applied moderately. Fertilization consists of applying 1 quintal of N-P-K (10-30-10 or 12-24-12) and 1 quintal of urea (46% nitrogen) at the moment of seeding; some apply only complete fertilizer at this time. The variety of maize most used is "creole". Nevertheless, some farmers use X-107, B-666, and "Máquina", the latter being the most widespread. However, with some improved varieties, there is a problem that the husk does not cover the end of the cob, provoking losses by the rotting of the grain.

Beans: Planting data: First, second, and third season.

Traditional Technological Level: This basically consists of clearing the land and scattering the seed. In the humid zones, seed is scattered

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1) Agronomist of the CATIE/GTZ Project, Agronomist from DGTA (Horticultural Section) and Agronomist from DGTA (Coffee Section).

in the weed stand which is often cut to cover the seeds, thus permitting the emergence of the plants.

Planting with a stick or with the plow is suitable in the dry zones. Weed control is carried out during the first month of crop development. Fertilizers are not applied nor are the pests and diseases controlled.

Semi-technical Level:

This is characterized by: clearing the land, plow with oxen (2 times), and application of 1 quintal of complete fertilizer (18-46-0 , 12-24-12 , or 17-44-3) at the moment of planting. Insecticides are used to control the pests and seldomly are fungicides applied.

Maize-Beans: With this type of association, the technical level employed is semi-technical as described above.

Potatoes: In relationship to the other crops, the technical level of the potato is semi-technical with variant A and B.

Semi-Technical Variant "A"

The land is plowed with oxen (3 times by plow) and cultivation practices such as weed control and side dressing are conducted one to two times. The use of agro-chemicals (fertilizers, insecticides, fungicides) is moderate.

Fertilization consists of applying 5 to 8 quintales of 15-15-15 or 10-30-10 at the moment of transplanting and 1 quintal of urea about 30 days after transplanting.

Semi-Technical Variant "B"

This consists of 3 times plowing with oxen and the cultivation practices such as: weed control and side dressing at a greater intensity compared to variant A. The doses of fertilizers are high and pest and disease control is intense, although in some cases it is not done at the most appropriate time. At both technical levels, the varieties most used are Azzimba and Kennebec.

5.3.2 Perennial Crops

Coffee: In the project area, coffee is cultivated in a traditional or semi-technical form.

Traditional Technological Level:

The variety used is "Typica". The distances for planting are 3x3 (1111 plants/ha), 4x3 (833 plants /ha), and 4x4 m (625 plants/ha).

Semi-Technological Level: Pests and diseases are not controlled nor is fertilizer used. Pruning, weeding, and regulation of shade is carried out. Small and average farmer use this technological level.

5.4 Use of Inputs

5.4.1 Use and Knowledge of Inputs

The distribution in the use of inputs in the four areas can be seen in Figure 5.4.1.

The utilization of improved seed is quite low and varies between 7 and 20%. Problems with seeds will be discussed in detail in the following chapter. The use of herbicides and other agro-chemicals such as insecticides and fungicides is low with an average of about 20 and 30% respectively. Although some of the farmers sometimes use stated inputs, there are often problems in the application of these. The lack of knowledge in the correct application appears to be a big limitation.

It was not asked about other inputs in the survey, such as animal feed. According to informal conversations, this type of input is not very important in the Jinotega region. The basic nourishment for the animals is still provided from the farm (bananas, basic grains, fruits, pasture).

In general, it can be said, that the utilization of purchased inputs is quite low, especially on small farms. The average size of farms which are using and those ones not using various inputs are significatly different as shown in Table 5.4.1.

Figure 5.4.1 Use of inputs in four areas of Jinotega

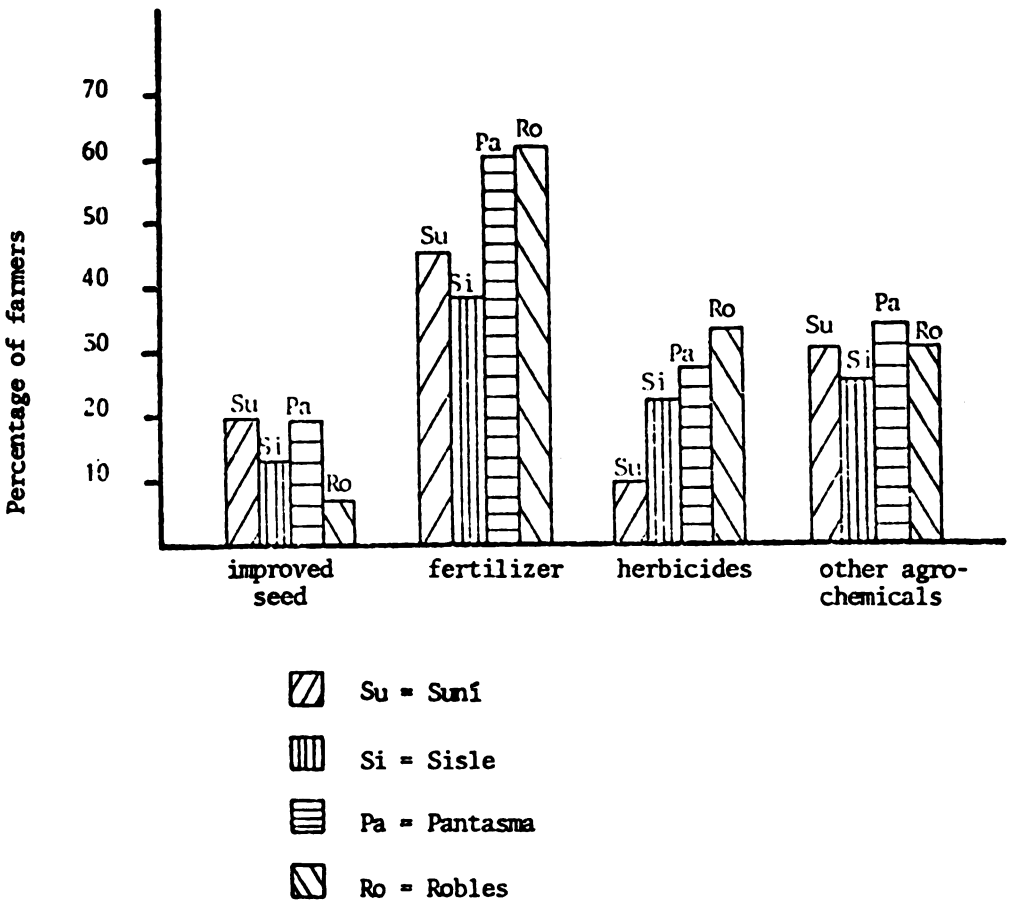

Table 5.4.1 Average of the total size of land with Annual Crops[1] distinguished from farmers that use and do not use various inputs.

	USE OF INPUTS			
	Yes	No	Value of F	
Improved seed	18.8	8.7	3.21	*
	4.3	2.3	11.72	***
Fertilizer	14.1	6.3	9.46	***
	3.1	2.1	5.82	**
Herbicides	20.5	7.3	7.35	***
	3.6	2.3	5.90	**
Other agro-chemicals	17.5	7.0	5.78	**
	3.5	2.2	8.52	***

1) First line: $\bar{X}$ of total size

Second line: $\bar{X}$ of land with annual crops

* significant, 10%

** significant, 5%

*** significant, 1% probability

5.4.2 Limiting Factors in the Use of Seeds

Jan Engels[1)]

Farmers have not yet recognized the problems with respect to the general use of seed (8), however, there are limiting factors.

In spite of the fact that an infrastructure has been organized for the production and distribution of seeds (4), it can not be judged due to scarcity of information and the changes made after the revolution. It has been shown by the experience in the field of production and distribution of adapted seeds (1,5) that the private enterprises generally function better than the government enterprises. It is obvious that the certification and control of seeds have to be in the hands of the State.

According to the information obtained, the production of basic grain seed (maize, sorghum, beans, and rice) is controlled by the institution PROAGRO. It is not known yet if PROAGRO is responsible for control during the production and certification. According to Echandi and González (4) DGTA has this function. The organization PROCAMPO is in charge of the distribution and sale of the seeds. This institution also assists the farmers with such matters as "How to treat seeds" and "What seed density is recommendable" in base of the germination trials. If the germination is less than the acceptable limits, then they can stop the sale or increase the seed quantity per unit price with the recommendation to plant higher populations. Under normal conditions, it is not recommendable to sell seeds of low viability. The only way to convince the farmers to use certified seeds is to offer good seeds that give better results. The price aspect for the seeds seems to be good; certified seed is sold for more (>50%) than seeds for consumption such as beans and maize.

Presently, farmers use their own seeds, kept from the last harvest. There are exceptions such as beans (little certified seed of the H 46 variety) and maize (bad quality seed, variety La Máquina 7422) which PROCAMPO sells. Vegetable seeds are generally imported (tomato, carrot, onion, potatoes, garlic, lettuce, cabbage, cucumber, pea, etc.), but now a project

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1) Specialist in Genetic Resources, CATIE, Turrialba.

(Chinese) has been established for the seed production for vegetables.

The main problem with using farm seed is storage: lack of favorable conditions for storage could be solved with the construction of small warehouses (a FAO project is working on this). The selection of seeds in the fields could be improved with an extension campaign. Table 5.4.2.1 shows the quality of seeds gathered in various sites of the region. The majority of the samples were recently harvested.

Table 5.4.2.1 Germination and percentage of seed purity kept for the April/May planting in 1981.

Crop	Variety	Origin	% of germination after about 7 days	% of inert material[1)]
Bean	Gualiceño	Suní	80.0	4.3
Bean	Mono	El Mojón	62.6	0.0
Bean	Rojo	Namanjí	82.4	1.9
Sorghum	Millón[2)]	Suní	56.0	5.0
Maize	Malaco	San Marco	97.3	0.3
Maize	Monochito	Sisle	95.2	1.9
Maize	Tusa morada[3)]	El Mojón	50.4	4.8

1) This column includes the percentage of inert materials and parts of seeds not viable.
2) General name for creole variety
3) Some corn husks were collected from a population with white and purple types.

Conclusions:

- The farmers mostly use their own seeds, in general, from non-improved creole varieties.
- Vegetables seeds are generally improved and frequently imported.
- The germination of beans is relatively low (about 80%); for maize quite good, with one exception; and for sorghum very low.

- In future years, a great improvement in the situation of certified seed production can not be expected. There is a scarcity of basic seeds despite cooperation from the international agricultural institutions (like CIAT and CIMMYT).

- The farmers ought to know that certified seeds are advantageous despite their high price. This awareness can be increased through demonstration plots on farmers' fields.

5.5 Labor Peaks on the Farms

Labor peaks (see Figure 5.5) are encountered principally during land preparation in May, the second planting in October and the coffee harvest between November and January. These peaks seem to be a serious limitation for production, considering that most of the work is done manually.

5.6 Sale of Agricultural Products

In order to obtain an idea about the relative importance of farm products as sources of cash income, a question was included about the sale of different crops (Table 5.6). The annual crops are mainly produced for self-consumption, but one needs to differentiate between the areas and the crops.

Maize is mainly produced for self-consumption in Suní, Sisle, and Los Robles. In Pantasma about 24% sell the "majority" and 49% "a little" of their maize production.

22% and 21% of the farmers in Suní and Pantasma respectively sell the majority of beans, and 55 and 48% "a little". In Los Robles the bean production is distinctly used for self-consumption. These figures are consistent with the areas sown to the crops in the studied areas.

Vegetables and coffee are produced principally for sale and therefore are not included in the table. Farmers that produce plantains, bananas, and citrus sell only small quantities.

Figure 5.5. Labor peaks in four areas of Jinotega

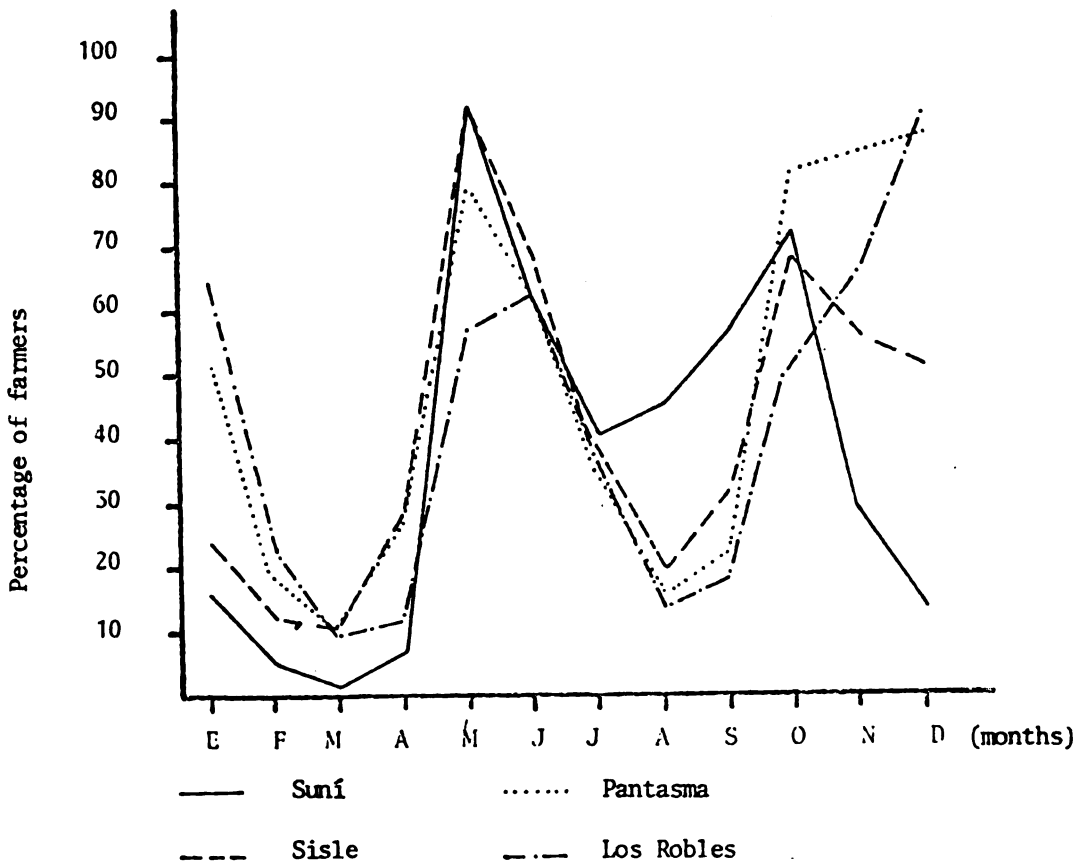

Table 5.6 Sale of Annual Crops (in %)

	A R E A S			
	SUNI	SISLE	PANTASMA	ROBLES
Maize:				
majority	6	2	24	4
little	22	23	49	11
nothing	72	75	27	86
Beans:				
majority	22	3	21	0
little	55	35	48	17
nothing	23	62	31	83

6. Problems encountered by the farmers

Johannes Lagemann[1)]

The greatest problems, according to the farmers interviewed, are listed in Table 6.1.

It is evident that pests present the greatest problem for farmers in all the areas. Without control insects rapidly attack the plants and the losses are quite visible. The lack of technical assistance is the second major problem in the areas of Sunî, Sisle, and Pantasma. In Los Robles, the farmers do not believe that the lack of technical assistance is very great.

The availability of land in Sunî and Sisle is much less in comparison to Pantasma and Los Robles. Consequently, the farmers in Sunî and Sisle feel more the lack of inputs such as fertilizers, credit, etc., and the lack of resources such as land and oxen.

These responses are typical of the small farmers that produce mainly for self-consumption, have few resources, can not benefit from a good infrastructure, and receive little help in their daily problems.

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1) Agricultural Economist and Coordinator of the CATIE/GTZ Project.

Table 6.1 Greatest agricultural problems according to the farmers in four areas of Jinotega.

	Percentages of farmers[1]			
	SUNI	SISLE	PANTASMA	LOS ROBLES
Lack of technical assistance	28	36	34	17
Pests	39	44	54	45
Diseases	0	16	9	21
Lack of fertilizer	20	29	12	17
Lack of credit	10	13	3	5
Transportation and market.	10	15	15	10
Lack of land	23	13	7	7
Lack of oxen	13	10	5	7
Lack of agro-chemicals	5	10	0	2
Lack of tools	2	7	3	5

1) Up to three replies per farmer.

7. Conclusions

Johannes Lagemann[1)]

The previous chapters represent a basic inventory on the region's environment, the resources, and characteristics of the farms. In regard to development of innovations and their distribution, the question should be asked: "What are the greatest limitations affecting maximum use of the existent resources"?

These limitations have already been indicated in the text, but they are clearer when presented together in a table according to the different types:

Table 7.1 Limitations in the agricultural production in the Jinotega region

Type of limitations	Specification
1) Physico-Biological	
a) Climate	- large variation in annual precipitation
	- well defined dry season in Suní
	- danger of excess water between September and November in Sisle
b) Topography	- areas with very hilly relief in the area of Sisle
c) Soils	- deficiency in phosphorus
d) Pests	- the slug (*Vaginulus plebeigus*) constitutes a serious problem for beans
2) Socio-Economic	
a) Physical and Social Infrastructure	- access to the Suní Valley difficult in the rainy season

1) Agricultural Economist and Coordinator of the CATIE-GTZ Project.

- bus service non-existent or very poor
- no electricity in any of the four areas
- bad supply of drinkable water
- the need for health centers
- lack of schools, and especially teachers

b) Marketing
- big price fluctuation for vegetables
- lack of fixed contracts for the sale of vegetables
- lack of information about the market prices

c) Inputs
- lack of sufficient quantities of improved seed for basic grains
- greatly increased prices for fertilizer and agro-chemicals

d) Credit
- limited credit availability for the small farmer; not sufficient in comparison to the demand

e) Service institutions
- too many farmers per extension worker
- lack of field training and experience of many extension workers
- scarcity of vehicles and materials

3) Resources

a) Land
- limited availability of land, especially in Sunî and Sisle (56% of the farmers have less than 4 has)

b) Labor
- limited labor during peak work periods,

c) Capital
- limited possibility of auto-financiation for inputs. Farmer poverty very high

4) Technology

a) Annual crops
- activities such as clearing, planting, and weeding done manually
- rapid growth of weeds
- lack of knowledge of dose and form of application of fertilizers
- low population of maize
- low germination of farmer seed
- inadequate storage

b) Perennial crops
- old plantations with low productivity
- lack of maintenance on the plantations, especially with regulation of shade, fertilizer and pruning
- lack of knowledge about combating pests and diseases.

The list of the limitations is substantially large, and it is not possible to solve all of them. Therefore the limitations need to be divided into 2 groups.

1. Environmental Factors

- Physical environment
- Socio-economic environment
- Farm resources

2. Management Factors

- Agricultural enterprises
- Land preparation
- Cropping pattern in time and space
- Crop rotation
- Pasture management
- Varieties
- Fertilization
- Pests and disease control

1. The environmental factors are exogenous factors, that is they are outside the farmer's control. Within the socio-economic environment, the bad infrastructure and the insuficiency of technical assistance seem to be the greatest limiting factors.

2. The management factors (endogenous factors), are under the farmer's control and they are also the most important factors for the extension-workers and investigators. For the annual crops, pest and weed control seem to be the greatest limitation. The low yields are often the result of the insufficiency of this control.

With perennial crops (in this case coffee), old plantations with low-productive varieties, and the lack of management of the plantations, appear to be the biggest limitations. The potential of the new varieties is good. According to information from DGTA there are many farms in the area that produce 50-60 qq of oro/manzana with new varieties and good management. This is about 6-8 times higher than production in the traditional system.

These conclusions ought to be treated as preliminary. There is still not enough information about the management factors in the four areas of the region and information is especially lacking about the production and productivity of the different agricultural enterprises and of the farms in total. This information will be collected during the multi-visit survey with about 70 farmers from the region and with exploratory experiments.

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APPENDIX I

Table 1

Climatic Data of Jinotega

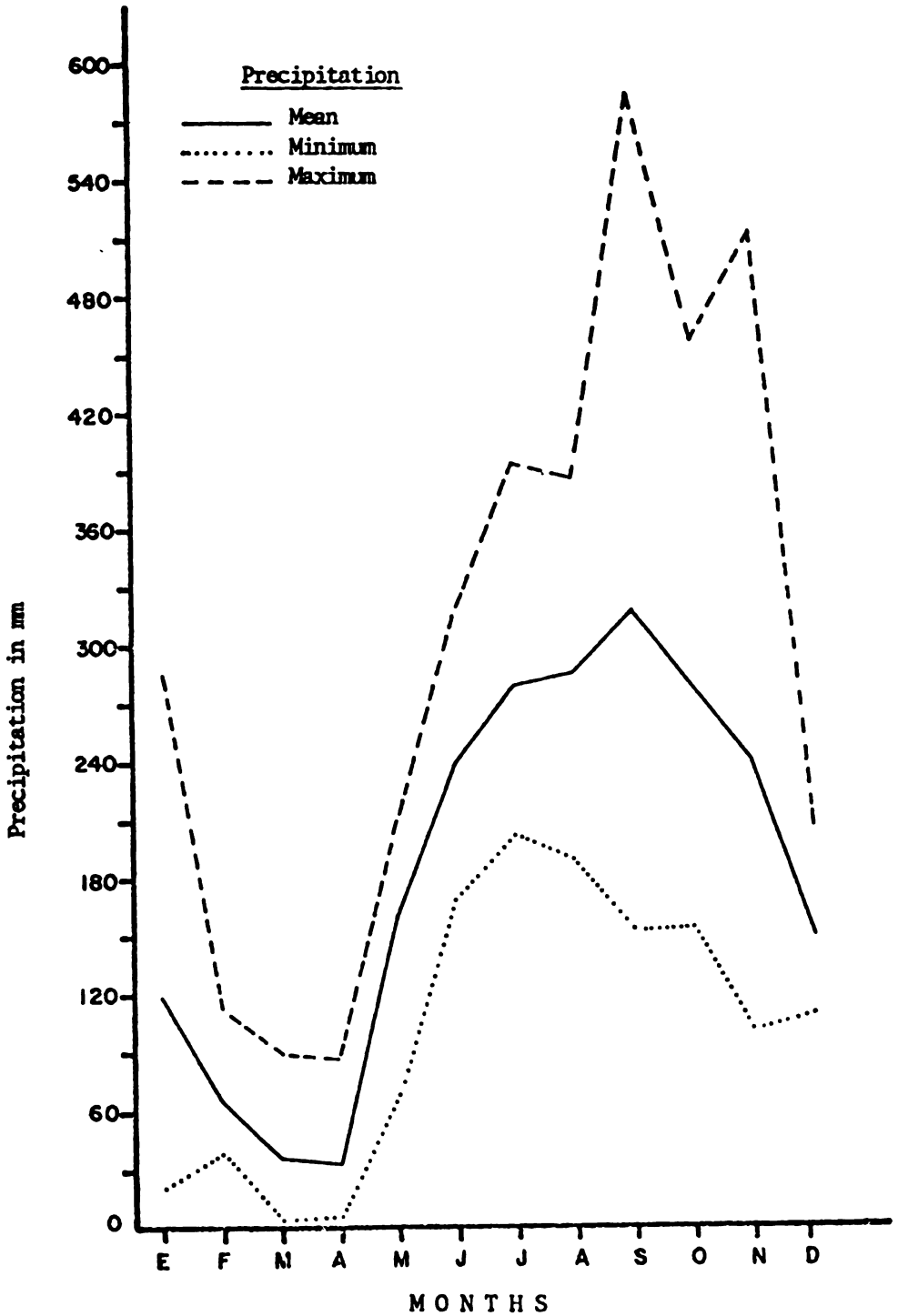
Altitude: 1038 m

Data: Means from 10 years

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Precipitation	39	23	11	11	140	135	148	123	164	213	57	44	1163
Temperature	20,5	21,0	22,1	22,7	22,1	21,0	21,6	21,0	20,5	20,5	19,9	19,9	21,1
Rel. Humidity	78	77	75	69	76	88	85	85	86	85	84	83	81
Potential Evapotranspiration	117	118	149	162	158	137	136	135	123	120	106	105	1554

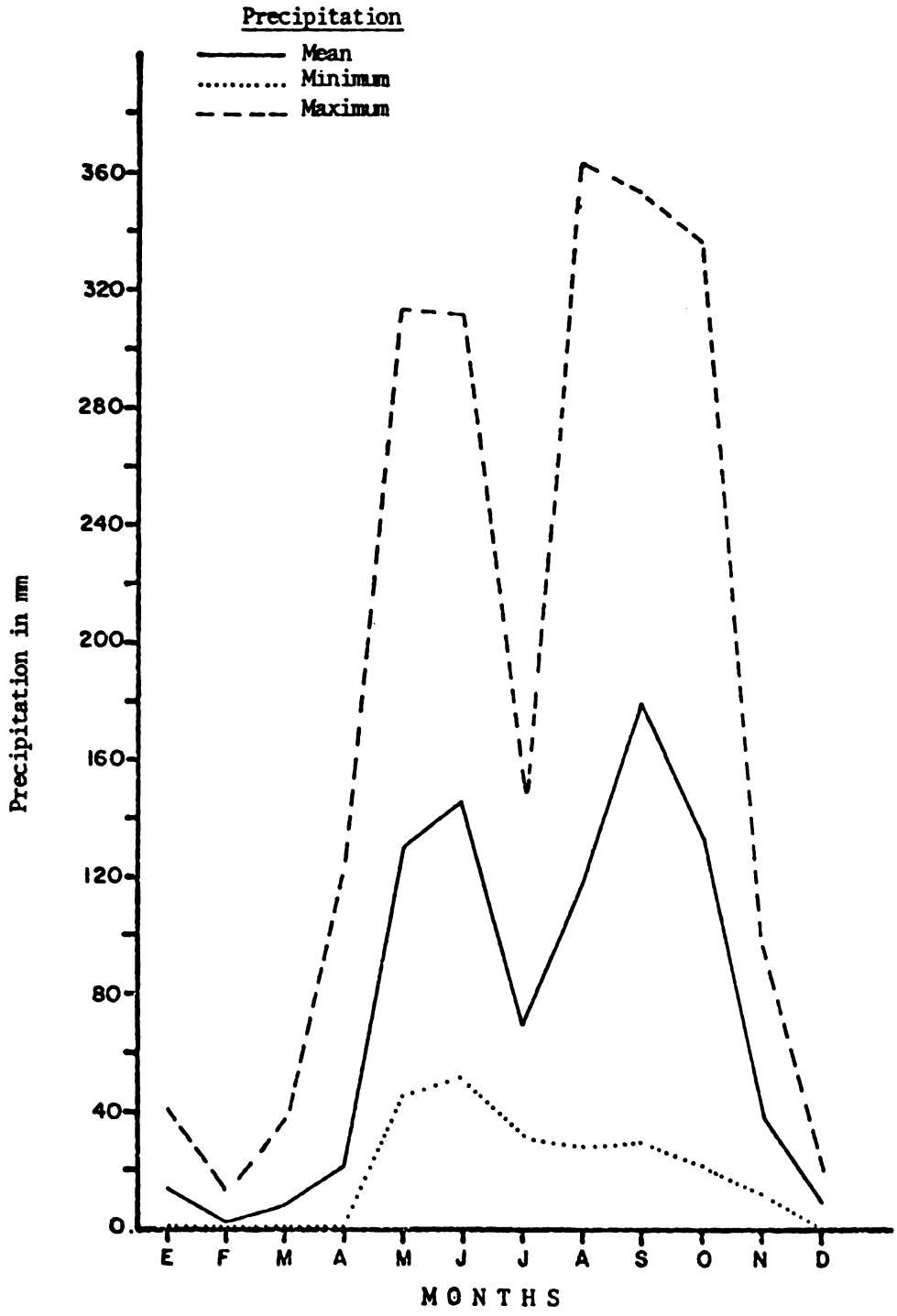
Source: Utah State University, op. cit.

Figure 1: Precipitation in La Porra (altitude: 1020 m); years of observation: 5



Source: INE

Figure 2: Precipitation in La Concordia (altitude 900 m); years of observation: 10



Source: INE

APPENDIX II

Table 1: Family Structure, Means

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of farmers	61	62	59	42	9	233
Persons per family	7.8	7.0	6.7	6.8	7.3	7.1
Men*	2.2	2.0	1.9	1.9	2.8	2.0
Women*	2.0	1.8	1.6	1.5	1.6	1.7

*More than 14 years old

Table 2: Off-farm work

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of farmers	61	62	59	42	9	233
No ----------N	43	48	43	30	8	172
Porcent:	70.5	77.4	72.9	71.4	88.9	73.8
Seldom ---------N	7	3	2	2	0	14
Porcent:	11.5	4.8	3.4	4.8	0	6.0
Sometimes ------N	7	11	12	10	1	41
Porcent:	11.5	17.7	20.3	23.8	11.1	17.6
Regularly ------N	4	0	2	0	0	6
Porcent:	6.6	0	3.4	0	0	2.6

Table 3: Use of Land
Number and Means of Farmers

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Total farm size ----ha	5.0	5.1	13.3	12.9	8.8	8.7
Annual Crops--------N	58	61	55	30	9	213
Mean :	2.4	2.0	4.5	2.1	3.4	2.8
Coffee ----------N	0	36	42	40.0	0	118
Mean :	0	1.2	1.9	2.7	0	1.0
Other perennial crops----N	0	7	5	6	4	18
Mean :	0	2.4	2.4	1.0	0	1.9
Pasture ----------N	28	26	29	18	4	105
Mean :	5.9	4.3	11.0	12.5	12.2	8.3
Other ----------N	1	5	10	4	0	20
Mean :	4	4.3	12.8	35.4	0	14.6

Table 4: Vehicles and Machines
Number of Owners and Percentages

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Vehicles						
Pick-Up	2	1	2	6	0	11
Porcent:	3.3	1.6	3.4	14.3	0	4.7
Motorcycle	0	0	0	0	0	0
Porcent:	0	0	0	0	0	0
Machines						
Tractor	0	0	0	0	0	0
Porcent:	0	0	0	0	0	0
Plough	45	37	35	10	7	134
Porcent:	73.8	59.7	59.3	23.8	77.8	57.5
Irrigation	1	5	4	3	2	15
Porcent:	1.6	8.1	6.8	7.1	22.2	6.4
Mill	4	11	11	6	0	32
Porcent:	6.6	17.7	18.6	14.3	0	13.7
Sprayer	13	9	13	14	4	22.7
Porcent:	21.3	14.5	22.0	33.3	44.4	22.7
Depulper	1	7	7	19	0	34
Porcent:	1.6	11.3	11.9	45.2	0	14.6
Other	1	1	3	6	0	11
Porcent:	1.6	1.6	5.1	14.3	0	4.7

Table 5: Livestock
Farms with livestock and means of animals

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Cattle ----------	32	26	30	14	4	106
Mean	5.8	5.8	15.3	17.6	12.0	10.4
Beef cattle--------	12	9	15	7	0	43
Mean	3.8	4.6	17.1	19.1	0	11.6
Dairy cattle ------	22	23	27	13	3	90
Mean	2.7	2.8	5.1	4.4	6.0	3.0
Draft animals -----	18	15	14	7	4	58
Mean	3.2	2.7	5.1	8.0	7.5	4.4
Horses ----------	28	18	23	14	6	91
Mean	1.7	2.1	2.3	3.9	3.3	2.4
Pigs ----------	40	27	30	27	4	130
Mean	2.4	1.4	2.1	1.7	1.5	1.9
Chicken ----------	43	53	51	39	7	193
Mean	7.6	8.0	12.3	11.3	10.0	9.8
Others ----------	0	0	1	4	0	5
Mean	0	0	0.0	2.5	0	3.6

Table 6: Number and Percentage of Farmers with Annual Crops

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Maize ----------	54.0	61.0	55.0	28.0	9.0	207.0
Porcent:	88.5	98.4	93.2	66.7	100.0	88.8
Beans ----------	60.0	60.0	42.0	23.0	9.0	194.0
Porcent:	98.4	96.8	71.2	54.8	100.0	83.3
Sorghum ----------	17.0	.0	.0	.0	.0	17.0
Porcent:	27.9	.0	.0	.0	.0	7.3
Millet ----------	21.0	.0	.0	.0	.0	21.0
Porcent:	34.4	.0	.0	.0	.0	9.0
Onions ----------	28.0	4.0	.0	.0	.0	32.0
Porcent:	45.9	6.5	.0	.0	.0	13.7
Cabbage ----------	1.0	18.0	.0	2.0	3.0	24.0
Porcent:	1.6	29.0	.0	4.8	33.3	10.3
Lettuce ----------	.0	8.0	.0	1.0	.0	9.0
Porcent:	.0	12.9	.0	2.4	.0	3.9
Tomato ----------	.0	8.0	.0	1.0	2.0	11.0
Porcent:	.0	12.9	.0	2.4	22.2	4.7
Carrots ----------	1.0	.0	.0	.0	.0	1.0
Porcent:	1.6	.0	.0	.0	.0	.4
Others ----------	.0	4.0	3.0	1.0	3.0	11.0
Porcent:	.0	6.3	5.1	2.4	33.3	4.7

Table 7: Sale of most important Annual Crops
Number and porcentage of farmers with the answer: majority, little, nothing.

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Maize ----------	54	61	55	28	9	207
Sales: majority	5.6	1.6	23.6	3.6	.0	8.7
little	22.2	23.0	49.1	10.7	11.1	27.5
nothing	72.2	75.4	27.3	85.7	98.9	43.8
Beans ----------	60	60	42	23	9	194
Sales: majority	21.7	3.3	21.4	.0	.0	12.4
little	33.0	35.0	47.6	17.4	11.1	40.7
nothing	23.3	61.7	31.0	82.6	88.9	46.9
Sorghum ----------	17	0	0	0	0	17
Sales: majority	29.4	.0	.0	.0	.0	29.4
little	47.1	.0	.0	.0	.0	47.1
nothing	23.5	.0	.0	.0	.0	23.5
Millet ----------	21	0	0	0	0	21
majority	23.8	.0	.0	.0	.0	23.8
little	42.9	.0	.0	.0	.0	42.9
nothing	23.5	.0	.0	.0	.0	33.3
Onions ----------	28	4	0	0	0	32
Sales: majority	96.4	100.0	.0	.0	.0	96.9
little	.0	.0	.0	.0	.0	.0
nothing	3.6	.0	.0	.0	.0	3.1

Table 8: Destiny of Sales of Annual Crops

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	39	42	9	233
Middle men ---------	26	25	17	4	6	78
Porcent:	49.1	69.4	59.3	44.4	100.0	53.1
ENABAS ----------	27	6	23	2	0	58
Porcent:	50.9	16.7	53.5	22.2	.0	39.5
Direct sale --------	8	9	6	2	0	24
Porcent:	15.1	22.2	14.0	22.2	.0	16.3
Other ----------	1	1	3	1	0	6
Porcent:	1.9	2.8	7.0	11.1	.0	4.1

Table 9: Use of land during the year
Number and means of farmers

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Maize ----------	16	29	54	23	5	127
Mean	1.3	1.3	4.7	2.0	2.2	2.9
First season -----N:	16	29	48	21	5	119
Mean	1.2	1.3	3.0	1.4	2.1	2.8
Second season ----N:	2	3	36	8	2	51
Mean	.9	.6	2.9	2.0	.4	2.5
Dry season -------N:	0	0	3	0	0	3
Mean	.0	.0	1.0	.0	.0	1.0
Bean ----------	32	45	36	17	3	133
Mean	1.5	1.0	1.1	.6	.5	1.1
First season -----N:	18	10	6	8	2	44
Mean	1.4	.6	.5	.6	.4	.9
Second season ----N:	23	42	34	9	2	110
Mean	.9	.9	1.0	.7	.4	.9
Dry season -------N:	0	0	0	0	0	0
Mean	.0	.0	.0	.0	.0	.0
Maize/Bean --------	42	36	4	9	6	97
Mean	1.7	1.4	1.2	1.3	1.5	1.5
First season -----N:	41	33	4	8	5	91
Mean	1.5	1.4	1.2	1.4	1.6	1.4
Second season ----N:	8	6	0	1	1	16
Mean	1.4	.9	.0	.7	.7	1.1
Dry season -------N:	0	0	0	0	0	0
Mean	.0	.0	.0	.0	.0	.0
Sorghum ----------	30	2	0	0	0	32
Mean	1.4	1.6	.0	.0	.0	1.4
First season -----N:	15	1	0	0	0	16
Mean	1.3	.7	.0	.0	.0	1.3
Second season ----N:	16	2	0	0	0	18
Mean	1.3	1.2	.0	.0	.0	1.3
Dry season -------N:	0	0	0	0	0	0
Mean	.0	.0	.0	.0	.0	.0

Table 10: Number and percentage of farmers with perennial crops

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Coffee ----------	0	35	41	40	0	116
Percent	.0	56.5	69.5	95.2	.0	49.8
Plantain ----------	0	0	3	1	0	4
Percent	.0	.0	5.1	2.4	.0	1.7
Banana ----------	0	6	19	16	0	41
Percent	.0	9.7	32.2	38.1	.0	17.6
Citrus ----------	0	9	4	9	0	22
Percent	.0	14.5	6.8	21.4	.0	9.4
Others ----------	0	1	2	0	0	3
Percent	.0	1.6	3.4	.0	.0	1.3

Table 11: Sale of most important perennial crops
Number and percentage of farmers with the answer: majority, little, nothing.

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Coffee ----------	0	35	41	40	0	116
majority	.0	42.9	78.0	90.0	.0	71.6
little	.0	42.9	17.1	7.5	.0	21.6
nothing	.0	14.3	4.9	2.5	.0	6.9
Plantain ----------	0	0	3	1	0	4
majority	.0	.0	.0	.0	.0	.0
little	.0	.0	100.0	.0	.0	75.0
nothing	.0	.0	.0	100.0	.0	25.0
Banana ----------	0	6	19	16	0	41
majority	.0	.0	.0	.0	.0	.0
little	.0	.0	21.1	.0	.0	9.8
nothing	.0	100.0	78.9	100.0	.0	90.2
Citrus ----------	0	9	4	9	0	22
majority	.0	33.3	.0	22.2	.0	22.7
little	.0	66.7	25.0	.0	.0	31.8
nothing	.0	.0	75.0	77.8	.0	45.5
Others ----------	0	1	2	0	0	3
majority	.0	.0	.0	.0	.0	.0
little	.0	.0	50.0	.0	.0	33.3
nothing	.0	100.0	50.0	.0	.0	66.7

Table 12: Destiny of Sales of Perennial Crops

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Middle men --------	0	10	17	13	0	40
Percent:	.0	33.3	42.5	33.3	.0	27.2
Direct sale -------	0	12	13	12	0	37
Percent:	.0	40.0	32.5	30.8	.0	25.2
Other ------------	0	9	15	16	0	40
Percent:	.0	30.0	37.5	41.0	.0	27.2

Table 13: Use of Unputs
Number and Percentage of Farmers

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Improved seed -----	12	8	11	3	2	36
Percent:	19.7	12.9	18.6	7.1	22.2	15.5
Fertilizer---------	28	24	35	26	6	119
Percent:	45.9	38.7	59.3	61.9	66.7	51.1
Herbicides -------	6	14	16	14	2	52
Percent:	9.8	22.6	27.1	33.3	22.2	22.3
Other agro-chem. --	18	16	21	13	5	73
Percent:	29.5	25.8	35.6	31.0	55.6	31.3

Table 14: Peaks in percentage
- multiple answer

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
January ----------	16.4	24.2	50.8	64.3	22.2	36.1
February ---------	4.9	12.9	18.6	23.8	11.1	14.2
March ------------	1.6	11.3	11.9	9.5	11.1	14.2
April ------------	6.6	29.0	27.1	11.9	44.4	20.2
May --------------	93.4	90.3	78.0	57.1	100.0	82.4
June -------------	62.3	67.7	61.0	61.9	66.7	63.5
July -------------	41.0	35.5	33.9	38.1	11.1	36.1
August -----------	45.9	19.4	15.3	14.3	.0	23.6
September --------	57.4	32.3	22.0	19.0	33.3	33.9
October ----------	72.1	67.7	81.4	50.0	88.9	70.0
November ---------	27.9	56.5	84.7	66.7	55.6	57.9
December ---------	13.1	51.6	86.1	90.5	22.2	56.7

Table 15: Most important problems in percentage

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Lack of Techn. Assis.	27.9	35.5	33.9	16.7	33.3	29.6
Pests	39.3	43.5	54.2	45.2	55.6	45.9
Diseases	.0	16.1	8.5	21.4	.0	10.3
Lack of fertilizer	19.7	29.0	13.9	16.7	44.4	20.6
Lack of credit	9.8	12.9	7.4	4.8	22.2	8.6
Transp. and marketing	9.8	14.5	15.3	9.5	.0	12.0
Lack of land	23.0	12.9	6.8	7.1	.0	12.4
Lack of oxen	13.1	9.7	5.1	7.1	11.1	9.0
Lack of agro-chem.	4.9	9.7	.0	2.4	.0	4.3
Lack of tools	1.6	6.5	3.4	4.8	.0	3.9

Table 16: Distribution of persons per family
- percentage per class

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
1 - 2 persons ------	3.3	11.3	10.2	4.8	.0	7.3
2 - 4 persons ------	16.4	14.5	25.4	11.9	11.1	17.2
4 - 6 persons ------	18.0	21.0	22.0	28.6	33.3	22.3
More than 6 per. ---	62.3	53.2	42.4	54.8	55.6	53.2

Table 17: Distribution of land

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Less than 0.5 ha						
Farm size mean	.2	.2	.4	.0	.0	.3
% of farmers	3.3	1.6	3.4	.0	.0	2.1
% of land	.1	.1	.1	.0	.0	.1
0.5 - 0.99 has						
Farm size mean	.7	.7	.8	.7	.0	.7
% of farmers	13.1	9.7	3.4	7.1	.0	8.2
% of land	1.9	1.3	.2	.4	.0	.7
1 - 1.99 has						
Farm size mean	1.4	1.4	1.5	1.3	1.2	1.4
% of farmers	19.7	14.5	6.8	23.8	22.2	15.9
% of land	5.4	4.1	.7	2.5	3.1	2.5
2 - 2.99 has						
Farm size mean	2.5	2.5	2.3	2.6	2.6	2.5
% of farmers	23.0	19.4	11.9	23.8	33.3	19.7
% of land	11.4	9,6	2.0	4.8	9.7	5.7
3 - 3.99 has						
Farm size mean	3.5	3.5	3.3	3.5	.0	3.4
% of farmers	3.3	12.9	16.9	9.5	.0	10.3
% of land	2.3	8.9	4.2	2.6	.0	4.1
4 - 4.99 has						
Farm size mean	4.4	4.5	4.5	4.9	4.5	4.5
% of farmers	9.8	14.5	6.8	2.4	11.1	9.0
% of land	8.6	12.7	2.3	.9	5.8	4.6
5 - 6.99 has						
Farm size mean	6.3	5.7	6.4	6.3	.0	6.2
% of farmers	14.8	9.7	11.9	9.5	.0	11.2
% of land	18.6	10.7	5.7	4.7	.0	7.9
7 - 9.99 has						
Farm size mean	8.9	8.9	8.6	7.6	.0	8.5
% of farmers	8.2	6.5	8.5	7.1	.0	7.3
% of land	14.5	11.2	5.4	4.2	.0	7.2
More than 10 has						
Farm size mean	37.9	18.8	34.6	61.8	21.5	35.9
% of farmers	4.9	11.3	30.5	16.7	33.3	16.3
% of land	37.2	41.4	79.3	80.0	81.4	67.3

Table 18: Distribution of Annual Crops
Percentage of farmers and land per class

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Less than 0.5 Ha	3.4	4.9	3.6	6.7	.0	4.2
	.5	.7	.2	1.1	.0	5
0.5 - 0.99 Ha	17.2	13.1	9.1	26.7	.0	1.6
	5.1	4.5	1.5	9.1	.0	6.7
1 - 1.99 Ha	31.0	31.1	16.4	40.0	33.3	28.6
	17.2	22.7	5.1	25.6	11.5	13.9
2 - 2.99 Ha	25.9	36.1	23.6	6.7	33.3	25.8
	26.5	42.3	12.9	8.5	25.3	22.2
3 - 4.99 Ha	17.2	14.8	20.0	10.0	11.1	16.0
	29.5	29.8	17.7	17.0	14.9	22.7
More than 5 Has	5.2	.0	27.3	10.0	22.2	10.8
	21.2	.0	62.6	38.6	48.3	37.1

Table 19: Distribution of coffee
Percentage of farmers and coffee area per class

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Less than 0.5 Ha	.0	19.4	9.5	7.5	.0	11.9
	.0	4.7	1.8	1.0	.0	2.0
0.5 - 0.99 Ha	.0	36.1	38.1	27.5	.0	33.9
	.0	20.3	14.2	7.2	.0	12.1
1 - 1.99 Ha	.0	27.8	31.0	37.5	.0	32.2
	.0	30.6	22.9	18.4	.0	22.2
2 - 2.99 Ha	.0	11.1	9.5	10.0	.0	10.2
	.0	24.2	13.2	8.5	.0	13.1
3 - 4.99 Ha	.0	5.6	7.1	7.5	.0	6.8
	.0	20.2	14.5	12.5	.0	14.6
More than 5 Has	.0	.0	33.5	52.5	.0	36.0

Table 20: Distribution of other perennial crops
Percentage of farmers and crop area per class

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Less than 0.5 Ha	.0	28.6	20.0	50.0	.0	33.3
	.0	3.4	1.7	17.6	.0	5.2
0.5 - 0.99 Ha	.0	28.6	20.0	16.7	.0	22.2
	.0	8.4	5.8	11.8	.0	8.1
1 - 1.99 Ha	.0	.0	.0	16.7	.0	5.6
	.0	.0	.0	23.5	.0	4.0
2 - 2.99 Ha	.0	14.3	40.0	16.7	.0	22.2
	.0	16.8	6.2	47.1	.0	32.3
3 - 4.99 Ha	.0	14.3	.0	.0	.0	5.6
	.0	21.0	.0	.0	.0	10.1
More than 5 Has	.0	14.3	40.0	.0	.0	11.1
	.0	50.4	6.2	.0	.0	40.3

Table 21: Distribution of pasture
Percentage of farmers and pasture area per class

AREA	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Less than 0.5 Ha	14.3	.0	.0	16.7	.0	6.7
	.8	.0	.0	.4	.0	.2
0.5 - 0.99 Ha	7.1	11.5	13.8	.0	.0	8.6
	.8	1.9	.9	.0	.0	.7
1 - 1.99 Ha	10.7	19.2	10.3	16.7	.0	13.3
	2.8	6.6	1.2	1.9	.0	2.3
2 - 2.99 Ha	7.1	38.5	10.3	5.6	.0	15.2
	3.0	21.9	2.6	1.2	.0	4.7
3 - 4.99 Ha	32.1	3.8	20.7	27.8	50.0	21.9
	21.2	3.8	7.3	9.2	15.8	10.4
More than 5 Has	28.6	26.9	44.8	33.3	50.0	34.3
	71.5	65.9	88.0	87.3	84.2	81.6

Table 22: Distribution of livestock
Percentage per class

AREAS	SUNI	SISLE	PANTASMA	ROBLES	LOMAS	TOTAL
Number of Farmers	61	62	59	42	9	233
Total cattle						
2 and less	34.4	26.9	16.7	14.3	25.0	24.5
3 - 4	34.4	26.9	10.0	21.4	.0	22.6
5 - 7	12.5	15.4	13.3	21.4	25.0	15.1
8 - 11	9.4	19.2	26.7	21.4	25.0	18.9
More than 11	9.4	11.5	33.3	21.4	25.0	18.9
Beef cattle						
2 and less	58.3	44.4	20.0	14.3	.0	34.9
3 - 4	25.0	.0	6.7	42.9	.0	16.3
5 - 7	.0	33.3	26.7	.0	.0	16.3
8 - 11	8.3	22.2	20.0	.0	.0	14.0
More than 11	8.3	.0	26.7	42.9	.0	18.6
Dairy cattle						
2 and less	63.6	64.0	44.4	30.8	33.3	52.2
3 - 4	22.7	20.0	25.9	30.8	33.3	24.4
5 - 7	9.1	12.0	14.8	15.4	.0	12.2
8 - 11	4.5	.0	.0	23.1	.0	4.4
More than 11	.0	4.0	14.8	.0	33.3	6.7
Draft oxen						
1	11.1	20.0	7.1	.0	.0	10.3
2	61.1	60.0	28.6	57.1	25.0	50.0
3	5.6	6.7	.0	14.3	.0	5.2
4	5.6	.0	21.4	.0	.0	6.9
More than 4	16.7	13.3	42.5	28.6	75.0	27.6
Horses						
1	50.0	33.3	36.0	35.7	33.3	39.6
2	35.7	50.0	36.0	21.4	.0	34.1
3	10.7	11.1	8.0	14.3	33.3	12.1
4	3.6	.0	8.0	7.1	.0	4.4
More than 4	.0	5.6	12.0	21.4	33.3	9.9
Pigs						
2 and less	67.5	93.1	83.3	88.9	100.0	82.3
3 - 4	25.0	6.9	10.0	3.7	.0	12.3
5 - 7	5.0	.0	3.3	7.4	.0	3.8
8 - 11	2.5	.0	3.3	.0	.0	1.5
More than 11	.0	.0	.0	.0	.0	.0
Chicken						
5 and less	39.5	50.9	27.5	23.1	42.9	36.3
6 - 10	44.2	30.2	35.3	38.5	14.3	35.8
11 - 20	16.3	17.0	29.4	33.3	42.9	24.4
21 - 30	.0	1.9	2.0	2.6	.0	1.6
More than 30	.0	.0	5.9	2.6	.0	2.1