

CHAPTER 1
INTRODUCTION

CHAPTER I

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1.1 Background of the Master Plan

The economy of Nicaragua was extensively affected during the last decade by the internal armed conflicts and the failure of the economic policies of the past socialist government. The democratic government which took office in April 1990 made numerous efforts to restore a market-oriented economy, but it is reckoned that the required basis for a sustainable economic development have yet not been laid down. Even though the agricultural sector is still one of the main pillars supporting the economy of Nicaragua, it has not recovered from the drop in production which took place in the past.

Many economic indicators apparently show that the actual growth has not satisfied the expectations of the population on the national welfare. At the end of 1996, around 71% of the population were living under poverty conditions; the rate of infant mortality was of 58 per each 1,000 births; 26% of the population of less than 5 years old is suffering from malnutrition; the consumption of calories was 37% below the level recommended for the country; 25% of the population is considered to be illiterate.

In the National Development Program 1996-2000, the Government of Nicaragua attaches a high priority to the reactivation of the agricultural sector, with an emphasis on the increment of production and decrease of poverty levels. In this sense, the National Development Program 1996-2000 includes development plans for the agricultural sector.

The development of the agricultural sector contributes to the generation of employment and reduction of poverty, through measures like the rehabilitation of the production infrastructure were destroyed during the armed conflict (specially irrigation infrastructure), support to small scale farmers and conservation of the natural and social environment.

Taking into consideration of the above mentioned points, the Government of Nicaragua presented to the Government of Japan in December of 1995 a request for the realization of a study on the agricultural development of Regions II and IV which are the regions having a high potential for agricultural development, especially the areas located on the Pacific Ocean coast.

1.2 Objectives of the Study

The objectives of the Study are as follows:

- (1) Formulate a Master Plan for agricultural development and carry out a Feasibility Study for the prioritized projects on the Pacific Coast of Regions II and IV with an emphasis on the extension system for the small-scale farmers.
- (2) Execute a Pilot Plan within the area selected by the Feasibility Study aiming to promote the organization of farmers and carry out the verification of agricultural development plans implemented by the farmer's organizations.
- (3) To carry out the technological transfer to the Nicaraguan counterparts concerning the methods of study, approach and formulation of the projects.

1.3 The Study Area

The Study Area covers Regions II and IV located on the Pacific Ocean Coast. It's the zone with the highest development in the country, where the population density is high, with a good road network but with a deficient maintenance system. Region II includes the León and Chinandega Departments; Region IV includes Masaya, Granada, Carazo and Rivas Departments.

1.4 Scope of the Study and Study Activity Schedule

The main works to be carried out through the present Study are mentioned in the Table shown below. Phase I Study consists of Master Plan preparation, and the Phase – II Study includes Feasibility Study. Pilot Study will be carried out in Phase – III. At this stage of October 1998, the Master Plan is completed and the feasibility study compilation is carried out in order to start the Pilot Study.

Table 1.1 Scope of the Study

Phase/Stage			Description
Phase I	Works in Nicaragua	Preliminary Formulation of the Master Plan	Explanation and Discussion of the Inception Report
			Confirmation of the Project's organization and elaboration of the program for the transfer of technology
			Collection and review of related data and information
			Field Study
			Socio-economic Rural Survey (Made under sub-contract basis)
			Water Quality Survey (Made under sub-contract basis)
			Study of development potentials and constraints
			Preliminary formulation of the Master Plan
			Implementation of the Initial Environmental Evaluation (IEE)
			Study and discussion of the criteria for the selection of priority projects
Works in Japan	Formulation of the Master Plan	Report on the field works of Phase I carried out in Nicaragua	
		Analysis of the results of the Field Study of Phase I	
		Formulation of the Master Plan	
		Elaboration of the Interim Report	
Phase II	Works in Nicaragua	Preliminary Formulation of Priority Projects	Explanation and discussion of the Interim Report
			Topographic survey (Made under sub-contract basis)
			Study of the priority projects
			Preliminary formulation of the priority projects
			Preliminary selection of the Pilot Study Area
	Works in Japan	Formulation of Priority Projects	Report on the works of Phase II carried out in Nicaragua
			Analysis of the results of the Field Study of Phase II
			Formulation of the priority projects
			Formulation of the agricultural development plan for the Pilot Study of the Project
			Comprehensive evaluation of the priority projects and recommendations
Phase III	Works in Nicaragua	Pilot Study	Elaboration of the Master Plan Report
			Elaboration of the draft of the Final Report
			Explanation and discussion of the draft of the Final Report and Pilot Study
			Implementation of the Pilot Study-1
			Explanation and discussion of the Monitoring Report-1
	Works in Japan	Elaboration of the Final Report	Implementation of the Pilot Study 2 and 3
			Explanation and discussion of the Monitoring Reports 2 and 3
			Implementation of the Pilot Study-4
			Explanation of the Monitoring Report-4
			Report of the Pilot Study carried out in Nicaragua
			Analysis of the results of the Pilot Study of Phase III
			Organization of the results of the Pilot Study for the elaboration of the Final Report
			Elaboration of the Final Report

CHAPTER 2
NATURAL, SOCIAL AND ECONOMIC
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NATURAL, SOCIAL AND ECONOMIC CONDITIONS IN NICARAGUA

2.1 General Profile of Nicaragua

Nicaragua, which is the largest country among Central American countries, covers an area of 1.3 million square kilometers. The territory is located in the center of Central America and shares its borders with Honduras in the north and with Costa Rica in the south and faces both Pacific and Atlantic Oceans.

Based on topographic and ecological characteristics, the territory is divided into three large sections: Atlantic, Pacific and Interior. The Atlantic section has a tropical rain forest climate with high levels of temperature and humidity and is covered with a dense primeval forest with many rivers with rich water streams. The Pacific section has a tropical savanna climate with many mountains and a hilly topography along the coast and it is blessed with fertile plains. Lake Managua (1,042 km²) and Lake Nicaragua (8,264 km²) are located in this section and constitutes the agricultural center of Nicaragua. In the Interior section covering the north and central mountainous regions, oak and pine grow abundantly on the slopes and agriculture is carried out at the valleys and lowlands.

Nicaragua is in the circum-Pacific volcano belt where some volcanoes are active at present. Nicaragua suffers from frequent earthquakes. In 1972, Managua City, the capital of Nicaragua, was severely damaged by an earthquake, and the restoration of the city has not been completely finished.

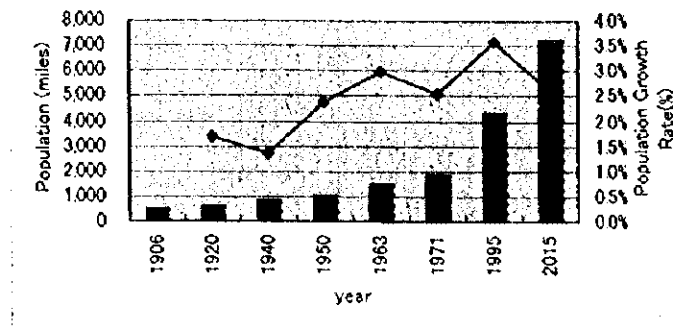
According to the 1995 Census, the population in Nicaragua was 4,357,099 against a population of 1,877,952 in 1971; this represented an annual average growth rate of 3.6%. This growth rate dropped to 3.1% in 1994 according to BNC data; nevertheless, it is expected that the population exceeds the 7,000,000 figure in 2010 and that the country will have to face over population problems.

The population density (persons/km²) of the three sections is as follows; 132.4 in the Pacific section; 39.8 for the interior section between the Pacific Ocean and the Atlantic Ocean; and 8.0 for the Atlantic section. At the national level, the population density is 36.4.

The main characteristic of the regional growth rate is the existence of a migratory movement from the hinterland between the Pacific and Atlantic Oceans towards the Atlantic section, in the search of new settlement areas; the population growth rate in these areas is 5.0%, which is higher than the country's growth rate of 3.6%. This migratory movement is causing environmental problems for which the government is implementing the Project on "Biodiversity for the Atlantic Corridor" aiming at the prevention of the environmental deterioration in the Atlantic Ocean section.

The urban population represents 54.4% of the country's total population; in the Pacific section, this population represents 70.2%; in the hinterland between the Pacific and Atlantic Oceans, it represents 34.7%; and in the Atlantic section, it represents 31.7%.

Population and Population Growth Rate



The industry absorption share of the workers over ten years old is as follows: primary 40%, secondary 13%, and tertiary 41%. The primary sector absorbs 53% of all male workers while the tertiary sector absorbs 72% of all female workers. In the urban area, the tertiary sector absorbs the largest number workers of both sexes while in the rural area, 85% of male workers are engaged in activities within the primary sector and 49% of female workers work in the tertiary sector. The country's unemployment rate is 16.9% (Census 1995) but 51% of the workers are considered to be self-employed according to the BCN.

As shown below, the 1995 Census highlights a striking contrast in educational conditions and basic services' infrastructure between the urban and rural areas.

	Country-wide	Urban	Rural
Illiterate rate* ¹	25%	12%	41%
Water service	55%* ²	84%	18%
Electricity supply	62%	88%	27%

*1 : people above 10 years old

*2 : water service within the house - 32%, water service outside of the house - 23%

2.2 Macro Economic Conditions

2.2.1 National Economy

In 1996, the Gross Domestic Product (GDP) in Nicaragua was C\$17.13 billion. The breakdown of the GDP according to sector is mentioned in the Table shown below. Per capita GDP was C\$3,810, equivalent to approximately US\$450.

For the last three years, the GDP in constant terms has been experimenting a positive growth. The GDP's growth rates for the period of 1994, 95 and 96 were 3.3%, 4.5%, and 5.5% respectively.

Sectors	Value (C\$ Billion)	Share of GDP (%)
Primary Sector (Agriculture)	5.98	34.9
Secondary Sector (Industry)	3.42	20.0
Tertiary Sector (Services)	7.72	45.1

2.2.2 Labor Force and Employment

In 1995, the labor force in Nicaragua was registered as 1.44 million people. It accounted for 48.2% of the total working age population (3.00 million), of 10 years old and above. The nation wide unemployment rate was 17%. Labor conditions in the census year of 1995 are summarized in the Table shown below.

Item	(Unit: 1000)		
	Total	Urban	Rural
Labor Force	1,445	818	627
Employed	1,200	660	540
Unemployed	245	158	87
Unemployment Rate	17%	19%	14%

Source: Censos Nacionales 1995, INEC

Labour distribution among production sectors is mentioned in the shown Table below. Even though the primary sector still absorbs the largest portion of the working population, its share has dropped from 47% in 1971 to 40% in 1995, while the tertiary sector increased its share from 34% in 1971 to 41% in 1995. The labour force growth rate was estimated to be 4% per year.

Distribution of the Labor Force

Sector	1971		1995	
	(1000 persons)	(%)	(1000 persons)	(%)
Labor Force	505.4	100	1,200.5	100
Primary Sector	237.3	47	484.2	40
Secondary Sector	85.7	17	157.4	13
Tertiary Sector	173.5	34	492.6	41
Not determined	8.9	2	66.4	6

2.2.3 Public Finance

The Table shown below provides information on the public sector finances. Of the overall deficit of C\$3.27 billion in 1996, C\$1.36 billion or 42% was generated by the central government. In 1996, the government obtained a total revenue of C\$3.61 billion (21% of the GDP) while total expenditure of the central government was C\$4.97 billion. As a result, there was a deficit of C\$1.36 billion. Most of the financing of the deficit was made through foreign grants and foreign and domestic loans. There was a strong dependence on external financing sources is strong.

PUBLIC SECTOR FINANCE		(C\$ Billion)
Total Revenue (A)		5.19
Total Expenditure (B)		7.53
Ordinary Deficit (C = A - B)		2.34
Interest Payments (D)		0.93
Overall Deficit (E = C + D)		3.27
FINANCING SOURCES		(C\$ Billion)
Foreign Grants (F)		1.50
Foreign and Domestic Loans (G)		1.77
Total (H = F + G)		3.27

2.2.4 Inflation and Foreign Exchange

The inflation rate in 1996 was 12.2% which is close to the average inflation rate for Nicaragua during the last four years. For 1996, inflation was mainly caused by raise of housing (28.2%) and food (12.7%) costs. For 1997, the annual rate of inflation was forecasted as 11.3%.

Concerning foreign exchange rate, the value of the peso dropped down from C\$5.00 per US\$ in 1992 to C\$8.44 in 1996 and according to the BCN, the rate was C\$9.62 per US\$ at the end of August, 1997. The inflation and foreign exchange rates for the period 1992-1996 are indicated in the Table shown below:

	1992	1993	1994	1995	1996
Inflation Rate (%)	3.5	19.6	12.5	11.1	12.2
FOREX (C\$/US\$)	5.00	5.62	6.72	7.55	8.44

2.2.5 Foreign Trade

In 1996, the deficit of foreign trade was US\$485 million, which was US\$49 million more than that in 1995. The deficit accounted for around 24% of GDP, although the rate shrunk from that of 33% in 1992.

Item	(Unit: US\$ million)					
	1991	1992	1993	1994	1995	1996
Merchandise Export	272	223	267	351	526	635
Merchandise Import	751	830	744	875	962	1,120
Trade Balance	-479	-607	-477	-524	-436	-485

Source: Informe Anual 1993-1996, BCN

(1) Export

The export of major traditional commodities has contributed to the national trading performance for a long time, although its contribution has fallen well below that of manufactures. As shown in the Table below, the total export of agricultural and livestock products was US\$297 million in 1996, accounting for 47% of the total export of US\$635 million. Among the export products, coffee, sugar and meat are the top three products in 1996 in terms of export value.

Item	(Unit: US\$ million)					
	1991	1992	1993	1994	1995	1996
Export	272	223	267	351	526	635
Agricultural and Livestock Products						
Coffee	36	45	32	73	131	111
Cotton	44	26	0	4	2	8
Sugar	31	19	18	16	30	38
Banana	29	10	6	6	14	22
Sesame	7	4	8	7	12	19
Molasses	3	5	2	2	4	3
Meat	38	41	61	68	55	44
Others	15	18	30	54	44	52
Total	204	169	156	230	291	297
Share (%)	75	76	58	66	55	47

Source: Informe Anual 1993-1996, BCN

(2) Import

Imports in 1996 were US\$1,129 million (56% of GDP). Imports of intermediate goods were US\$406 million or 36% of total imports. Imports of consumption goods were US\$276 million, or 25% of the total import. More than 80% of the goods were non-durable goods.

(3) Trade Balance of Food Products

The Table shown below indicates the trade balance of major food products between 1993 and 1996. Imports of grains have been larger than exports showing that Nicaragua has not reached a self-sufficiency level for food.

(Unit: 1000 tons)

Food Item	1993		1994		1995		1996	
	Import	Export	Import	Export	Import	Export	Import	Export
Wheat	77.9	-	91.9	-	89.4	-	103.3	-
Rice	147.2	0.3	46.7	2.5	53.9	1.6	70.0	3.1
Corn	5.2	0.4	35.4	9.0	32.4	4.2	18.9	4.3
Sorghum	0.6	0.8	0.7	21.2	0.1	0.6	9.3	2.0
Sugar	19.8	57.0	0.4	55.0	0.1	95.3	0.0	122.0
Beans	8.5	3.8	2.1	18.8	4.2	22.1	3.6	11.8
Banana	0.5	27.7	0.2	28.5	0.3	54.3	0.9	78.2
Coffee	0.4	29.6	0.0	37.8	-	37.8	-	53.1
Beef	0.0	25.2	0.1	26.4	-	25.4	0.0	21.5

Source: Informatica, MEDE

2.2.6 External Debt and Foreign Assistance

In 1995, the total external debt was US\$9.3 billion, accounting for 490% of GDP. The outstanding of long-term debt was US\$7.9 billion. The total debt-service was US\$282 billion, comprising US\$195 million of principal repayment and US\$87 billion of interest payment. Thus, the debt service ratio (DSR) was 39% in 1995. The DSR has slightly decreased from 40% in 1994 but still shows that financial situation in the country is still serious and makes it difficult to obtain fresh financial assistance from overseas. The Table shown below provides information concerning external debt for the period of 1991-1995.

(Unit: US\$ Million)

Item	1991	1992	1993	1994	1995
Total External Debt	10,563	11,033	10,448	11,011	9,287
1. Long Term Debt	8,714	8,937	8,695	9,013	7,937
2. Use of IMF Credit	24	23	23	51	39
3. Short Term Debt	1,825	2,073	1,730	1,947	1,311
Debt Outstanding of Long Term Debt	8,714	8,938	8,695	9,013	7,937
1. Public and Publicly Guaranteed	8,714	8,938	8,695	9,013	7,937
a. Official Creditors	6,698	6,936	6,690	7,012	6,968
- Multilateral	988	1,124	1,158	1,363	1,489
- Bilateral	5,710	5,812	5,532	5,649	5,479
b. Private Creditors	2,016	2,002	2,005	2,001	969
- Bonds	524	524	524	524	524
- Commercial Banks	1,397	1,395	1,393	1,394	388
- Others	95	83	88	83	57
2. Private Nonguaranteed	0	0	0	0	0
Total Debt Service	530	105	117	195	282
1. Principal Repayment	329	42	52	96	195
a. Long Term Debt	329	42	52	93	182
b. IMF Repurchases	0	0	0	3	13
2. Interest Payments	201	63	65	99	87
a. Long Term Debt	196	34	51	91	78
b. IMF Charges	0	2	1	1	1
c. Short Term Debt	5	27	13	7	8
Major Economic Aggregates					
1. GNP	1,293	1,351	1,401	1,306	1,575
2. Exports of Goods & Services	348	327	398	489	730
Ratios (%)					
1. Total External Debt/GNP	816.7	816.6	745.8	843.3	589.7
2. Debt Service Ratio *1	152.3	31.8	29.3	39.9	38.7

Source: World Debt Tables, 1996, World Bank

Note: Long term debt is defined as having original maturity of more than one year.

*1 Debt service as a percentage of earnings from exports of goods and service (including workers' remittances).

Gross receipts of official development assistance (ODA) from the OECD countries and multilateral international organizations aggregated to US\$1,810 million as grant for the recent six years between 1991 and 1996. During this period, the top five donor countries were USA, Sweden, Japan, Netherlands and Norway in the order of amount of grant for Nicaragua, the total amount of which accounted for US\$1.10 billion for the six years or more than 75% of the total bilateral grant of US\$1.48 billion. The grant amount of the five countries also accounted for more than 60% of the total grant of US\$1.81 billion. The total annual amount of grant gradually decreased year after year since 1991.

In terms of loan, gross receipts aggregated to US\$2.42 billion for the recent six years. The annual average of loan was US\$0.40 billion per year. The top three organizations were IDB, BCIE and IDA, the total amount of which accounted for US\$0.93 billion for the six years or 40% of the total loan accumulation.

The Table shown below gives detailed information on loans and grants for the period of 1991-1996.

Organization	1991	1992	1993	1994	1995	1996
GRANTS						
A. Bilateral	537.7	258.0	200.0	193.0	138.1	148.5
B. Multilateral	47.3	67.6	48.6	52.4	90.7	28.0
Total	584.9	325.6	248.6	245.4	228.8	176.5
LOANS						
A. Bilateral	190.2	147.0	17.5	84.4	74.6	62.4
B. Multilateral	168.2	184.4	97.7	229.6	166.8	151.5
C. Other Organizations	246.2	80.4	70.1	122.9	173.9	147.6
Total	604.6	411.8	185.3	436.9	415.3	361.5

Source: Informe Annual 1995-1996, BCN

2.3 National Development Policy

Even though the new government of President Alemán has not officially issued a National Development Plan, it is expected that the Plan will closely follow the one issued by the Chamorro administration.

The Plan aims to achieve the following goals:

- (1) To consolidate the democracy and the constitutional state.
- (2) To establish an economic system having efficient and dynamic markets opened to international markets.
- (3) To reduce poverty, taking concrete actions for the poor to develop their potentiality, to increase opportunities of self-improvement and to participate to the social life of the nation.
- (4) To prevent the environmental deterioration and to promote the right use of the natural resources, taking their potentialities and restrictions into consideration. To modernize the institutions of public sector, by means of (i) reinforcing the subsidiary system; (ii) improving the public service efficiency through decentralization and participation of the population; and (iii) efficient control of the financing resources.

Concerning poverty alleviation policy, the government takes the following social development actions such as creation of employment, increase the nutrition level, improvement of public hygiene including potable water service, fulfillment of basic social services including education in particular, and motivation of communal organization.

Regarding to the strategy for the environment and natural resources protection, the following goals are aimed at; 1) effective use of the lands; 2) activities for the environmental conservation; 3) reforestation activities; formulation of policies such as cooperation among Central American countries for the sustainable development through the union of these countries.

2.4 Situation of the Agricultural Sector

2.4.1 Agricultural Situation

- (1) Characteristics of the Agricultural Sector in Nicaragua

The agricultural sector in Nicaragua is the most important production sector in Nicaragua. It represented 35% of the GDP in 1996. During the period of 1960-80, cotton was the main and

the most profitable crop; the cultivated area for cotton during the period 1990-92 fluctuated between 51,000 to 64,000 Mzs. However, due to the drastic fall of the international prices for cotton, the cultivated area suddenly dropped to 3,300 Mzs for the 1992/93 season. For the 1995/96, the cultivated area somehow increased to 13,400 Mzs.

After the fall of cotton production, the production of basic grains and non-traditional products like groundnuts and soybeans rapidly increased. Maize, beans, rice and sorghum are the main basic grains. Sesame and coffee are the main export crops.

(2) Characteristics of the Livestock Sector in Nicaragua

The share of livestock sector in the GDP of Nicaragua is about 8%. Within that share, the cattle-related activities (production of beef and milk, etc.) represents 70%, poultry activities (production of meat and eggs) is 26%, and porcine-related activities is 4%. During the past 20 years, the domestic consumption of beef has decreased somehow while the consumption of poultry has increased by 200%. There is not a remarkable activity in the porcine industry.

The Tables shown below illustrate the structure of the agricultural GDP and the livestock GDP. In terms of share, the bovine participation is the largest, but in recent years, the poultry share has been increasing. The production of poultry meat is dominated by only 2 companies representing 95% of the total production. Production of eggs is controlled by 4 or 5 companies which cover 80% of the production. More than half of the production cost in the poultry industry is represented by concentrated chicken feed; 85% of the total volume of this item is imported.

Structure of the Agricultural GDP (%)

	Agric.	Livestock	Others
1992	61.3	35.5	3.2
1993	56.4	39.1	4.4
1994	59.2	35.2	5.7
1995	60.6	31.9	7.5
1996	63.7	28.4	7.9

Source: Central Bank of Nicaragua

Structure of the Livestock GDP (%)

	Bovine	Porcine	Poultry
1992	75.9	4.0	20.3
1993	76.5	2.7	20.8
1994	74.9	3.0	22.1
1995	73.1	3.3	23.7
1996	71.1	3.4	25.5

Source: Central Bank of Nicaragua

The Table shown below illustrates that around 50% of total beef production is exported. From the point of view of international trade, in recent years especially the exports to El Salvador, mainly cheese, powder milk, etc., have been increasing, going from 15,618 ton in 1991 to 24,516 ton in 1995. The reason that may explain this phenomenon is that in recent years the number of people from El Salvador who have emigrated to Nicaragua has increased dramatically and they send daily products to their country.

Exportation of Meat and Domestic Consumption (Ton, %)

		1990	1991	1992	1993	1994	1995
Exportation	(t)	28,375	15,618	20,021	25,106	25,560	24,516
	(%)	55.3	35.1	42.5	48.4	49.9	50.0
Domestic Cons.	(t)	22,972	28,874	27,104	26,786	25,696	24,470
	(%)	44.7	64.9	57.5	51.6	50.1	50.0
Total		51,347	44,492	47,125	51,892	51,257	48,987

Source : MAG

(3) Public Investment for Agricultural Projects

The public sector investment comprises of the following items: a) investment made by the government to build social and economic infrastructure; b) expenses made to provide public services; c) finance agricultural projects and other projects related with the production sector. MAG, INTA, INRA, PNDR, CONAGROS, etc., which are the agriculture-related public agencies, are the executing agencies for projects of a diverse nature. In 1996, the total investment amount made by the public sector was C\$2,210 million (13% of the GDP); the breakdown of the investments carried out by the public agencies in the agricultural sector is shown below:

Executing Agency	Investment	Share in Total Investment (%)	Growth rate Compared to 1995 (%)
MAG	1.23	5.6%	71
INRA	0.16	0.7%	64
MARENA	0.49	2.2%	69
INTA	1.90	0.9%	90
PNDR	1.27	5.7%	67
CONAGRO	0.05*	0.2%	--

Source: Informe de Evaluación del Plan de Inversiones Públicas 1990-96

* First Year

Investment for agricultural and livestock projects is carried out mainly by the public sector. In 1996, the total investment amounted to C\$2.21 billion, accounting for 13% of GDP. Of the total, these agencies invested the following amounts for their projects: C\$123 million by MAG; C\$16 million by INRA; C\$49 million by MARENA; C\$19 million by INTA; C\$127 million by PNDR; and C\$5 million by CONAGRO. Among the investment by the agencies, C\$276 million or 12.5% of the total amount (C\$2.21 billion) was invested for agricultural and livestock projects. For forestry and environment sector, C\$63 million or 2.8% of the total was invested in 1996, as well.

2.4.2 Agricultural Production and Food Demand

(1) Crop Production

Present production of major crops in the country for the period of 1991-96 is expressed in Tabular form as shown below.

Production of Main Crops				(Unit: 1,000 ton)		
Crops	1991	1992	1993	1994	1995	1996
Exports						
Sesame	8,538	7,820	9,936	17,268	19,223	17,259
Cotton	24,697	1,500	1,573	1,127	5,791	2,884
Banana *1	321,637	204,401	131,431	102,566	143,575	213,169
Coffee	47,523	33,175	42,320	41,129	58,668	58,420
Sugarcane	2,323,672	2,041,480	2,270,560	2,624,456	3,326,496	3,289,000
Groundnuts	9,660	9,936	20,507	56,957	31,018	42,610
Tobacco	1,739	1,329	1,334	925	1,592	2,185
Domestic Consumption						
Rice (Paddy)	45,540	56,925	59,598	62,468	46,000	55,200
Rice (Upland)	25,788	27,600	52,900	41,400	53,857	76,075
Broad Bean	58,678	56,810	77,685	83,002	69,000	102,212
Red Beans			73,048	74,520	69,000	102,212
Black Beans			4,639	10,138	0	0
Maize	233,662	230,000	287,776	246,100	294,400	327,405
Sorghum	85,086	91,319	103,362	92,000	48,907	77,436
Soybean	4,600	4,922	10,525	18,354	27,117	24,150

Note: *1 Production Unit :1000 Boxes.. Source : BCN Annual Report 1993-1996

The value added (VA) of major crops production was as follows in 1996: C\$1.16 billion of coffee; C\$0.47 billion of sugar; C\$0.45 of corn; C\$0.33 of rice; and C\$0.30 of beans. The total VA of these crops was aggregated to C\$2.71 billion or more than 60% of the agricultural sector's VA, C\$4.40 billion.

(2) Livestock Production

The livestock production for the recent 6 years in Nicaragua is shown below. It can be seen that the cattle and pork production shows a somehow decreasing tendency while the poultry production is increasing.

Livestock Production

(Unit : 1,000ton)

Type	1990	1991	1992	1993	1994	1995
Cattle	51.35	44.49	47.13	51.89	51.26	48.99
Pork	5.68	5.22	4.81	4.45	4.90	5.13
Poultry	9.94	13.62	20.07	26.24	29.78	31.10

Source : MAG

The total added value for livestock production was C\$1,690 million: C\$1,220 million for cattle, C\$600 million for pork, and C\$410 million for poultry. Then the added value for cattle represented around 72% of the total added value for livestock production.

(3) Food Demand and Balance

1) Food Self- Sufficiency

The self-sufficiency of food in Nicaragua from the nutritional point of view is illustrated in the Table shown below. For the recent six years, the self-sufficiency rate was around 70% except in 1992. In other words, the country has to procure at least 30% of food from

foreign countries. As far as observed in the Table, this self-sufficiency situation is not improved in the recent years.

(Unit: kcal/day/capita)

Item	1990	1991	1992	1993	1994	1995	1996
Food Granted	360	312	358	184	97	78	84
Food Imported	135	154	350	137	485	449	415
Domestic Production	1,205	1,248	1,034	1,255	1,282	1,204	1,247
Total	1,700	1,748	1,742	1,756	1,864	1,731	1,746
Self-sufficiency Ratio	71%	73%	59%	71%	69%	70%	71%

Source: MAG

2) Food Intake Requirements

MAG has calculated the amount of calorie intake required per person per day. The calorie requirement standard recommended by MAG is shown in the following Table.

Recommended Basic Calorie Requirements of Nicaragua

(Unit: kcal/day/person)

Item	Standard	1990	1991	1992	1993	1994	1995	1996
Rice	240	288	306	226	317	318	328	353
Maize	629	556	546	527	555	540	463	451
Wheat	177	124	150	158	148	130	113	111
Beans	152	138	124	116	137	127	113	112
Sugar	297	279	251	294	310	356	358	380
Oil	226	138	192	192	199	206	182	188
Beef	40	54	52	51	45	42	37	39
Pork	17	11	12	8	7	8	6	7
Chicken	19	13	20	26	28	31	36	31
Milk	121	80	83	105	90	92	82	61
Eggs	22	80	83	105	90	92	82	61
TOTAL	1,940	1,700	1,748	1,715	1,849	1,864	1,730	1,746
Proteins(g/day/person)	51.5	45.0	45.3	44.4	45.0	46.1	42.7	40.9

Source: MAG

The government recommends a total calorie intake of 1,940 kcal/day/capita, however, in 1996, the average calorie intake was estimated at 1,746 kcal/day/capita, lower than the standard calorie intake. Concerning food consumption, rice is consumed increasingly year by year, but intake of corn, wheat, beef and milk decrease gradually.

3) Forecast for Food Demand

According to the FAO's report, "World Agricultural Forecast 2010", the population of Nicaragua will grow at an annual rate of 3.1%; from 2000 to 2010, the growth rate will be 2.6% per annum. Using the above mentioned rates, the total population for the year 2015 was estimated as 7.46 million people.

Estimates of future food demand in the target year 2015 are given in the Table shown below. It shows the difference between the demand and the average production. In terms of rice, 1.71 million qq (78,500 tons) will be insufficient for food requirement in 2015. That means the country has to procure 1.71 million qq of rice or 78% more than the present production by the year 2015. In the same manner, the country has to procure the major crops and livestock products as shown as in the following Table.

Products	Unit	1991/96 Average	2015 Projection	Difference
Rice	1000 qq	2,186	3,892	-1,706
Corn	1000 qq	5,867	10,216	-4,349
Wheat	1000 qq	0	2,757	-2,757
Beans	1000 qq	1,621	2,595	-974
Beef	1000 qq	553	973	-420
Milk *1	Million gallons	49	142	-93

Note: *1 The registered milk production (6.43 million gallons on average) is assumed to be 13% of the total production.

2.4.3 Agencies Related to Agricultural Development

(1) Background

The public sector related to the agricultural sector development planning consists of five institutions, including the Ministry of Agriculture and Livestock (MAG), National Institute for Land Reform (INRA), National Institute of Agricultural Technology (INTA), National Program for Rural Development (PNDR), and Ministry of Environment and National Resources (MARENA); there is also the Agriculture and Livestock National Council (CONAGRO). Even though only MAG and MARENA have the status of ministries, the other institutions enjoy of a wide autonomy and executing powers which allows them to excise their functions independently from MAG.

Investment in the Agriculture and Livestock Public Sector (SPA) for 1997 is C\$623.1 million (US\$68 million) representing 23.5% of total public investment. This investment is financed mainly through foreign resources (85.4%); local resources only finance 14.6%. All the resources are for investment for production purposes.

The distribution of the resources allocated by institutions indicate that PNDR has a bigger share, around 41.7%. The shares of MAG, MARENA, INRA INTA and CONAGRO are 27.5%, 17.8%, 6.4%, 5.9%, and 0.7% respectively.

The National System for Public Investment (SNIP), established in 1992, is in charge of collecting all the information dealing with investments and technical assistance projects which need public funds for their implementation or cover operating costs. All public investments must be approved by the SNIP. The data handled by the SNIP becomes the base of the Public Investment Annual Program. At present, only PNDR within the agricultural sector provides information on a regular basis to the SNIP.

Actually, the organizations within the SPA are working without any coordination among them; there is also no coordination with MAG. MAG does not participate in the process of deciding which investments must be carried out, The investment projects are identified and selected according to the objectives and procedures set up by the executing institutions. Some of the procedures are set up depending on the indications given by the foreign institutions financing the projects. There are no explicit priorities for the determination of selecting public investments.

(2) Description of Responsibilities of Agriculture-Related Public Organizations

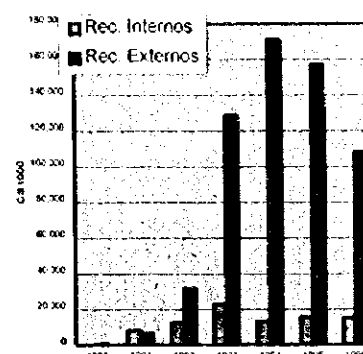
1) Public Organizations

The main public organizations related to the agricultural sector are as follows:

Ministry of Agriculture and Livestock (MAG)

Among the agriculture-related organizations, MAG has the responsibility of coordinating the activities within the agricultural sector. From 1993, the budget for projects implementation has grown considerably; however, for 1996, the investment was decreased to 29% compared to 1995. The budget for 1996 was C\$691.8 million (own domestic resources: C\$87.2 million; foreign resources: C\$604.6 million). It can be seen that the domestic resources represents only 13% of the total investment, showing the degree of dependence on foreign resources.

PUBLIC INVESTMENT '90-'96



The breakdown of the investment by type of projects is as follows: development projects, 70%; strengthening of supporting services, 22%; science and technology projects, 7%; and food projects, 1%. The following Table shows the breakdown of the MAG investments by type of projects:

Breakdown by Type of MAG's Projects

	Total 1990-1996(C\$1,000)			Total 1990-1996(%)	
	Domestic Resources	Foreign Resources	Total	Domestic Resources	Foreign Resources
Total	87,203.7	604,551.7	691,755.3	0.13	0.87
1. Development	61,677.9	533,013.4	594,691.3	0.10	0.90
2. Science and Technology	5,691.4	8,799.0	14,490.3	0.39	0.61
3. Food Program	780.6	3,645.7	4,426.3	0.18	0.82
4. Supporting Services	19,053.8	59,093.6	78,147.4	0.24	0.76

Source: MINISTERIO DE ECONOMIA Y DESARROLLO

In 1996, the total capital investment by MAG was C\$123 millions. It represented 7% of total public capital for investment of the public sector; it also represented 6% of total investment made in the agricultural sector.

MAG responsibilities include the following:

- Expansion of domestic markets and opening of international markets
- Creation of mechanisms to facilitate public and private investments
- Quality control of agricultural export products
- Promotion of processing of livestock products
- Set up a national system of improved seed as a way to increase crop productivity
- Rehabilitation & expansion of irrigation systems
- Genetic improvement of cattle
- Maintenance of updated statistics & information on agriculture & livestock

- Formulation of sectoral development projects and search for international aid
- Adjustment of MAG structure for the normative/regulative role

The functions of other agriculture related institutions are described below :

Ministry of the Environment and Natural Resources (MARENA)

MARENA responsibilities include the following:

- Formulation of national policy on environmental protection and sustainable use of natural resources
- Maintenance of a registry of toxic & hazardous substances
- Search for international aid on environmental matters and channeling of these resources
- Formulation of standards for the management of natural resources, and implementation control

Nicaraguan Institute for Agrarian Reform (INRA)

INRA responsibilities include the following:

- Consolidation of land tenure through titling of the agrarian reform land
- Proposal of policies on land tenure and farmers organization
- Promotion of farmers organization
- Implementation of agricultural framework & land registry
- Implementation of rural development projects

Nicaraguan Institute for Agriculture & Livestock Technology (INTA)

INTA responsibilities include the following:

- Post-harvest technology transfer
- Basic grain seed production development
- Generation & transfer of agriculture & livestock technology to small & medium size producers
- Integrated system for fertility management
- Technology transfer on growing multiple purpose trees: agroforestry, soil conservation, and water management

National Program for Rural Development (PNDR)

PNDR encompasses a number of projects and programs aiming to achieve the following objectives:

- Revitalize the potentialities of those regions which are not developed
- Promotion of rural supporting services in order to increase production and productivity
- Support a sustainable development based on the promotion of women's participation and the development of human resources
- Revitalize the activities of the rural markets
- Strengthening the rural financial system

2) Non-Government Organizations

The number of NGOs in Nicaragua is estimated at anywhere between 500 and 1,800. Legal basis for NGOs is General Law on Non-Profit Juridical Persons (Ley General sobre Personas Jurídicas sin Fines de Lucro - Ley 147), but it covers too many types of organizations, including Red Cross and Rotary Club. Hence, a specific law on NGOs would be useful. NGOs are required to register with Government Ministry (Ministerio de la Gobernación: MINGO), plus submittal of yearly financial statement and sectoral investments were made during the year. In January 1997, when MINGO tightened control of NGOs, only 230 were registered.

The amount of foreign aid to NGOs is estimated at 10% of export value, but many NGOs make no investments, administrative expenses being all their expenditures. Ministry of External Cooperation (Ministerio de Cooperación Externa) will also tighten control of NGOs, and will make NGO status information available to prospective foreign donors.

Some of NGOs involved in agricultural development of Nicaragua are described below.

ACAC (Asociación de Campesino a Campesino: Peasant to Peasant Association)

Head office: Sta. Rosa del Peñón, León Department, Region II

Active from: June 1990, initially UNAG affiliation; juridical person since 1995

Services: revolving credit for women & farmers, training in soil conservation

Geographic area: 16 rural communities & the urban area

Main projects for 1996-1997: reforestation in urban & rural areas; minor infrastructure

Source of support: ACRA (Italian NGO), Redd Barna of Norway, IBIS of Denmark

ACOC (Asociación de Comités Comarcales: Association of "Comarcal" Committees)

Head office: León, Region II

Active from: June 1995

Origin: to help communities affected by the Cerro Negro eruption and the tidal wave

Services: credit, technical assistance, training, food for work

Geographic area: 50 "Comarcas" in 5 Municipalities (León, Telica, Quezalguaque, Malpaisillo and La Paz Centro) of León Department.

Main projects for 1996-1997: "Banco de Granos Básicos: Basic Grain Bank" revolving fund; "Banco Comunal: Communal Bank" revolving fund; workshop to train leaders; industrialization of cassava

Financial sources: World Food Program (PMA); UNDP; Asociación Paz y Desarrollo - Córdoba, Spain; Friedrich Ebert Foundation.

ASODERI (Asociación de Desarrollo de Rivas: Association for Rivas Development)

Head office: Rivas, Region IV

Active from: January 15, 1993

Objective: promotion of small businesses through individual and group financing (Bancos Comunales and Grupos Solidarios)

Services: technical assistance & training for industry, commerce, service & groups

Geographic area: 10 Municipalities of Rivas Department

Main projects for 1996-1997: financing production of plantain, livestock, tourism, agricultural industry

Source of support: PAMIC (National Program for the Support of Small Businesses), UNDP, PL-480, Peace Corp Volunteers

CODEPARI (Cooperativa de Productores Agropecuarios de Rivas: Cooperative of

Agriculture & Livestock Producers of Rivas)
 Head office: Rivas, Region IV
 Active from: May 1994
 Number of members: 116 in 1996
 Services: credit, marketing, training, technical assistance
 Geographic area: Rivas Department
 Main projects for 1996-1997: development of small & medium farmers, marketing
 Source of support: Royal Norwegian Society for Rural Development, PAMIC

UCOOM R.L. (Unión de Cooperativas Multisectoriales: Union of Multi-sector Cooperatives, Ltd.)
 Head office: León, Region II
 Active from: March 20, 1994
 Services: credit, marketing
 Geographic area: León Department, Municipalities of Achuapa, Sauce, Santa Rosa del Peñón, Jicaral, Malpaisillo, Telica, Quezalguaque, León, Nagarote
 Main projects for 1996-1997: Financing BANADES-UCOOM, training & technical assistance IBIS-Denmark
 Source of support: IBIS-Denmark, BANADES, Alpha Investments

UNAG (Unión Nacional de Agricultores y Ganaderos: National Union of Farmers and Cattlemen)
 Head office: Managua
 Active from: April 25, 1981
 Services: technical assistance & training of affiliated small/medium farmers and cooperatives
 Geographic area: whole country
 Main projects for 1996/1997: Strengthening of "cajas rurales", strengthening of grain marketing, expansion of ACAC activities into new areas
 Source of support: Winrock International (Farmer to Farmer Program); SNV-Holland; IBIS-Denmark; NORAD-Norway; UNDP; IDB; USAID; COSUDE and others.

(3) Investment Planning for the Agriculture and Livestock Sector

Institutions	Number of Projects	%	Global Cost of Projects (C\$ 1,000)	%	Amount Corresponding to 1997 (C\$ 1,000)	%
MAG	5	15	952,767	21	171,220	34
PNDR	20	59	3,101,656	69	259,617	51
INTA	6	17	155,497	4	36,886	7
INRA	3	9	254,798	6	40,146	8
Total	34	100	4,464,718	100	507,869	100

The global cost of projects was C\$4,464,718,000 (US\$470 million). It must be noted that a great share of financing funds come from external sources. For example, external grants represent 76% of total financing while external loans represent 13%.

In the Table shown above, it can be seen that the global amount of resources requested to the National assembly to finance the Public Investment program in 1997 was around C\$507,869 thousand (US\$53.5 million); in other words, financing for the year 1997 represents almost 11.4% of the total global amount.

When comparing the amount for investments corresponding to the year 1997 to the one for

1996, the rate of increase is as follows: MAG-39%; PNDR-104%; INRA-144%; INTA-96%.

Another significant factor is that the PNDR absorbs 69% of the resources. For the 1997 program, its share was 51%. On the other hand, MAG has increased its share from 21% to 34%. Other institutions have slightly improved their share.

In the 1997 program, the external funds used for financing of the projects kept their strong participation. The share of grants have decreased significantly from 76% to 61% and the financing gap is still being covered by external resources but at present, most of the financing is being made through loans.

(4) Implementation of the Agricultural and Livestock Policy

The executing agencies of the agricultural and livestock public sector (SPA)-INTA, INRA, PNDR and in some way MARENA, are independent institutions with their own executive board and authorities designated by the MAG, and have their own budget. All of the institutions work independently from each other and MAG; MAG does not take part in the process of deciding which investments should be carried out by each institution.

The above mentioned situation has become more strong during recent years as a result of the lack of leadership of MAG and acute budgetary constraints.

The projects are identified and selected according to the goals and procedures which are set up by the executing agencies; the regulations are, in most of the cases, indicated by the external financing sources which make the funds available for specific purposes.

One important factor is the lack of provision concerning the financing of recurrent costs. Sometimes it happens that some projects considered to become successful in the long run do not so due to the lack of financing resources for operations after the foreign resources are finished.

2.4.4 Agriculture Extension

(1) Governmental entity of agriculture extension

The governmental organization to execute agricultural extension is the Nicaraguan Institute of Agricultural Technology (INTA: about 500 staff) established in April 1993. The functions imposed to INTA are mainly as follows;

- a) Technology generation for extension sources in the Research station and on-farm trials
- b) Technology transfer role via agriculture extension activity
- c) Technical support to human resources development
- d) Institutional development, planning and coordination among internal and external organs.
- e) Superintendent of the extension work over the five agro-ecological zones in the country

INTA has a head office in Managua and the regional offices allocated in the 5 agro-zones in the country. The INTA regional offices are stationed to each zone; i.e., A-1 zone: León, A-2 zone: Masatepe, B-3 zone: Esteli, B-5 zone: Matagalpa and C-6 zone: Juigalpa and has been superintending each jurisdictional extension agencies, respectively. Total number of the extension workers is approximately 115 staffs as of 1997 in nationwide.

(2) Extension Program

INTA has been implementing several projects under the 7 programs through technology generation and transfer in the whole country as mentioned below;

- 1) Basic grain program
- 2) Crop diversification program
- 3) Animal production program
- 4) Soil and water conservation program
- 5) Integrated pest management program
- 6) Seed production program
- 7) Post-harvest technology program

Bilateral and international donor agencies including JICA have aided the above-mentioned programs.

(3) Relationship between Research and Extension

Technology generation for extension and transfer by INTA is enforced based on the process shown in the Figure.

1) Confirmation of Production Constraints

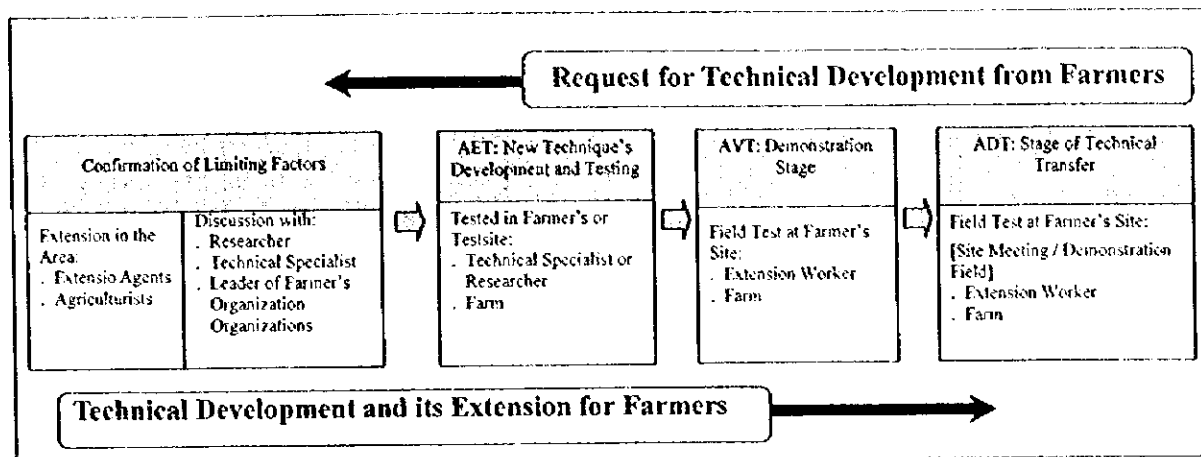
The constraints of production, which are faced by the farmers will be identified through everyday extension activities by the extension workers. These production constraints shall be confirmed through annual meetings with leaders of farming groups and the technical staffs of related research organizations.

2) Experimentation on the Production Constraints

After identifying the constraints of production, experiments will be conducted in the farms and the research station in order to identify the suitable techniques to solve these constraints.

3) Application and Extension of Experimented Techniques

The assigned INTA specialists will carry out the follow up works of extension agents in charge of technical extension through the local meetings and demonstration of farm activities in the experimental & demonstration farms.



Method of Technology Transfer :

a) Visiting individual farmers and farmers group

INTA has focused the target group to disseminate technology on the small-medium scale farmers, and carried out extension work by categorizing them into the 3 classes as mentioned below:

- **ATPB(Basic Technical Assistance for the Public)**
Extension service for the beneficiary-clients is done with non-cost sharing basis and mainly consists of consultation with extension workers, participation of the field day organized, observation of demonstration farm and radio program for the agriculture extension program.
- **ATP1(Technical Assistance co-financed for the Public)**
This system has begun since May 1995 with 20 pilot studies in a whole country and reached to about 3500 producers in 1997. Cost of the extension service is partially shared with the beneficiary-client in terms of crop or livestock, or farming system to receive technical service.
- **ATP2 (Private Technical Assistance co-financed)**
ATP2 has started since August, 1995. This system is to disseminate technology appropriate to the beneficiaries through a private company contracted with INTA in terms of technology transfer. The cost necessary for this system is co-financed between INTA and the beneficiary-client. Co-financed system is comprised of 80 % of the service costs from INTA first year and the rest 20 % from the beneficiary. The cost borne by the beneficiaries is gradually increased year by year and reaches to 100 % at the fifth year.

b) Radio program and printed information

It is realized that 80 % of the rural population have radio and at least one of the family member knows how to read. In this point of view, INTA has carried out technology transfer on farming practice for the small-medium scale farmers over the country through a massive media of radio and printed information program. There are 13 local radio stations over the 5 agro-ecological zones in the country.

2.4.5 Agrarian Reform

The Agrarian Reform enforced by the Sandinista Revolutionary Government (1979-1990) greatly affected the society and economy in Nicaragua. After the enforcement of the agrarian reform, the sector was divided into two according to land tenure; one is the 'private sector' which maintains the traditional farmland tenure, and the other is the 'reformed sector' which was newly established by the agrarian reform. The reformed sector is further classified into three groups; cooperatives, individuals or groups of individuals.

The comparison between the structure of the land tenure in 1988, after the agrarian reform, and the one in 1978, before the reform, is presented in the Table shown below. According to this Table, the total farmland of the large scale farmers with more than 500Mzs each was reduced to 6.4% in 1988, after the reform, from 36.2% in 1978. In 1988, the share of the private sector and the reformed one in relation to the total farmland was 45.9% and 48.4% respectively.

Structure of Land Tenure; 1978-1988

unit: (Mz)

SECTOR	1978		1988	
	AREA	%	AREA	%
PRIVATE	8,073,000	100.0	3,708,496	45.9
More than 500Mzs	2,920,000	36.2	514,633	6.4
200 to 500Mzs	1,311,000	16.2	725,507	9.0
50 to 200Mzs	2,431,000	30.1	1,401,591	17.4
10 to 50Mzs	1,241,000	15.4	929,361	11.5
Less than 10Mzs	170,000	2.1	137,404	1.7
REFORMED			3,904,794	48.4
R.A. Company			948,230	11.7
Cooperatives*			1,115,680	13.8
Assignment to Individuals			209,974	2.6
Special Tiling			1,459,996	18.1
Tiling to Indigenous Communities			170,914	2.1
Abandonment			459,710	5.7
TOTAL	8,073,000	100.0	8,073,000	100.0

* : Only the areas granted by the Agrarian Reform are included

(Source: LA REFORMA AGRARIA EN NICARAGUA 1979 - 1989, VOL I)

The alteration of land tenure by the agrarian reform was carried out through the following three measures;

- (i) Confiscation of the Somoza family's properties: 1,600 thousands Mzs.
- (ii) Confiscation of unused lands and insufficiently used lands through the First and Second Agrarian Reform Laws: 750.5 thousands Mzs.
- (iii) Granting of land titles to farmers who have actually used/occupied the nationally-owned lands or the lands with unknown ownership: 1,688 thousands Mzs.

The granting of land titles*1 to individuals and cooperatives officially carried out by the Government amounted to 7,582 cases (963 thousands Mzs) during the period between 1980 and 1988, and to 16,308 cases (1,293 thousands Mzs) during the period between 1989 and 1990. However, considering the fact that land tenure titles had been excessively issued at the last stage of the Sandinista Government, the Government of Chamorro has been reviewing the agrarian reform.

The records of titles issued from 1980 to 1996 is presented in the Table shown below. According to that data, the accumulated cases and farmland area amount to 23,016 cases (837,876 Mzs), and the ratio according to gender is 74.5% for men and 25.5% for women. As for the beneficiary's antecedents*2, it consists of 73.9% of farmers and 24.4% of soldiers*3.

Titles Issued in 1980 – 1996

YEAR	TIT.	AREA (Mzs)	TOTAL BENEF	SEX		SOLDIER	FARMER	OTHER	BENEFICIARY
				MA	FE				
1980-88	7,582	963,151							
1989-90	16,308	1,292,317							
1992	1,134	35,088	1,425	1,248	177	564	807	54	4,714
1993	3,310	105,471	4,530	3,970	560	1,915	2,577	38	17,107
1994	5,844	181,316	9,352	7,609	1,743	2,671	6,634	47	27,426
1995	6,337	257,539	10,081	7,069	3,012	2,514	7,566	1	27,720
1996	6,391	235,462	12,580	8,251	4,329	1,541	10,839		30,417
TOTAL	23,016	837,876	37,768	28,147	9,621	9,205	28,423	140	107,384
PERCENTAGE				74.5%	25.5%	24.4	75.3	0.4%	

Source : INTR

- *1: In addition to this, there is Special Titling, amounting to 30,996 cases and 1,459,996 Mzs. As this is considered a tentative measure, the INRA discounts it from the official data.
- *2: PRECA consists of those who have continuously cultivated lands and COLON who have automatically got the title of land tenure.
- *3: This consists of Sandinista Revolutionary Soldiers (EX-RN), persons driven away by Civil War (REPAT) and soldiers (E.P.S).

At present, the Government is continuously implementing the agrarian reform and targets 34,000 of families and 1.1 million Mzs by the end of 1998, as a national plan.

2.5 Nation-wise Situation of the Study Area

(1) Surface and Population

As presented in the Table shown below, the Pacific Coast Region represents 15.6% of the surface of the whole country and 56.6 of the total population lives there; this region is the economic center of Nicaragua. The Regions II and IV represent 81.4% of the total surface of the Pacific Coast Region while their population represent 55.8% of its total population.

Surface and Population

	Country	Region					Central and North Regions	Atlantic Region
		Pacific Coastal Region				Managua		
		Total	Region II	Region IV				
Surface(km ²)	119,838	18,638	10,279	4,894	3,465	33,985	67,215	
Surface (%)	100.0	15.6	8.6	4.1	2.9	28.4	56.1	
Population (people)	4,357,099	2,467,742	687,106	686,876	1,093,760	1,354,246	535,111	
Population (%)	100.0	56.6	15.8	15.8	25.1	31.1	12.3	
Pop. Density (Persons/km ²)	36.4	132.4	66.8	140.4	315.7	39.8	8.0	

Source: Census 1995

(2) Agricultural Production

The Table represents the average production of a six-year period, 1990/91 to 1995/96, of the share of Regions II and IV in the whole country agricultural production. It must be noted that the regions concentrate almost all the production of many products which are the main agricultural exports such as sesame, cotton, banana and groundnuts. In the Pacific Coast region, coffee is widely cultivated in the inland areas while tobacco is in the Northern inland areas. For domestic consumption products, not considering soybeans and sorghum, the regions produce 37% of total production of rice, 15% for beans and maize. Based on the available information, the yield in both regions does not show any significant difference.

Crop Name	Share(%)
For Export	
Sesame	0.95
Cotton	1.00
Banana	1.00
Coffee	0.13
Sugarcane	0.77
Groundnut	1.00
Tobacco	0.13
For Domestic Consumption	
Rice	0.37
Bean	0.15
Maize	0.15
Sorghum	0.65
Soybean	1.00

Source: MAG

(3) Land Potential

The land potentialities of Nicaragua is presented in the Table shown below. For Regions II and IV, the lands for agricultural purposes including orchards is 56% and 42% for pastures. These regions are important agricultural centers for Nicaragua for the present and the future.

Potentialities of Agricultural Land in Nicaragua

Land Use	Region: Area (Mz)				Whole Country	Regional Share in the National Total Area(%)				
	Region II	Region IV	Regions II and IV	Other Regions		Region II	Region IV	Regions II and IV	Other Regions	Whole Country
Crops and Orchards	486,329	185,136	671,464	510,871	1,182,336	0.41	0.16	0.57	0.43	1.00
Pasture	305,886	88,557	394,443	514,250	908,693	0.34	0.10	0.43	0.57	1.00
Silvi-culture	73,750	127,793	201,543	6,119,857	6,321,400	0.01	0.02	0.03	0.97	1.00
Forests	378,214	265,900	644,114	6,647,071	7,291,186	0.05	0.04	0.09	0.91	1.00
Protected Land	189,107	6,900	196,007	1,446,636	1,642,643	0.12	0.00	0.12	0.88	1.00
Total	1,433,286	674,857	2,108,143	15,238,114	17,346,257	0.08	0.04	0.12	0.88	1.00

Source: MAG

Potencialidades y Limitaciones de su Territorio

CHAPTER 3
PRESENT CONDITIONS OF THE STUDY AREA

CHAPTER 3

PRESENT CONDITIONS OF THE STUDY AREA

3.1 Natural Features

3.1.1 Topography and Geology

(1) Topography

The Study Areas - Region II and IV – are located along the Pacific Coast in the Republic of Nicaragua. The Pacific Coast consists of a low land of about 70 to 100 km in width and less than 200m in altitude; Maribios mountain, lying in north-west direction in center of the low land; and Caraso terrace. This coastal area also comprises of lift-valley, Lake Managua (1,042km²), Lake Nicaragua (8,264 km²) and a volcanic zone.

In General, this coastal area is blessed with fertile soil and good water resources. Since, the Lake Managua is closed at present; there is no water flow in the river from this lake. On the other hand, the Lake Nicaragua is connected to Atlantic Ocean by the River Rio San Juan, which has been passing through the boundary of Costa Rica.

The Region II (two) covers an area of about 10,033 km², with Maribios Mountain lying in the north - west direction at the center of the region. The area located in the south west of this mountain is a plain land, having a gentle slope and less than 100m in altitude. The seacoast runs for a distance of 150 m along the Pacific Ocean. A narrow strip of land of 5 to 20 km width, located to the north of Maribios Mountain, is also a plain area with 200 m in altitude. The eastern part of this plain area is faced to the Lake Managua, while, there is a swamp in the western part, located widely around the boundary of Honduras. Northern part of this area has a 100 to 800 m high mountain making it a sloppy area.

Region IV (four) covers an area of about 4,724 km², bordering Pacific Ocean in the south west and Lake Nicaragua in the East Side. The coastal line faced to Pacific Ocean has about 110 km distance while that of lake Nicaragua is about 160 km. Local weather conditions are remarkably influenced by these topographic conditions, and there are a plenty of rainfall in this region. Topography of this region is dominated with mountains, ranging from 200 to 800 m altitudes in the northern part. Low mountain ranges of 200 to 300 m altitude lie along the Pacific Coast. Ometepe Island (266 km²), located in lake of Nicaragua is also included in Region IV. This island has two volcanoes of 1,000 to 1,500 m height and hence all of the island area is covered by volcanic ash soil.

(2) Geology

The geological structure of the sub-stratum is slightly different in Region II and IV. The salient features of geology of each region are described as follows;

Region II

Loose tertiary rocks form the underneath area of the Region II. Alluvium of quaternary period and sedimentary are lying over the tertiary formations and these layers are made into plain lowland. Volcanoes of quaternary period lie along the fissure line that runs from northern west to southern east at the center of basin, and form volcanic zone in the plains.

Groundwater is stored in the alluvium and level of groundwater is shallow ranging from 20 m to 30 m.

Region IV

In the Region IV, the topographic conditions of the Rivas Department, located in the southern part is different from that of rest of the areas.

Topo-geology of Rivas, mainly consists of both cretaceous period and palaeogeno hilly formations. Other formations include *Sheras* which is volcanic soil from tertiary period to alluvium, and forms Carazo terrace. In the department of Masaya, Volcano Masaya runs through the formations of *Sheras* period so that topographic conditions are distributed with pyroclastic flow deposits such as basalt and *scoria*.

Although the formations of *Sheras* period have superior ground water storage, the ground water level is generally more than 100 m. Part of the coastal areas of Lake Nicaragua consists of quaternary period formations which are rich in ground water storage.

3.1.2 Soils and Land Use

(1) Soils in the Study Area

The region II is in the subtropical dry zone, and the soil type is mainly classified into Entisol, Vertisol, Inceptisoles, Mollisoles, Alfisoles and so forth based on the criteria of USDA classification. The soils are resulted from three groups of volcanic ash soil, diluvium soil, and alluvium soil. Most primary woods were disappeared through the destructive felling and subsequently only secondary woods are remaining now.

The region IV is in the tropical dry zone to tropical and subtropical wet zone, and the soil type is mainly classified into Entisol, Vertisol, Inceptisoles, Mollisoles, Alfisoles and so forth. The type is also classified in to three groups in its developing process. The first one, which originates in volcanic ash and pyroclastic rock produced by volcanic activity, is observed at the southern plain area of Managua city and the foothills of the Ometepe island. The second one, which is formed from the rock facies originated in the sedimentation rock formation process, is the principal soil type in the Region IV and it is largely observed at the low hilly country of the Pacific. The last one, which originates in alluvium and marine sedimentary rock, is observed at the shore of the lake Nicaragua and the surrounding areas of the scattered lagoons.

(2) Soil Texture

Soil texture in the Study area which is classified depending on specific region is tabulated below; In the Region II, the northern part is characterized by clay and heavy clay, and the southern part is by heavy clay and loam. In the Region IV, 70% of the Pacific coastal area is occupied with clay, and 30% of the coastal area of the lake Nicaragua is with heavy clay soil, and the rest part of the coastal area of the lake Nicaragua and the high plains area is mainly with loamy clay and sandy loam.

Soil Texture in the Study Area

Soil Texture		Area (Mzs)					Ratio (%)				
		Region II		Region IV			Region II		Region IV		
		Northern Part	Southern Part	High Plain Area	Lake Nicaragua Coastal Area	Pacific Coastal Area	Northern Part	Southern Part	High Plain Area	Lake Nicaragua Coastal Area	Pacific Coastal Area
A	Clay	300,446	90,145	0	14,677	259,458	70	9	0	7	70
a	Sand	11,207	2,862	0	0	0	3	0	0	0	0
aF	Loamy sand	0	75,200	0	0	0	0	7	0	0	0
Ap	Heavy clay	101,050	261,049	0	60,079	26,238	24	26	0	30	7
FA	Loamy clay	0	303,390	26,845	63,503	59,271	0	30	42	32	16
Fa	Sandy loam	0	0	11,439	38,088	0	0	0	18	19	0
Fa-F-FL	Silt loam	16,126	271,809	25,559	21,770	25,259	4	27	40	11	7
F	Loam	0	0	0	0	0	0	0	0	0	0
Total		428,830	1,004,456	63,843	198,118	370,226	100	100	100	100	100

Source: MAG

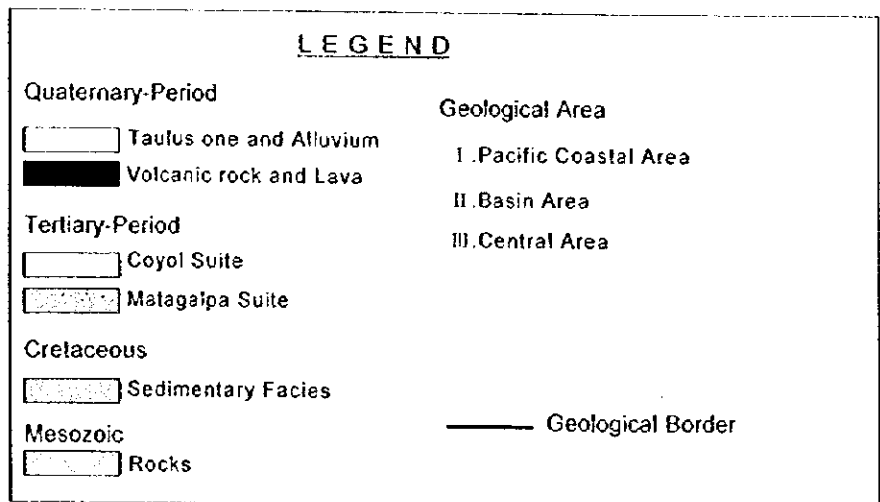
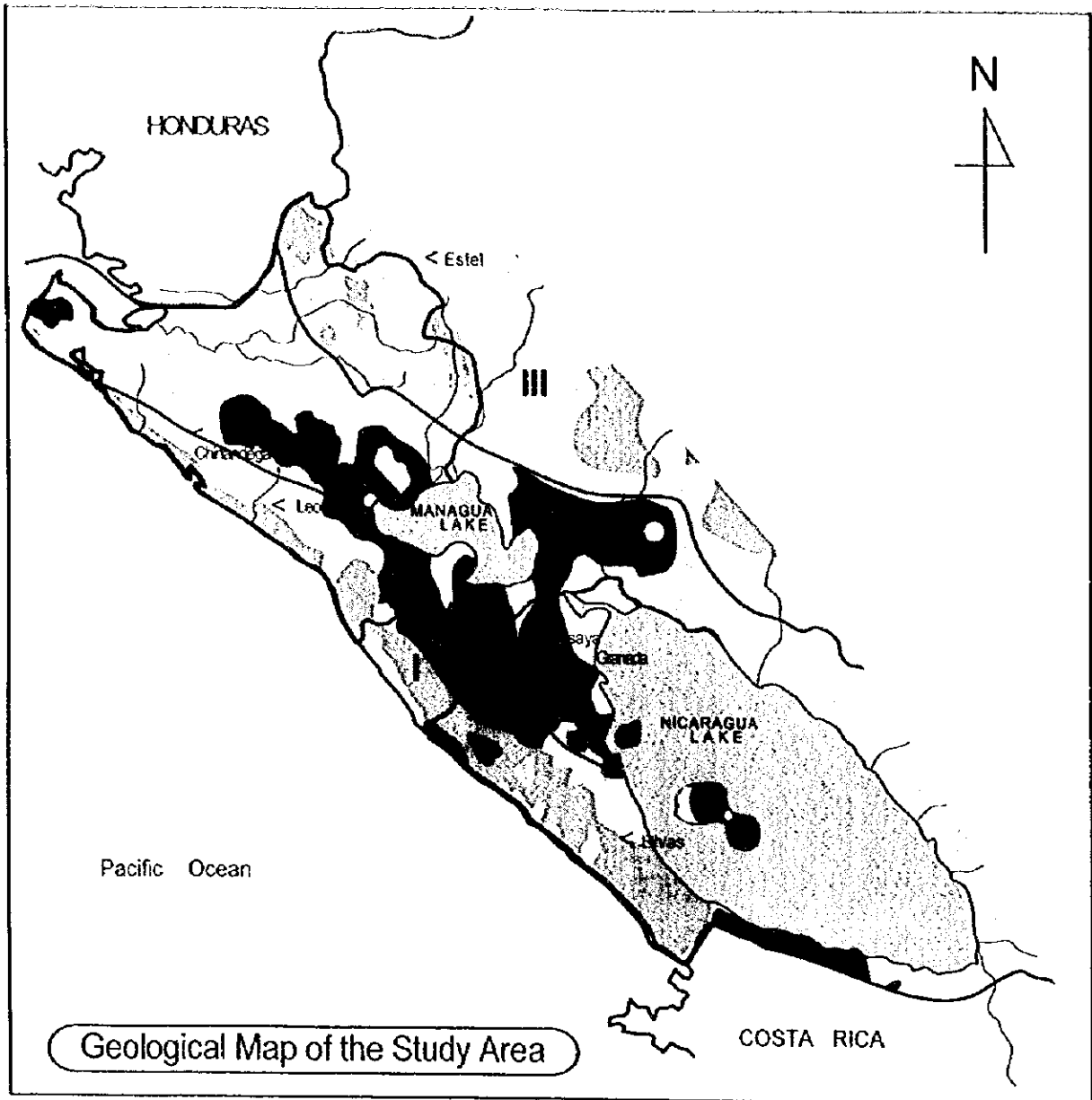
(3) Actual Land Use

Actual land use in the Study area is classified into annual crops, perennial crops, pasture, abandoned area, forest, residence areas and lagoons/rivers/wetlands, as shown below. The abandoned area, which is called "Tacotales" in Spanish, shows the thickly shrubby lands due to shortage of labor for cultivation or impossibility of cultivation because of conflicts. It is to say that it was not abandoned due to low productivity of infertile land but shortage of labor or inevitable accident. Therefore some lands have its high potential of agricultural production. Ratio of such kind of the lands is respectively 17.1% in Region II and 18.2% in Region IV. It is desirable to use these kind of lands effectively.

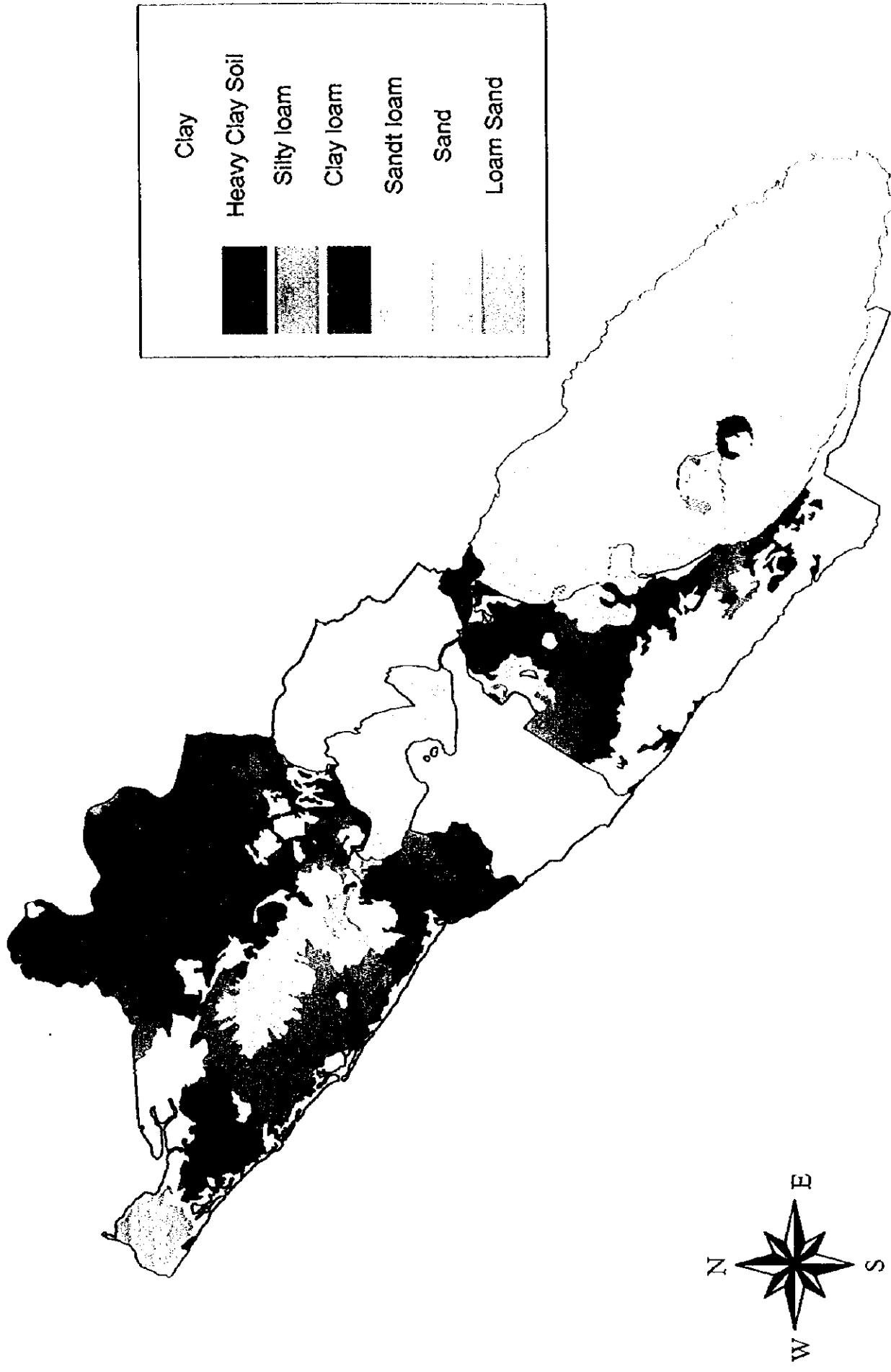
Actual Land Use in the Study Area (First Cropping in 1996-1997)

Unit : Mz

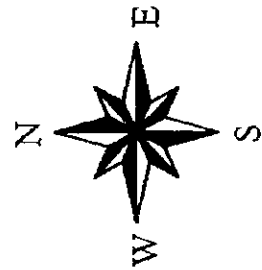
Region	Prefecture	Annual Plant	Perennial Plant	Pasture	Abandoned Area	Forest	Residence Area	Lagoons/ Rivers/ Wetlands	Total
Region II	Chinandega	126,928	59,011	145,721	45,903	25,040	10,090	2,441	415,134
	León	142,336	10,788	221,627	122,089	52,872	11,105	3,951	564,768
	Sub-total	269,264	69,799	367,348	167,992	77,912	21,195	6,392	979,902
	Ratio(%)	27.5	7.1	37.5	17.1	8.0	2.2	0.7	100.0
Region IV	Masaya	28,448	17,478	15,753	7,423	4,306	3,424	741	77,573
	Granada	28,786	13,479	37,877	17,336	24,402	2,902	1,402	126,186
	Carazo	33,783	14,537	34,616	37,818	22,452	2,741	1,490	147,437
	Rivas	35,462	31,658	128,087	40,916	45,168	4,780	3,196	289,267
	Sub-total	126,479	77,152	216,333	103,493	96,330	13,847	6,829	640,463
	Ratio(%)	19.7	12.0	33.8	16.2	15.0	2.2	1.1	100.0
Nationwide		1,174,932	414,217	3,980,210	1,495,740	679,162	116,439	49,310	7,910,010
Ratio to Nationwide(%)		33.7	35.5	14.7	18.2	25.7	30.1	26.8	20.5



Source : INSTITUTO NICARAGÜENSE DE ESTUDIOS TERRITORIALES



Clay	Heavy Clay Soil	Silty loam	Clay loam	Sandt loam	Sand	Loam Sand



Scale 1:1,500,000

Figure Soil Texture of the Study Area

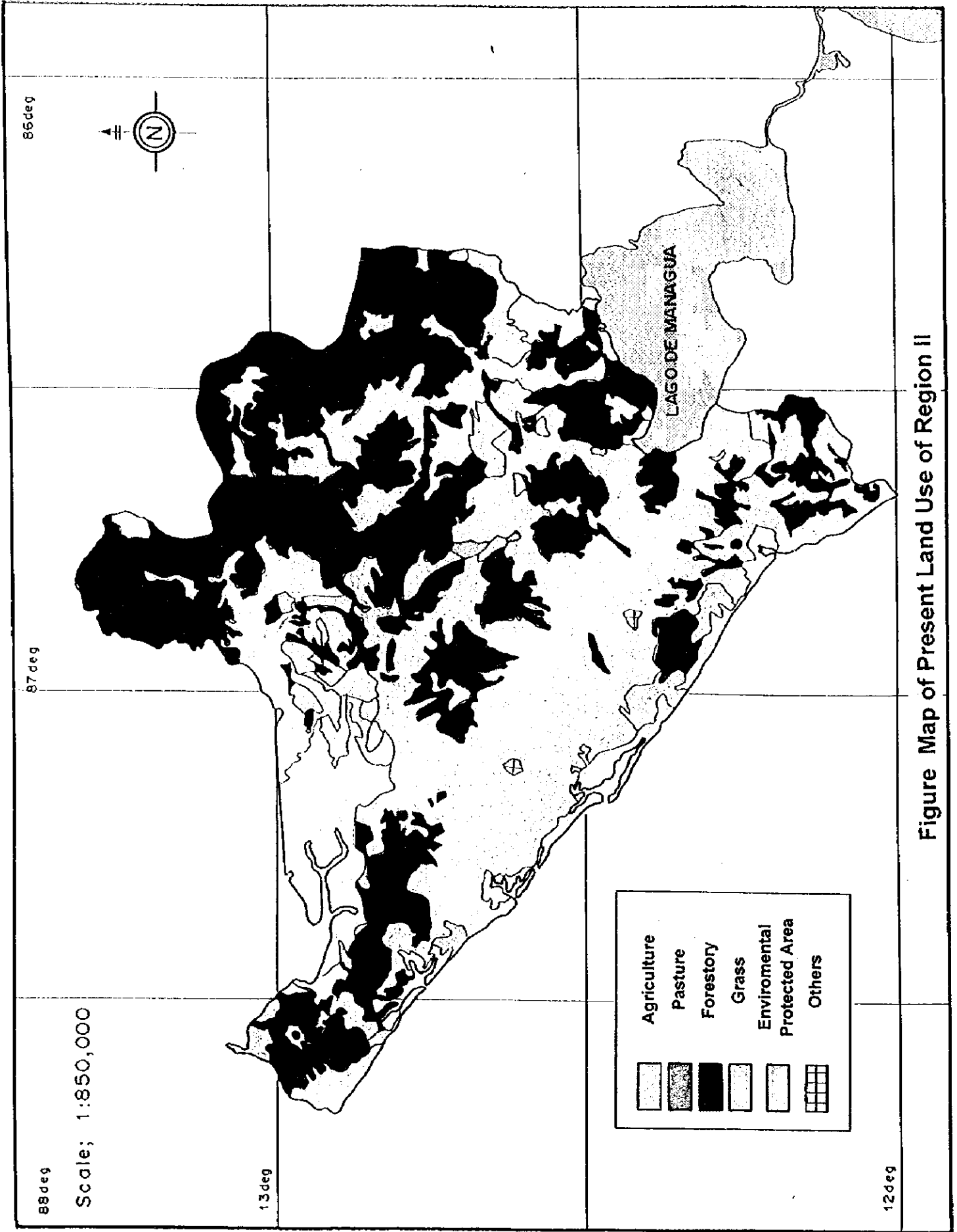


Figure Map of Present Land Use of Region II

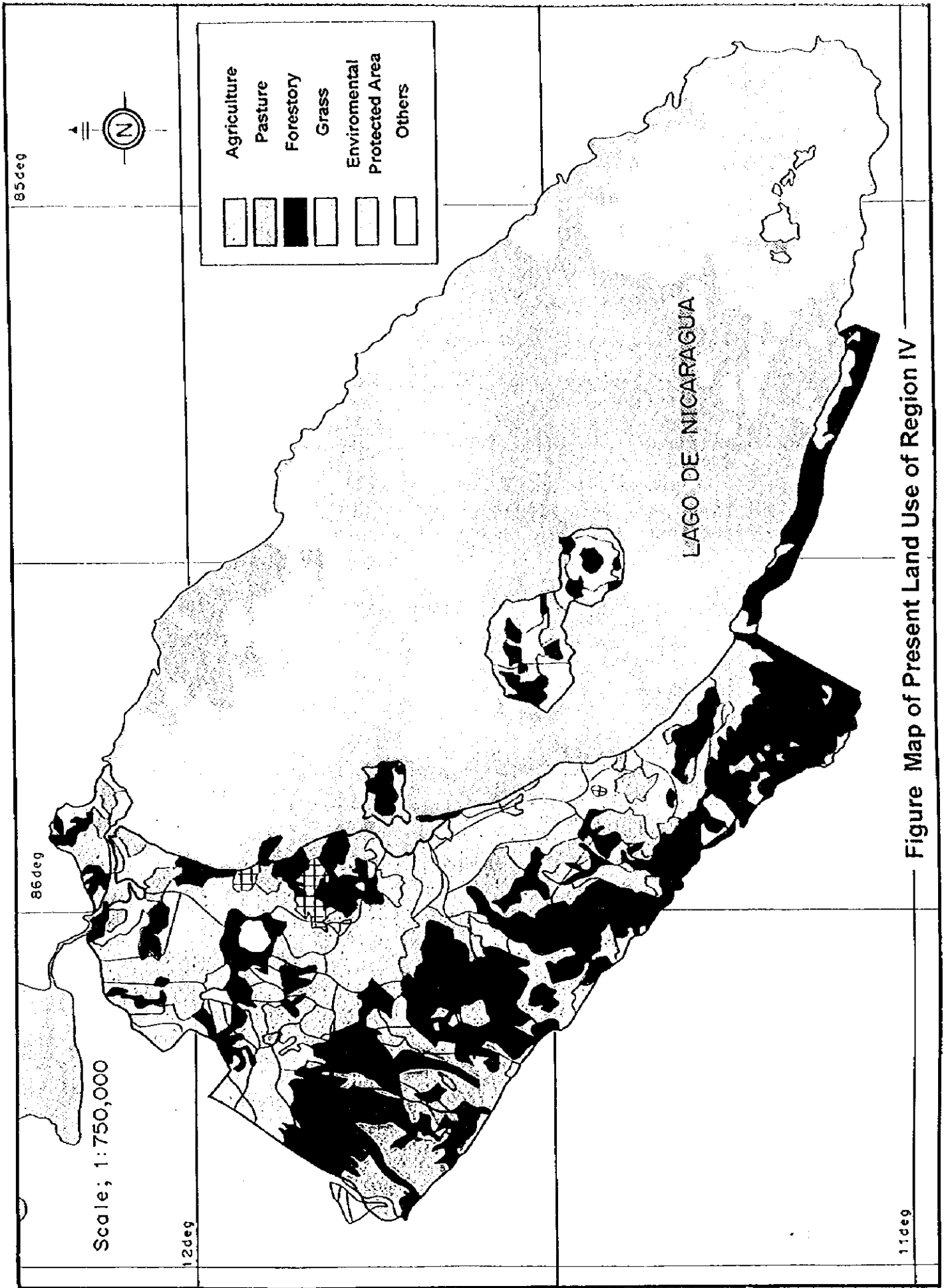


Figure Map of Present Land Use of Region IV

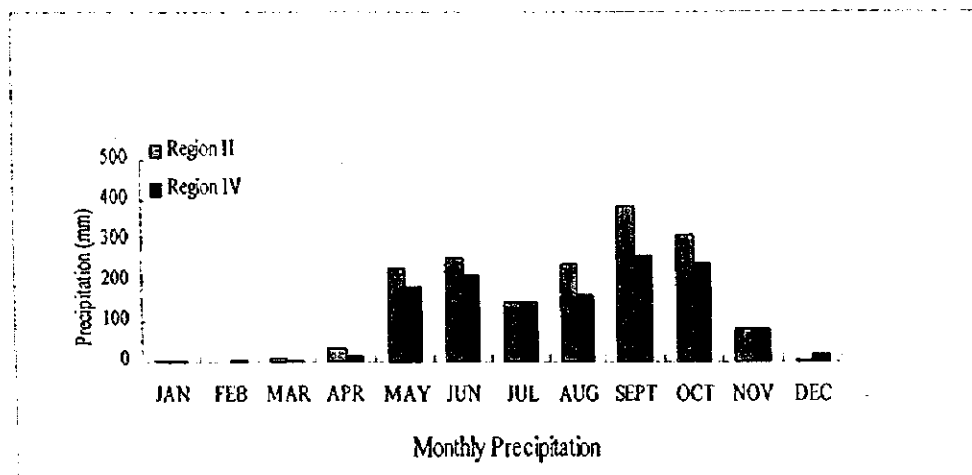
3.1.3 Meteorology and Hydrology

(1) Meteorology

1) Precipitation

The precipitation in the Study Area is concentrated during the period from April to November. The dry season starts from December and continues until March. The average annual total precipitation at the Region II is 1,717mm and 1,356mm at the Region IV. The rainfall in Region II is about 350mm higher than Region IV. The highest precipitation was recorded at the Pacific Coast, in the northern part of LEON and at the plain between the ESTELI Plateau and the MARIBOS Mountain Range. On the other hand, the lowest precipitation was recorded at the CARAZO Plateau, where the total annual precipitation is approximately 1,200mm. The average precipitation pattern for each region is presented below.

One of the characteristics of the precipitation pattern in the Study Area is the frequent occurrence of successive no-rain days during the rainy season, called "Canicula", which causes serious damages on farm products. More than 15 successive no-rain days have already occurred during July, and 5 successive no-rain days frequently occur during the rainy season.



2) Other Parameters

The mean annual temperature is approximately 27°C, and the annual fluctuation between the maximum and the minimum monthly temperature is only 3°C. The mean maximum temperature in the Study Area is approximately 34°C. The mean minimum temperature is slightly higher at the plain of the Pacific Coast than at the inland plateau in the Study Area.

The mean annual relative humidity at the coastal part is higher than at other parts of the Study Area. The minimum monthly mean relative humidity was 71% and was recorded in April, and the maximum monthly mean relative humidity was 85% and was recorded in September in Rivas, which is located at the coastal part. On the other hand, in Somotillo which is located at the inland, the minimum monthly mean relative humidity

was 48%, recorded in April, and the maximum monthly mean relative humidity was 79%, recorded in October. The total monthly evaporation is more than 200mm recorded during dry season, and less than 150mm recorded during the rainy season in most parts of the Study Area.

(2) Hydrology

1) River Water

There are four drainage basin systems in the Study Area; the Fonseca Gulf System, the Pacific Coast System, the Lake Nicaragua System and the Lake Managua System.

The characteristics of the rivers in the Study Area are; 1) too much fluctuation of monthly mean discharge; 2) too much underflow; 3) the water source of many of the rivers are springs, which are affected by the precipitation pattern and the nature of soil and geological conditions.

The rivers located in the Pacific coastal area have small topographical catchment area, because of mountainous location and the proximity to the coast. However these rivers have larger catchment area than topographical one, due to the fact that the rivers waters flow out of springs (underground water).

The characteristics of the main rivers are presented in the following Table.

River Name	Drainage System	Catchment Area (km ²)	Annual Mean Discharge (m ³ /sec)	Specific Discharge (m ³ /sec/km ²)	Runoff Ratio (%)
Río Atoya	Pacific Ocean	354.7	4.12	1.19	10.23
Río Tamarindo	Pacific Ocean	288.4	2.9	0.67	12.68
Río Brito	Pacific Ocean	261.5	3.55	1.11	18.31
Río Villa Nueva	Fonseca Gulf	1005	10.92	1.13	18.86
Río Negro	Fonseca Gulf	1237	4.37	0.88	-
Río Sinecapa	Lake Managua	1382	1.95	0.31	3.9
Río Viejo	Lake Managua	1405	12.2	0.87	14.05
Río Maracatoya	Lake Nicaragua	1132	11.31	0.31	10.94

2) Lake Water

There are 2 big lakes in the Study Area, which are the lake Nicaragua and the lake Managua. The surface area of the lake Nicaragua is 8,260 km² and it is connected with the Caribbean Sea through the San Juan river (annual mean discharge is 410 m³/sec). On the other hand, although surface area of the lake Managua is 1,040 km² and it is a closed lake, sometimes it overflows and its waters flow into the lake Nicaragua during the rainy season.

3) Groundwater

Geologically, most of the Study Area is formed of Quaternary formation based on the Tertiary Miocene formation. The characteristic of the basement nappe is low permeability, and it consists of welded pyroclastic sediment, tuff, sandstone tuff, basaltic lava, andesitic lava and gravel. The Quaternary formation is accumulated on the basement. Its main characteristic is the high permeability, and consists of aqueous

sediments. Groundwater is the main water source of the existing irrigation systems, and for domestic and industrial facilities in the Study Area. However, in the past too much groundwater was taken for cotton cultivation irrigation in part of the Region II, leading to a reduction of the groundwater level at that time. It must be taken into consideration that the groundwater shall continue to be used.

(3) Water Resources

Three water resources are available for irrigation purpose in the Study Area; rivers, lakes and groundwater. Rivers and lakes are not usually used except by large scale farmers.

1) River Water

As described before, the rivers in the Study Area are very much affected by the precipitation pattern and the nature of soil and geological conditions. These characteristics affect the utilization of rivers for irrigation purpose. Irrigation facilities were already installed at abundant discharge rivers, by large-scale farmers. Only Rio Villanueva and Rio Sinecapa are considered as stable water resource for irrigation. Discharge in draught year (non exceedence probability analysis, with a return period of 5years) and average year (non exceedence probability analysis, with a return period of 2years) are presented as follows.

(m³/sec)

River	Year	Jan	Feb	Mar	Apr.	May.	Jun	Jul	Aug.	Scp	Oct	Nov.	Dec	Ave.
Rio Sinecapa	Average Year	0.3	0.2	0.2	0.1	1.4	2.3	0.4	0.7	3.4	10.5	2.6	0.6	1.9
	Drought Year	0.1	0.1	0.1	0.1	0.4	0.6	0.1	0.1	0.3	2.1	0.4	0.1	0.4
Rio Villanueva	Average Year	1.0	0.8	0.6	0.6	4.7	10.5	3.5	3.0	18.8	25.1	9.0	2.2	6.6
	Drought Year	0.2	0.1	0.1	0.1	1.8	6.1	1.2	0.7	3.1	7.5	2.6	0.6	2.0
Rio Sanjuan	Average Year	436.5	373.3	299.9	229.6	242.1	274.2	396.3	420.7	474.2	510.5	521.2	504.7	390.3
	Drought Year	310.2	249.7	185.7	137.9	177.7	171.2	261.6	287.3	358.8	381.9	380.9	378.8	273.7

The Rio Villanueva and Rio Sinecapa have a high discharge fluctuation between the rainy season and the dry season. The discharge in the rainy season is 40 times higher than in the dry season at the Rio Villanueva, and 90 times higher at the Rio Sinecapa. No river discharge gauging stations were installed at the Rio Telica. However through site visits and hearing survey, it is found that the discharge of this river is expected not to present such a high fluctuation as in Rio Sinecapa and Rio Villanueva. The discharge measurement was carried out at the Rio Telica in the Phase I Study, and is continuing at the present. The average discharge of this river at Phase I field investigation was 1.0m³/sec.

2) Lake water

- Lake Nicaragua

The San Juan river which drains the lake water to the Caribbean sea has abundant discharge (shown in the previous Table). The lake water level fluctuates by 1.3m between the lowest and the highest recorded level. The water quality is good, thus becoming a good water source for irrigation purpose.

- Lake Managua

The lake Managua is a closed lake, thus the water drains only by evaporation. This lake water quality is inferior due to the inflow of waste water from Managua city and surroundings. Moreover, boron and basic material inflow from the basement napple, and hence this water is not proper for irrigation purpose.

3) Groundwater

The groundwater depth is as shallow as approximately G.L.-50m, and its stream capacity is higher than $0.012\text{m}^3/\text{sec}/\text{km}^2$, except in high altitude areas such as the CARAZO plateau. Almost all the existing wells for irrigation purpose are 50m to 100m deep, and can produce 0.01 to $0.1\text{m}^3/\text{sec}$ of water volume. However, this water volume is possible provided that only one well is installed per 1km^2 . If the well density is increased beyond this condition, there will be a reduction of the water volume in each well.

The plain between the ESTELI Plateau and the MARIBOS Mountain Range and around the 2 big lakes, has a high groundwater potential. On the other hand, the area between the Pacific Cost and the PACIFIC Mountains, only presents a small groundwater potential. In this area, the groundwater shall be used only for domestic purpose.

The theoretical groundwater potential at Region II is presented as follows.

Groundwater Basin	11,000	km^2		
Annual Mean Precipitation	1,660	mm/year		
Groundwater Discharge Volume	249	mm/year	15%	of Annual Mean Precipitation
Surface Runoff Volume	216	mm/year	13%	of Annual Mean Precipitation
Evaporation Volume	1,195	mm/year	72%	of Annual Mean Precipitation
Annual Total Groundwater Discharge Volume	2,739	MCM		
Irrigable Area using Groundwater	2,800	Km^2		
Unit Groundwater Volume for Irrigable Area	0.031	$\text{m}^3/\text{sec}/\text{km}^2$		

The Irrigable Area utilizing groundwater are farmlands, which are impossible to be irrigated with surface water and have no irrigation facilities to use groundwater. The Unit Groundwater Volume for Irrigable Area is not the available water volume for irrigation purpose, that volume is the Annual Total Groundwater Discharge Volume divided by the Irrigable Area. The Groundwater Discharge Volume ratio is the average ratio at the pacific zone of Nicaragua. The Surface runoff volume ratio is adopted in the Phase I Study analysis.

The theoretical groundwater potential at Region IV can not be analyzed, because the groundwater basin area of the Lake Nicaragua is not specified and due to geological conditions. However the plains around the Lake Nicaragua have the same groundwater conditions as in Region II, and therefore the Unit Groundwater Volume can be estimated as the same as in Region II.

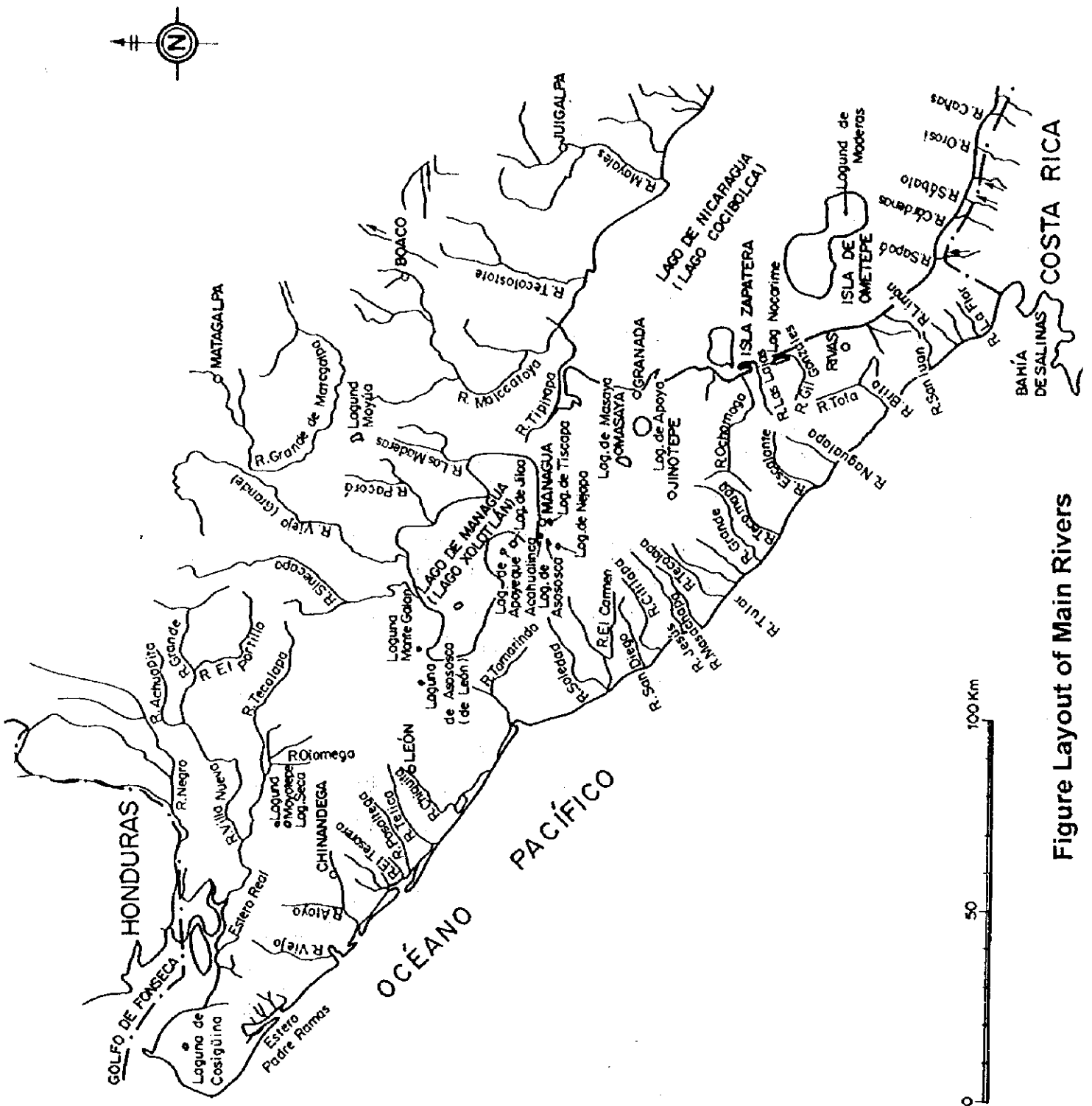


Figure Layout of Main Rivers

3.2 Socioeconomic Conditions

3.2.1 Administration and Population

(1) Administrative Divisions

The basic administrative divisions of Nicaragua are: Region, Department, and Municipality. Other smaller basic administrative divisions are: "Comarca", "Caserio" and "Comunidad" which are under the jurisdiction of the municipality. Generally, the towns which do not have a specific name are grouped under the collective denomination of "Comarca"; there are many of these "Comarcas" at the regional level. The budget for the administration of these divisions is under control of the respective municipality where there is a section in charge of those smaller divisions; there is no other official basic administrative division for that purpose. Therefore, there is no departmental head. In the Study Area the existing official administrative divisions are as follows:

	Region II	Region IV
Department	2	4
Municipality	23	31

(2) Area, Population Density and Urban and Rural Population Rates, by Department

The Study Area is located at the north (Region II) and at the south (Region IV), of the Region 3 of Managua. As presented in the Table shown below, the Region II has 2 departments and 23 municipalities, the Region IV has 4 departments and 31 municipalities, summing up to 6 departments and 54 municipalities. The population of Regions II and IV are very similar, despite the fact that the Region II area is approximately the double of the Region IV one. The population density in Regions II and IV are 68 and 145 inhabitants/km², respectively. The urban and rural population rates in both Regions II and IV are 55% and 45% respectively. There are no remarkable differences among the departments; the highest urban population rate is found in Managua, 62%, while the lowest one is found in the Department of Rivas, 34%. Furthermore, the average number of members in the family in Regions II and IV is 5.8, without remarkable differences among the areas

Area, Population and Population Density

Area/ Department	Department	Number of Municipalities	Area (km ²)	Population (inhabitants)	Population Density (persons/km ²)	Urban Population Rate (%)	Rural Population Rate (%)
Study Area		54	14,757	1,373,982	93	0.55	0.45
Region II		23	10,033	687,106	68	0.57	0.43
	CHINANDEGA	13	4,926	350,212	71	0.58	0.42
	LEON	10	5,107	336,894	66	0.55	0.45
Region IV		31	4,724	686,876	145	0.54	0.46
	MASAYA	9	590	241,354	409	0.57	0.43
	JINOTEPE	8	1,050	149,407	142	0.57	0.43
	GRANADA	4	929	155,683	168	0.62	0.38
	RIVAS	10	2,155	140,432	65	0.34	0.66

(3) Population Growth Rates by Department

The Table shown below presents the population growth rates, in different census periods, carried out in the decade of 90, by departments.

Population Growth Rate

Census Periods	Total of the Country	Geographical Regions									
		Pacific								Central and North	Atlantic
		Total	Chinandega	Leon	Managua	Masaya	Granada	Carazo	Rivas		
1906-20	1.7%	1.1%	2.1%	-1.0%	3.2%	1.3%	1.4%	1.2%	1.4%	2.5%	1.4%
1920-30	1.4%	1.5%	1.9%	1.0%	2.4%	1.5%	0.7%	1.2%	0.7%	1.2%	1.4%
1940-50	2.4%	2.6%	1.8%	2.7%	3.0%	2.8%	2.3%	2.5%	2.4%	2.1%	2.4%
1950-63	3.0%	3.1%	3.5%	1.5%	5.4%	0.4%	2.3%	1.8%	2.7%	2.9%	2.4%
1963-71	2.5%	3.2%	2.4%	1.3%	5.4%	2.3%	1.0%	1.0%	1.8%	0.7%	6.0%
1971-95	3.6%	3.4%	3.4%	3.0%	3.4%	4.1%	3.3%	3.1%	2.7%	3.5%	5.0%

Source: CENSO 1995

Until 1971, Managua had the highest growth rate in the country, presenting a slight reduction ever since. After 1971, the highest and lowest population density departments within both Regions II and IV are Masaya with 4.1% and Rivas with 2.7%, respectively.

3.2.2 Economic Activities

(1) Economic Conditions of the Study Area

The main economic activities in the Study Area are related to agriculture; the area plays an important economic role in Nicaragua. As examined elsewhere in this Report, the potentiality for agricultural development in this area is very high at present and in the future.

(2) Agricultural Conditions of the Study Area

1) Agricultural Production

Analysis of the agricultural production of Regions II and IV in 1996 compared to the whole country is presented in section 3.11.1. It is clear that the agricultural and livestock production of both regions is important for Nicaragua and it has not changed in many years.

2) Agricultural Sector Labor Force

The Table shown below presents the agricultural population by department in the 1995 census. Chinandega Department had the largest agricultural population among six departments, which accounted for 30% of the total agricultural population in the study area. Percentage of agricultural population to the total employed population in each department ranges between the maximum 49% of Rivas, and the minimum 22% in Masaya. Thus, the economy of Rivas Department is mostly relied on agricultural activities. Incidentally, most of the agricultural population in rural areas are categorized as small and medium-scale farmers and those in urban areas are said to belong to large scale farmer groups.

(Unit: 1000)

	Census Population	Labor Force	Employed Population	Agricultural population
Region II	478.5	227.6	180.0	69.4
Chinandega	240.9	113.8	90.4	37.5
Leon	237.5	113.8	89.7	31.9
Region IV	482.1	227.4	183.2	57.1
Masaya	169.2	83.4	70.6	15.5
Granada	108.7	50.3	39.8	11.4
Carazo	105.3	48.0	37.8	13.0
Rivas	98.9	45.7	35.3	17.2
Study Area	960.6	455.0	363.2	126.5

Source: Census 1995

In the 1971 census, the agricultural sector accounted for 237,300 or 47% of the total labor force, as shown in the Table below. During 24 years by the last census in 1995, the share of the primary sector decreased to 40%. This phenomenon implies that the economic role of agriculture has declined relatively in the national economy.

(Unit: 1000 Persons)

Sector	Nicaragua				Region II				Region IV			
	1971	%	1995	%	1971	%	1995	%	1971	%	1995	%
Total Labour Force	564	100	1,445	100	84.6	100	174.9	100	77.2	100	183.2	100
Agriculture	265	47	578	40	40.6	48	69.4	40	33.4	43	57.1	31
Industry	96	17	188	13	15.3	18	25.9	15	16.0	21	34.9	19
Services	192	34	592	41	26.5	31	75.9	43	26.7	35	82.1	45
Others	11	2	87	6	2.2	3	3.7	12	1.1	1	9.1	5

Source: Census 1971 and 1995, INEC

The average growth rates of agricultural population in both regions were 2.3%, which were 0.7% lower than the national average. The sector shares of Region II was characterized as similar to the national average, but in Region IV, the labor force was tending to shift to the secondary sector more than the primary sector. The share of the primary sector is larger than that of the secondary sector.

The distribution of the labor force by department in the Study Area is shown in the following table.

	Sector	Chinandega	Leon	Masaya	Granda	Carazo	Rivas
Population	Total	90,366	89,712	70,617	39,768	37,591	35,252
	Primary	37,485	31,931	15,495	11,376	13,025	17,192
	Secondary	12,988	12,868	17,177	8,241	5,599	3,815
	Tertiary	36,135	39,753	33,437	18,537	17,303	12,866
	No Reply	3,758	5,160	4,508	1,614	1,664	1,349
Percentage	Primary	41.5	35.6	21.9	28.6	34.6	48.8
	Secondary	14.4	14.3	24.3	20.7	14.9	10.9
	Tertiary	40.0	44.3	47.3	46.6	46.0	36.5
	No Reply	4.2	5.8	6.4	4.1	4.4	3.8

The maximum percentage of population of labor force in the primary, secondary and tertiary sectors are 48.8% in Rivas, 24.3% in Masaya and 47.3% in Masaya respectively.

3.2.3 Land Reform

The following Table shows the result of the farms which were given land titles in Regions II and IV during the period 1980-1996. The land titles of those lands affected by the Land Reform during the period 1980-1988 and given to individuals and cooperatives are 2,216 covering a total of 291,304 Mzs; at the end of the Sandinista's regime a total of 3,994 titles were issued for 383,964 Mz. The issuing of land reform titles started again in 1992, increasing the number of issued titles each year; by 1996, there were 2,848 titles with an approximate coverage area of 70,000 Mzs.

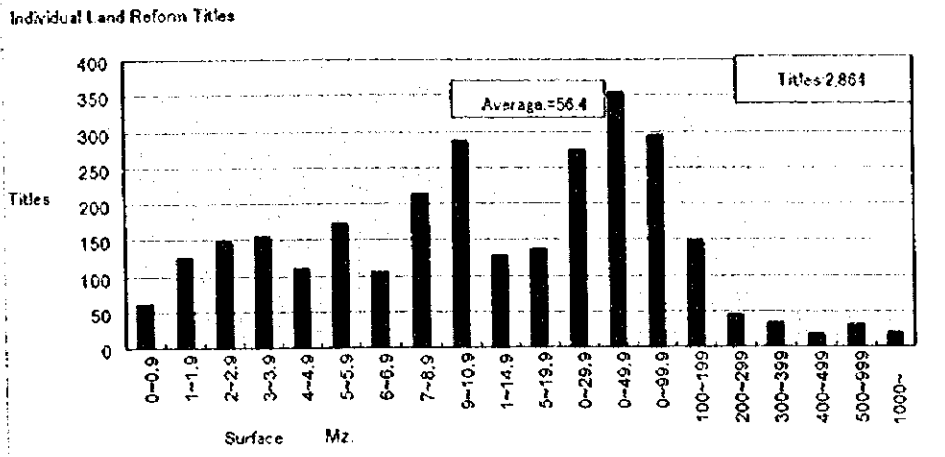
Land Reform Titing

	1980 - 1988						JANUARY 1989 - APRIL 1990					
	TOTAL		INDIVIDUALS		COOPERATIVES		TOTAL		INDIVIDUALS		COOPERATIVES	
	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)
REGION II & IV	2,216	291,304	1,370	29,027	846	262,277	3,994	383,964	2,864	161,635	1,130	222,330
REGION II	1,146	149,911	796	15,665	350	134,246	2,573	245,915	2,096	119,935	477	125,981
LEON							1,250	107,637	1,124	64,314.00	126	43,323.00
CHINANDEGA							1,323	138,278	972	55,621.00	351	82,658.00
REGION IV	1,070	141,393	574	13,362	496	128,031	1,421	138,049	768	41,700	653	96,349
GRANADA							268	17,389	163	3,108.00	105	14,280.00
MASAYA							464	17,492	197	1,882.00	267	15,520.00
CARAZO							286	34,310	140	4,912.00	146	29,398.00
RIVAS							403	68,948	268	31,798.00	135	37,151.00

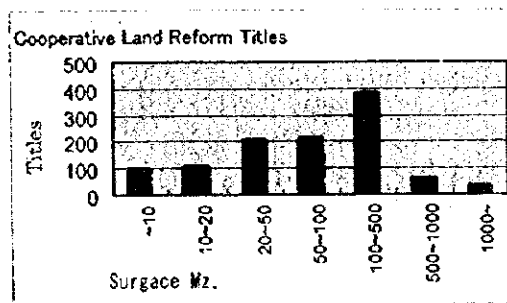
	YEAR 1992		YEAR 1993		YEAR 1994		YEAR 1995		YEAR 1996		TOTAL: 1992-1996	
	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)	TITLES	AREA (Mzs.)
REGION II & IV	96	547	537	6,648	435	16,832	769	19,473	1,011	26,365	2,848	69,865
REGION II	0	0	274	2,759	199	9,862	673	17,398	923	23,322	2,069	53,341
LEON			155	2,254.00	125	6,635	339	12,304	190	2,821		
CHINANDEGA			119	503.00	74	3,227	334	5,094	733	20,501		
REGION IV	96	547	263	3,889	236	6,970	96	2,075	88	3,043	779	16,524
GRANADA	7	406.00	7	807.00	37	2,000	7	203	2	6		
MASAYA					11	29	8	37	18	139		
CARAZO	89	141.00	8	439.00			1	834	5	1,217		
RIVAS			248	2,643.00	188	4,941	80	1,001	63	1,681		

SOURCE: INRA

The result of the Land Reform according to the individual farm sizes for the period 1980-1990 is shown in the following figure. There were a total of 2,864 titles with an average area of 56.4 Mzs. for each title. The farms with less than 5 Mzs represent 21% of the total and farms with an area of greater than 100 Mzs represent 10%.



In the Figure shown below, the number of titles issued to cooperatives during the period of 1980-1990 is shown; there were 1,130 titles with an average area of 197 Mzs.



3.3 Rural Society / Gender

3.3.1 Administrative Position of the Community

While the administrative organizations at the regional and departmental levels do not function, only one at the municipal level functions as an administrative office with the budget and the head. The area of the municipality is divided into some parts customarily called as "Comarca", and further each part has some communities or "caserio".

3.3.2 Form of the Rural Communities

Generally a region has some communities. While in many cases, the houses are concentrated in a place, forming a community (caserio), there are some cases where the houses are scattered in Comarca without forming a community. Generally speaking, the former case tends to be the older form than the latter one. The farmers who obtained the lands by the Agrarian Reform (hereinafter referred to as "A.R. farmer) normally belong to the latter type.

3.3.3 Socioeconomic Survey of the farmers

(1) Objective

This survey was implemented for the purpose of understanding the real situation of small and middle scale farmers, since it is indispensable for the Master Plan. For this purpose, the surveys were carried out in the Region II and IV. The number of sample survey was 200.

(2) Method of the Survey

The Survey is composed of 2 parts. One part is the survey with questionnaire for the farmers while the other is the rural intensive survey "Rural Rapid Appraisal: RRA". The former offers a wide range of information, although it has the disadvantage of gathering the qualitative data. On the other hand, RRA is able to collect the qualitative although it can not be applied to a large area. The combination of these two survey methods makes it possible to get highly credible information.

1) Socioeconomic Survey with Questionnaire of the Farmers

The number of the survey is 200 out of 104,113. This number is small, considering the size of the population. Taking into account of this condition, we set up the criteria to select households through the discussions with the officers of MAG.

Criteria for selection

- To select 40 communities which have regional characteristics in each municipality from " Flat Area" and " Mountainous Area (Slope)".
- To select households that possess 20 Mzs. or less.
- To select 5 households from each community at random, using the lists made up by regional offices of MAG.

2) Rapid Rural Appraisal

The selection of the community from each Region (II and IV) is based on the discussion with the regional officer of MAG, considering high portion of small scale farmers.

Selected Communities

- Region II: Cinco Pinos, Municipality of Cinco Pinos, Department of Chinandega
- Region IV: Fátima, Municipality of San Marcos, Department of Carazo

The following section describes the real conditions in the Region II and IV based on the results of the surveys by two methods, the existing information, and other surveys by the first survey.

3.3.4 Existing Social Conditions in the Rural Area

(1) Housing

Wood is usually used as the housing material for the wall and the others include concrete, bricks, adobe, and so on. The roofs is built by the tiles and zinc (90%). A few houses use the woods for the floor in the survey area. In most cases, the housings do not have specific materials for the floor (simply people live on the land). In some cases, those who are in a better economic condition can put bricks or tiles on the floor. The average number of the

rooms in a house are between 3 and 4 rooms. Generally, the housings have few windows or nothing. Normally the size of a window is quite small, and it is made of wooden board. People seldom use glass for the window.

(2) Family Structure

The family structure in the survey area is divided broadly into two types; the nuclear family and the extended family. The nuclear family is about 50 to 60 percent while extended family is about 30 percent. Despite the differences by each department, the Department of Carazo appears to have more portion of the extended family than the nuclear family, comparing with other departments (FIDEG). The average number of children are 6, and this number is higher than the urban area.

(3) Foods

The small and medium scale farmers normally consume rice, tortilla, beans, "guineos" (a kind of banana), etc. Among them, they eat rice more commonly with the beans (called it "Gallopinto"). Many kinds of vegetables are not commonly consumed. Chicken, beans, eggs, and milk (sometimes beef) are the main sources of the protein. The used fuel for cooking is the firewood, while propane gas and kerosene are rarely used in rural area.

About 80 to 90 percent of drinking water is provided by the pipeline, or the individual and communal wells. The rest are taken from the river or the lakes. The water service has largely spread to more than a half of households in the Department of Carazo and Masaya with a large proportion of mountain area. In the rest of departments, only 18 to 30 percentage of the households are provided with the water service. The majority of the inhabitants are satisfied with the quality of the water.

(4) Health

Each municipality has the health center administered by the Health Ministry, although the General Hospitals are located only in the principal cities. When the inhabitants need official medical service, they have to go to the health center. Further, if some of them needs the high medical service, they go to the General Hospital with a reference. Since the medicines lacks in almost all health centers, the physicians only write a prescription and the patients buy some medicines in the pharmacy.

According to the report of UNICEF, the diarrhea and the acute respiratory infection are two principal causes of infant mortality. This situation is observed very frequently in the rural area. The infant mortality and morbidity are caused by the bad (or inappropriate) condition in the sanitation and the housings. This high rate of morbidity is observed in the children and the old. Especially, the morbidity under 5 years by the respiratory infection is about 60 percent (ISMR). The knowledge of the prevention, makes it possible to decrease the rate of morbidity or mortality by two causes. In this sense, it's necessary for parents to have knowledge of " Preventive Health".

The life expectancy in Nicaragua is 65 years at the national level, while it is only 55 years in the rural area.

In 1990, the fertility rate is 6.4 by a woman, which is a double number compared to the rural area. 67 percent of the women who have one or more child do not wish to have more children

(MAG). In particular women do not want to be pregnant. Therefore, more family planning services have to be extended.

(5) Religion

Currently, 80 to 90 percent of inhabitants are catholic, and 10 to 20 percent are Protestant. In earlier times, almost all were catholic, but there has been an increase of the Protestants in these years. Based on the data of ISMR, 82 percent of the inhabitants in the survey area are catholic and less than 10 percent are Protestant.

3.3.5 Employment in Rural Area

(1) General Type of Employment

According to ISMR, the average time of work by day, was 12.3 hours for husbands and 11.6 hours for wives. The husbands are involved in the economic activity in the field, and practically don't participate in the domestic works. On the other hand, the domestic work occupies a large part of the work of the wives. Moreover, one out of four women are involved in working in the field, but the average time of such work is less than an hour. There is a clear division of the work between man and woman.

(2) Work of the Woman

According to the survey of FIDEG, women spend more than 30 hours per week in the agricultural sector, and produce 33 percent of the agricultural crops. A large part of women's work is considered as family work. In other words, it is unpaid work. Even in the case that women can get a salary, it is relatively low (325 cordobas per month).

On the other hand, according to the information of ISMR, women are involved in the productive work for only 2 hours per day (14 hours by week), while the work related to house garden occupies about 60 percent.

3.3.6 Education

(1) Education of the Farmers

According to the information of the census (1995), about 40 percent of the economically working population are not educated at all and about 30 percent completed up to the degree of the primary school. It seems to be difficult to improve this situation radically, because only 35 percent of the youths (between 6 to 29 years) attend school in the rural population.

The situation in surveyed 6 departments is a little better, compared with the Figures at the national level. However, there is a clear difference between rural and urban areas. This difference in 6 departments is between 10.1 % to 18.1% (24.7% at the national level), this average was 45.0 % in the rural area and 58.9 % in the urban area.

In the urban area, 65 to 70 percent of the inhabitants complete up to the fourth degree of primary or more, while only 35 to 40 percent do in the rural area. In the farming family, the boys are source of the work in the field and the girls are assistants of her mother. For this reason, frequently the students discontinue their studies or abandon them.

It is said that there is a relationship between the way of acquiring the land and the level of education. According to data of ISMR and, also, of FIDEG, the proportion of the uneducated within the A.R. farmers, is approximately 10 percent higher than the farmers who obtained by the inheritance or by buying themselves. It is well known that most of the R.A. farmers were the agricultural workers or the laborers. Normally they have less opportunities for attending school and for continuing to study. Most probably it can be thought as the reason of high percentage of "no education" in the A.R. farmers. The farmer's group which bought the lands has the highest education. This results in the effective land-use and high productivity, which is supported in the report of MAG concerning the relationship between the productivity and the education (written by Melba A. Castle).

It is observed that there is no distinctive difference of the educational level by sex, as well as how the educational level by geographical characteristics, based on to the information of ISMR and of FIDEG.

(2) Literacy

The literacy rate of the rural area is 20 to 30 percent lower than that of the urban area. There is a little difference in the urban by sex, and the men's literacy rate of is 3 to 5 percent higher women's. On the other hand, it is observed that there is no difference between the flat area and the mountainous area.

(3) Education

The primary and the secondary schools are facilitated in all the municipalities of the survey area. However, 60 to 70 percent of teachers working in the rural area are not qualified. This factor might become an obstacle to improve educational.

3.4 Agriculture

3.4.1 Characteristics of Agriculture in the Study Area

The Study Area is divided into two parts such as Region II and Region IV, which show distinctive agro-ecological characteristics. Moreover, due to some differences within each region, the region II is subdivided into the north and the south sub regions, while the region IV comprises of sub-regions of the highland area representing Carazo plateau, the shore of the lake Nicaragua, and the Pacific coast area, respectively. Each sub-region has agricultural characteristics as described below.

(1) Region II

This region is divided into the two parts where the Esteli river borders on the North (3133.6 km²) and the South (7145.7 km²) sub-regions, under tropical savanna climate. The North sub-region is occupied mainly with mountainous landscape, resulting in less flat area with low productivity. On the contrary, the South sub-region, which is extended with vast flat land, represents the largest agricultural zone in the country with the highest agricultural production in the country. The Table shown below indicates agricultural production by the sub regions based on the municipal agro-statistics in 1996/97.

Cultivation	North Zone			South Zone			Total QQ
	Area (Mz)	Production (QQ)	%	Area (Mz)	Production (QQ)	%	
Coffee	65.0	65.0	9.3	153.0	633.0	90.7	698.80
Cotton	0.0	0.0	0.0	2,852.0	57,481.0	100.0	57,481.0
Sesame	10,432.0	75,649.0	39.1	21,115.0	117,898.0	60.9	193,547.0
Sugarcane	0.0	0.0	0.0	14,200.0	662,531.0	100.0	662,531.0
Banana	0.0	0.0	0.0	2,565.0	1,670,218.0	100.0	1,670,218.0
Peanuts	0.0	0.0	0.0	13,561.0	484,578.0	100.0	484,578.0
Soyabean	0.0	0.0	0.0	11,097.0	272,270.0	100.0	272,270.0
Maize	19,539.0	291,472.0	44.9	18,642.0	361,681.0	55.1	656,153.0
Frijol	5,163.0	44,350.0	82.6	1,269.0	9,365.0	17.4	53,715.0
Rice	7.0	490.0	0.1	8,527.0	465,171.0	99.9	465,661.0
Sorghum	5,108.0	10,734.0	2.6	18,916.0	396,102.0	97.4	406,836.0
Sub total	40,314	425,760	8.6	112,897	4,497,928	91.4	4,923,688

Source: Compilation of the statistical data by the Study Team

Note: The yield of sugarcane is preliminary figure

1) The Northern sub-region

It is evident from the Table that the agricultural production of the Northern in 1996 is only 425,760 QQ which is equivalent to 8.6 % of 4,497,928 QQ production of the Southern region. The major cultivated crops are maize, frijol and sorghum for the basic grains, while sesame as cash crop, promoted by INTA in a series of crop diversification program is expanded as cash crop. Coffee production is managed only for the local consumption in small scale. This sub-region is generally oriented to the farming for self-supply focusing on the basic grains because of many mountainous landscape without good farm lands, and facing on the soil erosion problems.

2) The southern sub-region

The Southern sub region is mostly extended with plains and leading agriculture and livestock region in the country. Apart from the basic grain production, the large farmers, agricultural cooperatives, and private enterprises cultivate sesame, sugarcane, banana, peanut, soybean and etc. with large scale mechanized farming for exportation. This production accounts for 80 to 100 % over the national production.

The small-medium scale farmers cultivate mainly the basic grains, and introducing sesame cultivation which is easily managed even under the rainfed condition, and the area devoted to sesame has rapidly expanded.

(2) Region IV

The Region IV consists of 4 departments such as Masaya, Carazo, Granada and Rivas. Geographically, this region is subdivided into 3 sub-regions, i.e., the shore of Lake Nicaragua area (1541.6 km²), the Pacific coast area (2762.3 km²) and the Carazo plateau (589.8 km²). The Table shown below indicates the agricultural statistics by sub-region in 1995/96.

Estimated Crop Production and Area in the Region IV by Each Zone (1995/96)

Cultivo	Zone												
	Planicie Costera del Lago Nicaragua				Cordillera del Pacifico				Meseta de los Pueblos				Total
	Area(Mz)		Produccion(QQ)	%	Area(Mz)	%	Produccion(QQ)	%	Area(Mz)		Produccion(QQ)	%	
Coffee	1,031.6	3.1	8,371.0	6.7	835.9	2.5	9,199.1	7.4	9,756.5	39.4	107,219.1	85.9	124,789.2
Cotton	404.1	1.2	13,956.5	20.7	0.0	0.0	0.0	0.0	1,547.9	6.2	53,504.5	79.3	67,471.0
Sesame	724.4	2.2	7,147.5	30.3	1,054.9	3.2	11,568.6	49.0	492.4	2.0	4,891.9	20.7	23,607.9
Sugarcane	4,575.8	13.9	283,152.0	49.3	4,232.0	12.6	290,737.3	50.7	0.0	0.0	0.0	0.0	573,889.3
Tabaco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Banano	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mani	57.0	0.2	1,045.3	19.2	31.1	0.1	441.6	8.1	215.7	0.9	3,945.8	72.6	5,432.7
Soya	4.1	0.0	43.0	2.8	0.0	0.0	0.8	0.4	14.7	0.1	145.1	76.8	189.0
Maiz	7,060.7	21.4	163,635.4	29.2	12,319.9	36.8	293,684.7	52.4	5,408.8	21.8	102,982.4	18.4	560,302.5
Frijol	7,745.5	23.5	56,625.5	32.4	10,307.2	30.9	83,673.8	47.9	5,242.5	21.2	34,415.6	19.7	174,714.9
Arroz	8,827.8	26.8	321,073.1	82.7	2,133.5	6.4	65,492.2	16.9	56.5	0.2	1,456.7	0.4	388,622.0
Sorgo	2,521.9	7.7	125,711.9	38.5	2,533.5	7.6	93,808.9	28.7	2,048.3	8.3	108,873.7	32.7	326,394.5
Sub total	32,953	100.0	980,771	43.7	33,478	100.0	848,607	37.8	24,783	100.0	415,435	18.5	2,244,813

Fuente: Compilation of the statistical data by the Study Team

1) The High Plain sub-region in the Region IV

The Carazo plateau which ranges between 400 m and 900 m in above sea level, involving in part of Carazo and Masaya departments and located in the proximity to Managua metropolitan area, shows distinctive aspects agro-ecologically from the other areas. Further, many small-medium scale farmers are centered upon in this sub-region. Annual precipitation in this area falls in a range between 800 mm and 1200 mm and the soils in the area are sandy soil, loamy soil and clay soil. Many fruits and vegetables as well as coffee are widely cultivated under an advantageous climate condition such as cool climate. It is observed that some of the farmers sell their products directly to the markets in the metropolitan area since the location is closed to the suburbs of the metropolitan. Coffee production is managed as plantations by the large scale farmers and enterprises who employ the local idle labor forces. In the major crops cultivated in this sub-region, basic grains occupy 50 % of the total agricultural production, coffee occupy 40 %, and the rest consists of cotton, sesame etc. Fruits and vegetables are vital cash crops for the small-medium scale farmers because of its marketing background of Capital city, Managua. Particularly, La Concepcion in Masaya Department becomes famous for its cultivation of pineapples and pitahaya over the sloping area.

2) The shore of Lake Nicaragua sub-region

The shore of Lake Nicaragua sub-region involves in the part of Granada and Rivas departments. Except for Ometepe island in the Lake Nicaragua, the majority of the sub-region is expanded with flat land landscape. Soil taxonomy is dominantly clayey soils with a thick soil layer up to 80 cm depth. Annual precipitation ranging between 900 mm and 2000 mm is associated with a small dry spell in the rainy season so-called "Canicula", which occurs almost one month from mid-July to mid-August. Along the shore of the Lake Nicaragua, the large scale irrigation rice farming is expanded along the shore, especially in Malacatoya by pumping up water from the Lake Nicaragua and produces 80 % of the rice production in the Region IV. The type of irrigation rice farming is oriented to the land owner who holds paddy fields equipped with irrigation facilities, which are rented to the tenant farmers. There is no irrigation rice farming by the small scale farmer. Besides rice farming, this sub-region is mainly cultivated with sugarcane, maize, sorghum, frijol, fruits and vegetables.

3) The Pacific Coast sub-region in the Region IV

The south of the Pan American highway is expanded with the vast pasture zone and cultivated with sugarcane on a large scale. Clayey and loamy soils dominantly prevails in the area with 40 to 90 cm depth of soil layers. Annual precipitation varies with places, 800 mm in the Pacific coast to 2500 mm in the Municipality of Cárdenas where no "Canicula" occurs, and bordering to Costa Rica, and thus the 3rd cropping so-called "Apante" is possible in this area. Farming type is mainly oriented to livestock and agriculture, and an acreage of basic grains accounts for 80 % of the total cropping area, followed by sugarcane and sesame. Production of basic grains accounts for 50 % of maize and frijol in the Region IV.

3.4.2 Number of the Farm Households and its Possessed Farmland Size

The Table shown below indicates the number of farm households by farm size and pooled acreage by the farm size.

As shown in the Tables, the number of the farm households holding 0.1 to 4.9 Mz and 5.0 to 24.9 Mz classes account for 74.3 % in the Region II and 79.8 % in the Region IV, respectively. The total acreage of less than 25 Mz land holder to the total acreage of above 25 Mz ranges from 20 to 30 % except for Masaya Department which accounts for 55.9 %, more than half of the total farm land. This implies that the small-medium scale farmers are overwhelmingly concentrated in Masaya Department. On the other hand, Granada department accounts for 70 % of the farm lands which are hold by the land holder above 100 Mz, followed by 61.1 % in Rivas department. Similarly, the Region II shows the same trend, i.e., 50 to 55 % of the farm lands having been owned by the farm households owing more than 100 Mz, thus the small-medium scale land holders of less than 25 Mz result in a range of 22 to 27 %.

GENERAL LAND USE CHARACTERISTICS AND NUMBER OF FARM HOUSEHOLDS

REGION	Departamento	Número de Finca por Tamaño de Finca (Mzs)					Total	Número de Finca por Tamaño de Finca (Mzs)					Total
		0.1-4.9	5-24.9	25-99.9	100-499.9	500+		0.1-4.9	5-24.9	25-99.9	100-499.9	500+	
TOTAL PAIS		156,668	92,358	48,064	16,876	1,539	315,504	49.7	29.3	15.2	5.3	0.5	100.0
REGION II & IV		64,311	29,202	7,568	2,630	402	104,113	61.8	28.0	7.3	2.5	0.4	100.0
REGION II		20,819	17,927	5,113	1,682	221	45,762	45.5	39.2	11.2	3.7	0.5	100.0
	Chinandega	10,714	8,770	1,638	641	105	21,868	49.0	40.1	7.5	2.9	0.5	100.0
	Leon	10,105	9,157	3,475	1,041	116	23,894	42.3	38.3	14.5	4.4	0.5	100.0
REGION IV		43,492	11,275	2,455	948	181	58,351	74.5	19.3	4.2	1.6	0.3	100.0
	Masaya	17,329	2,678	229	92	10	20,338	85.2	13.2	1.1	0.5	0.0	100.0
	Granada	7,992	1,645	319	188	48	10,192	78.4	16.1	3.1	1.8	0.5	100.0
	Carazo	7,655	3,192	757	227	30	11,861	64.5	26.9	6.4	1.9	0.3	100.0
	Rivas	10,516	3,760	1,150	441	93	15,960	65.9	23.6	7.2	2.8	0.6	100.0

Fuente: MAG

Remarks:

The farm lands held by the cooperatives are described in the name of representative, thus obviously the class of above 500 Mz should include the cooperatives land but no actual data is available. Proceeding with the agrarian reform, the total farm lands owned by individual land holders reach to 515,000 Mz and the percentage of farmlands owned by the individual landholders is estimated to be around 6 %.

ENCUESTA DE PRIMERA -

REGION	Departament	Farm Area (Mzs)					Total	Percentage of Farm Area (%)					Total
		0.1-4.9	5-24.9	25-99.9	100-499	500+		0.1-4.9	5-24.9	25-99.9	100-499	500+	
TOTAL		277,48	1,021,706	2,295,05	2,883,96	1,431,80	7,910,01	3.5	12.9	29.0	35.5	18.1	100.0
REGION III		110,163	303,088	348,171	468,452	392,491	1,620,365	6.8	18.7	21.4	28.9	24.2	100.0
REGION II		42,738	194,886	236,922	294,386	210,970	979,902	4.4	19.9	24.2	30.0	21.5	100.0
	Chinandeg	22,683	89,383	75,526	123,367	104,176	415,135	5.5	21.5	18.2	29.7	25.1	100.0
	Leon	20,055	105,503	161,396	171,019	106,794	564,767	3.6	18.7	28.6	30.3	18.9	100.0
REGION		67,425	108,202	109,249	174,066	181,521	640,463	10.5	16.9	17.1	27.2	23.3	100.0
	Masaya	21,529	21,845	9,181	16,147	8,870	77,573	27.8	28.2	11.8	20.8	11.4	100.0
	Granada	11,790	14,588	13,019	36,271	50,517	126,185	9.3	11.6	10.3	28.7	40.0	100.0
	Carazo	15,122	30,943	34,437	39,379	27,557	147,438	10.3	21.0	23.4	26.7	18.7	100.0
	Rivas	18,984	40,825	52,612	82,269	94,577	289,267	6.6	14.1	18.2	28.4	32.7	100.0

Fuente:

3.4.3 Categorization of Small-scale Farmers

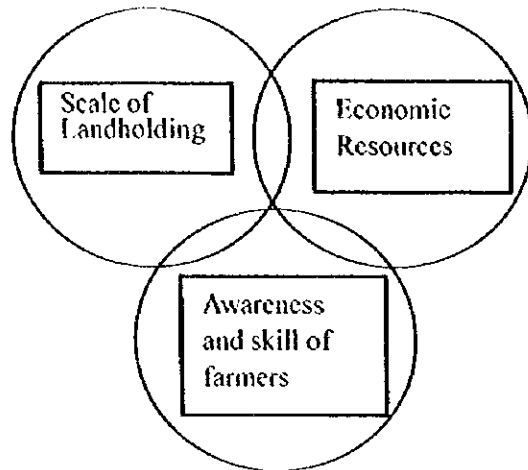
(1) Details of Small-scale Farmers

There was a fast dissemination of cotton cultivation on the Pacific Coast of Central America from 1950 to 1960. In the 60's, there was an expansion of large-scale farmland through the increasing of beef production. Since a forest around the plain land means a foundation of living for small-scale farmers, small-scale farmers must be selected from the way of living, which are 1) moving into hinterland, 2) moving into lowland of Pacific Coast for the agricultural frontier or 3) migration to urban area.

A lot of small-scale farmers acquired superior irrigable area by agrarian reform in Sandinista Government (1979 to 1990). However, in case the area allocated to small-scale farmers, are operated efficiently by landowner, private possession of land is guaranteed no relation to allocated area (An Article of the First Agrarian Reform). Consequently, farmers of 500Mz accounts for 0.4% of total, and these farmers manage 18.1% of total irrigable area. Besides aspects of farming for living standards applies the brakes to dividing irrigable area into tiny lots (33 Articles of the First Agrarian Reform). However, the area allocated by agrarian reform was divided into tiny lots by inheritance. Although personal irrigable area by agrarian reform is 56.4Mz in average in Region II and IV, allocated area of 5Mz accounted for 21% of total the area. Agrarian reform was also carried out to divide small-scale areas.

(2) Classification of Small and Medium scale Farmers

Definition of farm size is not given to farmers in Republic of Nicaragua at present. Small and medium scale farmers have utilized half of them farm land owing to farmers' nature. The concept of small and medium scale farmers is categorized 3 (three), which are 1) scale of superior farm land, 2) balance of farming and 3) farming conscious of the farmers. And these categories are closely related as shown in the Figure.



1) Classification by INTA

In 1997, INTA regional office categorized 2 (two) aspects, which are scale of the farm size and farming pattern, by each municipal. In the above categorization, maximum size of small-scale farmers is estimated 10 to 30Mz and 10 to 20Mz in Region II and IV. Definition range for small-scale farmers in Region II is wide comparing with region IV. In addition, suitable condition of farmland is small comparing with unsuitable irrigable area in each region.

In the detail estimation for the above categorization, categorization of small-scale farmers are divided into 3 (three) classes, which are 1) less than 10Mz, 2) less than 15Mz and 3) less than 30Mz, in Region II. Less than 10Mz of small-scale farmers is divided into flat land of 3 (three) municipals of which Leon, Chinandega and Somotillo, and less than 30Mz is divided scheduled place the mountains of 2 (two) area, which is around of Chinandega and northern part of Chinandega. Less than 20Mz is divided in the area except for the above area. On the other hand, categorization by size in region IV is divided into 2 (two) classes, which are 1) less than 15Mz and 2) less than 20Mz. Less than 15Mz of small-scale farmers is distributed in suburban high hilly place and Cardenas municipal and less than 20Mz is distributed in other places.

Farming of small-scale farmers is mainly of basic grain and pasture in every municipal. In addition to the above crops, sesame, coffee, fruits and vegetables are cultivated as cash crops.

2) Example of CINCO PINOS in RRA Study

Although small-scale farmers in CINCO PINOS are defined as less than 30Mz by INTA, farmers are divided into 3 (three) categories, which are 1) 1 to 5Mz of small-scale, 2) 5 to 20Mz of medium-scale and 3) more than 20Mz of large-scale. Income of large-scale farmers consists of both agricultural production and extra job. However, large-scale farmer is defined as poverty class based on the borderline for the poverty of World Bank, as shown in the Table. Besides, landless farmers (tenant farmers) belong to extreme poverty class.

	Scale of Irrigable Area	Cost for Foods consumption (US\$/person/year)		Living Expense (US\$/person/year)	
		With self-consumption	Without self-consumption	With self-consumption	Without self-consumption
Landless Farmers	Rented land 7Mz	132	78	195	142
Large-scale farmers A	34Mz	265	138	315	188
Large-scale farmers B	65Mz	232	125	339	231

Note: Poverty line; Living expense is US\$428.94/person, and Extreme poverty line; Living expense is US\$202.64/person

3) Living Expense in the Farm Economy Survey

Farm economic survey was intended for 82 and 90 farm households in Region II and IV in this study. Living expense per year of these farmers is estimated in average as shown in the Table. Although irrigable area in Region II is twice the size of Region IV, region II is defined as extreme poverty class same as region IV.

	Scale of Irrigable Area	Living Expense per Year (US\$/person)	
		With self-consumption	Without self-consumption
Region II	11.1Mz	172	153
Region IV	5.3Mz	221	193

4) Income of Large-scale Farmers

Income of large-scale farmers is estimated for each item based on the survey of FIDEG as shown in the Table. Farmers' yearly income of more than C\$50,000., covers half of total, and others obtained small income like income of small-scale farmers. There is no relationship between irrigable area and amount of income.

	Scale of Irrigable Area	Cultivated Area	Head of livestock	Income of agriculture	Selling of Milk	Selling Livestock	Total of Income
Farmer A	100Mz	1.5Mz	23	-	C\$16,314	C\$10,000	C\$26,314
Farmer B	62.5Mz	2.5Mz	61	C\$800	-	C\$451,787	C\$55,587
Farmer C	100Mz	4Mz	7	Cost for rented land C\$8,000	C\$6,913	-	C\$14,913
Farmer D	56Mz	4Mz	149	C\$3,040	C\$36,340	C\$45,000	C\$84,380
Farmer E	50Mz	40Mz	24	C\$63,240	C\$7,110	-	C\$70,350
Farmer F	50Mz	1.5Mz	20	C\$8,510	C\$3,200	C\$8,600	C\$20,310

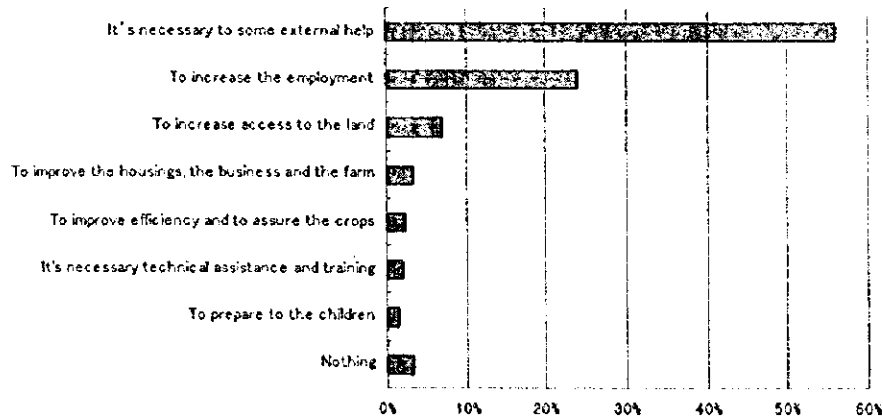
5) Classification by World Bank

Categorization of farmers in Region II is classified as follows by World Bank.

- i) Small-scale farmers (less than 5Mz, 58%):
Agricultural production is produced for self-consumption mainly, and exceeding production is supplied to market.

- ii) Medium-scale farmers (5 to 20Mz, 29%):
In addition to the case of small-scale farmers, pulses and sesame are added with basic Agricultural production, milk is also produced for self-consumption.
- iii) Large-scale farmers (more than 20Mz, 8%):
Livestock activities are carried out jointly with farming; the production is destined mostly to the markets.
- iv) Cooperative (7%):
Agricultural works are carried out through the cooperative. In some cases, women are not considered as agricultural workers.

6) Conscience of Agricultural Farmers



*The external help includes the construction of road, of school, of health center, of the drinking water net, of electrical energy, of aviation, improvement of transportation service and the financing by the government or the NGOs.

Form to Improve the Level of the Life

The Figure shown above indicates the results of the question concerning the ways to improve the standard of living. The positive opinions for improving their lives (by voluntary activities) are a very few. On the other hand, the opinions some exterior help are much larger. Adding "the access to the land" to this, it reaches more than 60 percent, which indicates that the farmers tend to be dependent on the exterior support.

Results of farm economy survey are shown in the Figure. A few farmers have a farming conscious, which is improvement of own living standards by farmers' ability and agri-technology. On the other hand, most of the farmers hope strongly for support from foreign organization. In addition the access road for farmland to the above mentioned, it means that 60% of total farmers hope improvement of living standards by supporting from foreign organizations.

7) Classification of Small and Medium scale Farmers

Out of the above, it is quite difficult to classify the farmers from small to large scale considering existing condition and other categorization, since there is no relationship between farmland size and income of Agricultural production. Characteristics of farmers are described qualitatively as shown in the Table.

Categorization of Farmers by characteristics

	Small-scale Farmers	Medium-scale Farmers
Objective of farming	Self-consumption	Self-consumption + Selling
Seeds	Seeds stock for self-consumption	<- + Seeds purchased from market
Access	Not available	Available
Access for Agricultural Credit	Not available	Available
Access for Agri-technology	Not available or Restricted	
Agricultural Equipment	Not available or Restricted	Available
Cultivation	Animal farming	<- + Farming Machinery
Pasture	Less than 5 heads of Cattle	More than 5 heads of Cattle
Nature conditions (Meteo-hydrology and soil)	Good	Good

However, categorization of farmers is classified as follows considering potential for agricultural system in the future, considering that obtaining superior irrigable area is base of farming.

- i) Small-scale farmers; less than 5Mz (53.3%)
5Mz of irrigable area ensures lowest living standard for small-scale farmers. However, in the case of less than 5Mz of the area, farmers must do farming involved another business.
- ii) Medium-scale farmers; 5 to 20Mz, pasture as main; 5 to 50Mz (estimate as 25 to 27%)
It is possible to carry out various agricultural development potential

8) Classification of Small and Medium scale Farmers

Categorization of farmers can be possible based on the farmers size of MAS. Small-scale farmers of 10Mz size accounts for more than 50% of the municipal areas. The major areas are 4 municipals in Chinandega department (31%); 4 municipals in Leon department (40%) in region II, and 8 municipals in Masaya department (89%); 2 municipals in Granada department (50%); 5 municipals in Carazo department (63%); 5 municipals in Rivas department (50%) in Region IV. The highland of Carazo which has various farming is shared mostly by small-scale farmers in the Study Area.

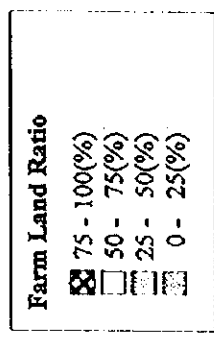
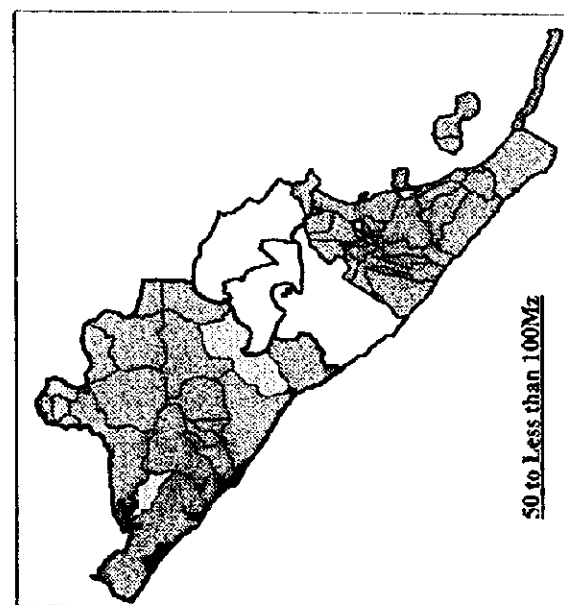
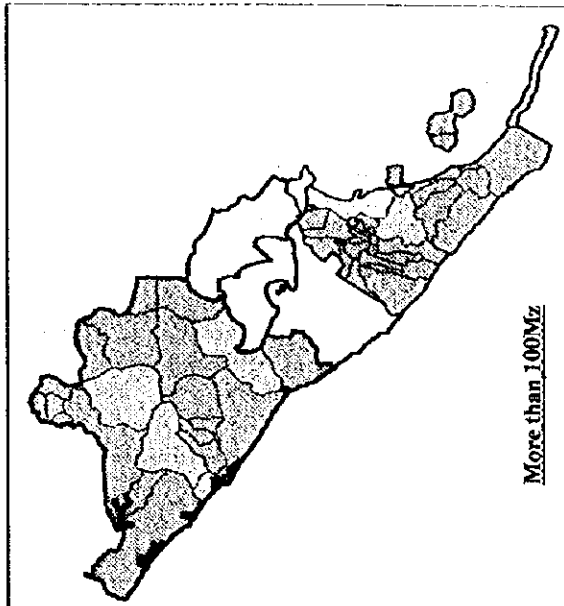
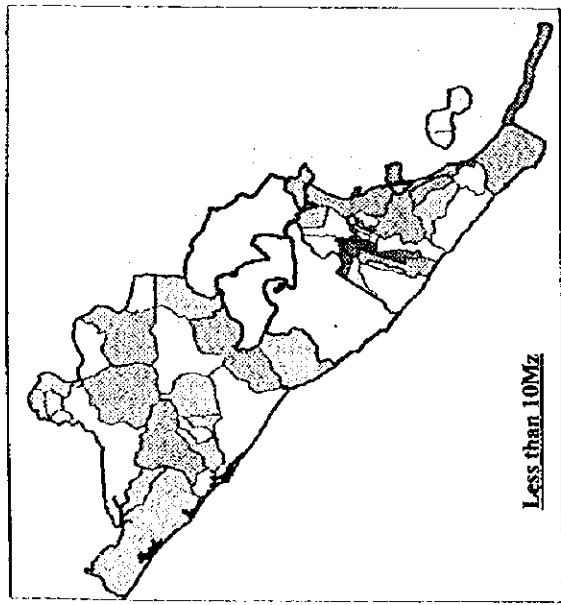
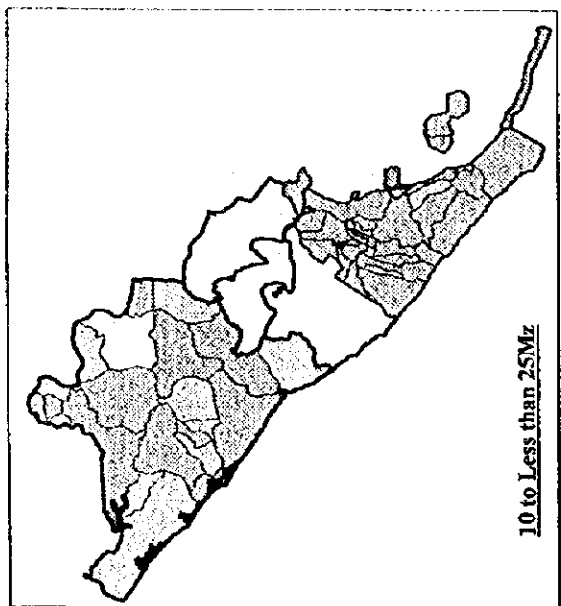
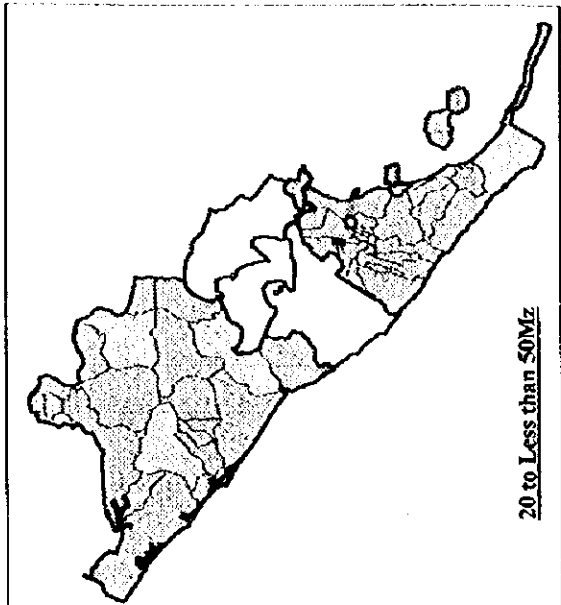


Figure Classification of the Farm Household by Farmland scale in Each Municipalities

3.4.4 Cultivated Crops, Area and Production

(1) Cultivated Crops

According to MAG, the major crops cultivated in the Study Area are mentioned below;

- Basic grains: maize, frijol, sorghum, rice
- Traditional crop: coffee, cotton, sugarcane, banana, tobacco
- Non-traditional crop: sesame, soybean, peanut, melon, watermelon, onion, tomato, green pepper, pipian (*Cucurbita pepo*), chayote (*Sechium edule*), ginger, cassava, quequisque (*Colocacia esculenta*), mango, avocado, pitahaya (*Hylcereus undatus*), pineapple, lemon, passion fruit, granadillas (*Passiflora microphylla*), jicaro (*Crescentia alata*)

(2) Cropping Acreage and Production

The following Table shows the major crops and cropping area, production, unit yield by department-basis during the year of 1990 - 96. Cropping acreage by the region-basis varies with the year, ranging from 130,000Mz to 208,000 Mz in the Region II, while the Region IV fluctuates from 76,000 Mz to 99,500 Mz. In crop-basis, cotton production decreased suddenly from the year of 1990/91 and hanged low, to the bottom during the year of 1992-95, and then it shifts to a upward trend.

The amount due to decrease of cotton is compensated by increase of the nontraditional crop production like basic grains, peanut and soybeans.

Cultivated Area by Main Crops in the Study Area

(Unit : 1,000Mz)

Crops	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/6
Export	276.3	293.3	252.0	203.8	202.6	237.7	269.8
Sesame	45.0	50.6	23.8	27.0	27.0	39.1	52.8
Cotton	49.6	64.1	50.9	3.3	3.6	2.1	13.4
Banana	3.2	3.2	3.4	3.4	2.2	2.4	2.5
Coffee	105.0	106.0	106.5	107.1	105.0	107.8	120.2
Sugarcane	56.3	60.5	60.0	56.0	54.1	59.7	64.5
Groundnut	6.5	7.1	6.0	6.0	9.7	25.7	14.8
Tobacco	1.7	1.8	1.4	1.0	1.0	0.9	0.9
Domestic Consumption	573.4	518.6	545.4	522.5	645.1	613.7	605.7
Rice	58.0	54.5	55.0	63.0	81.4	80.0	78.4
Beans	150.9	150.0	135.7	130.0	164.7	172.0	150.0
Maize	284.4	250.0	282.2	250.0	312.8	280.0	320.0
Sorghum	71.5	64.1	68.5	75.0	77.4	70.0	38.9
Soybean	8.6	0.0	4.0	4.5	8.8	11.7	18.4
Others	42.0	40.6	39.9	36.3	42.4	42.6	43.8
Total	882.7	852.5	837.3	762.6	890.1	894.0	919.3

Source : MAG

On the other hand, cropping acreage has continuously decreased by 8.4 % over the 6 years in the Region IV, from 99,558 Mz in 1990 to 91,214 Mz in 1996. The three departments except for Rivas show this trend markedly which is mainly due to decrement of sorghum and sesame. Cropping acreage of the basic grains generally has an increasing trend.

Percentage of Planting Ratio among Major Crops in the Study Area (1995/96)

Crop	Region II			Region IV				
	Leon	Chinandega	Region II	Granada	Masaya	Carazo	Rivas	Region IV
Coffee	0.6	0.3	0.4	1.5	15.7	34.8	0.0	12.7
Cotton	10.0	2.8	5.3	0.0	9.6	0.0	0.0	2.1
Sesame	35.0	19.7	25.1	1.5	2.9	1.0	5.2	2.5
Sugarcane	0.0	30.8	20.0	14.3	0.0	0.0	24.0	9.7
Tobacco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Banana	0.0	2.0	1.3	0.0	0.0	0.0	0.0	0.0
Peanuts	2.0	8.5	6.2	0.0	1.3	0.1	0.0	0.3
Soybeans	8.7	5.9	6.9	0.0	0.1	0.0	0.0	0.0
Maize	15.2	16.0	15.7	18.7	28.8	34.8	28.6	27.2
Frijol	6.5	3.9	4.8	22.0	28.9	28.2	26.5	25.6
Rice	7.6	5.4	6.2	36.1	0.3	0.6	4.0	12.1
Sorghum	14.4	4.8	8.1	6.0	12.4	2.4	11.7	7.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : MAG

3.4.5 Farming Practice

(I) Present Cropping System

In the Study Area, the cropping pattern adjusting a harvesting season to the dry season prevails widely under rainfed conditions as shown below.

Cropping type	4	5	6	7	8	9	10	11	12	1	2	3
1) Primera		■	■	■	■							
2) Postorera					■	■	■	■	■			
3) Apante								■	■	■	■	■

According the MAG seedling department, the cropping types are defined based on the rainfall as follows :

Primera : Cropping from May 15 to June 15

Postorera : Cropping from September 1 to October 10

Apante : Cropping from November 15 to January 15

In the above Figure, "Apante" is defined as a cropping pattern to utilize residue moisture of the soil for crop cultivation associated with late break of the rainy season, or a cropping pattern to start planting operation at a favorable soil moisture condition followed by a break of the rainy season since it is impossible during the rainy season due to standing water. The area where enable to do "Apante" is the Municipality of Cardenas in Rivas, bordering to Costa Rica, and a part of San Juan Del Sur Municipality in the same department, where annual precipitation ranges from 1,800 mm to 2,500 mm. Similarly, the lowland area(approx. 500 ha) so-called "Area bajo" in Tisuma municipality, Masaya Department in the Region II is also able to crop "Apante".

Most of the Study Area except for the above mentioned sites is mainly composed of "Primera" and "Postrera", but the number of crops and cropping season more or less vary with places. According to the result of farm household survey carried out by JICA Study Team, the number of cultivated crops range from 1 to 6. The Region II shows widely a combination of 1 to 4 crops. Meanwhile, in the Region IV, particularly in the highland area proximity to the metropolitan area develops with a distinctive farming under advantageous

factor of cool climate condition and shows the farming type such as combination of basic grains and fruits or vegetables.

(2) Farming Type

Based on the socio-economic survey result carried out by INTA, the farming type by region-basis is compiled as shown below .

Region	Sub-Region	Class	Farm size	No of Type
Region II	North	S, M	—	4
		S	1-30 Mz	9
		M	15-80 Mz	3
	South	S, M	--	7
		S	5-15 Mz	6
Region IV	Highland	S	0.25-50	16
		M	15-50	1
	Lake Nicaragua	S	0.5-15	6
		M	15-40	3
	Pacific coast	S	0.5-20	5
		M	15-100	10
Total				72

Source : INTA Note: S-small scale farmer, M- medium scale farmer

The farming type of the small-medium farm households are mainly focused on the basic grains combined with vegetables including kitchen garden or fruits or livestock rearing. The above classification is based on the factors such as farm holding size, kinds of cultivated crops with area, agricultural tools, kind of domestic animal with number of heads, level of farming practice, kind of labor forces, accessibility to financial source and market. From this classified farming type, regional distinctive aspects are clearly mentioned as shown below ;

Region II: Most of the small-medium scale farmers focuses mainly on the basic grain production combined with some cash crops such as sesame and vegetables, with few heads of large or small domestic animal rearing.

Region IV: Farm management diversification prevails in this region, i.e., based on a combination between basic grains for self-consumption and cash crop, the farming type that target crop is narrowed down into the cash crop or livestock farming with procurement of the basic grains prevail in the highland area as well as the Lake Nicaragua sub-region.

(3) Farming Labor Force

Evaluating a condition of farming labor force in the Study Area, an average farm management size was examined as shown below based on the farm survey result. An average of cropping area per farm household was 5.3 Mz in the Region II and 3.6 Mz in the Region IV, with crop intensity(CI) of 48.5 % and 67.1 %, respectively.

Region	Farm Size (Mz)	Cropping Area(Mz)	CI (%)	Family Size	Available F. labor/FH
Region II	11.1	5.3	48.5	7.2	2.8
Region IV	5.3	3.6	67.1	6.3	2.5

Source: Farm survey result by the JICA Study Team

Based on the CI from an average farmer's farming condition in both regions, a balance of labor force required for the farm management was examined by referring to the farming practice survey result of the individual farmers, with Figures of average man/day as per each crop. The result is shown below.

Region	Family Member per FH	Possible Family Labor	Total Farm Land(Mz)	Crop	Cultivate Area(Mz)	Man/Day (Mz)	Possible Total Labor/yea (days)	Deficiency of Labor(MD) Apr-Ma	Aug	Nov-Dec	Total Yield (QO)	Gross Incom (C\$)	Net Incom (C\$)		
II	72	28	11.1	Maize	3.2	55	176				112	11,200	6,528		
				Frijol	0.4	38	17				3	1,312	814		
				Ajonjolí	1.6	49	90				16	3,200	836		
				Total(Mz)	5.3	142.0	283	817.0						8,238	
				F/Labor Use Deficiency				34.61%			-10	-4	-16		
IV	63	25	53	Maize	1.4	55	75				49	4,900	2,858		
				Sorgo/B	1.4	93	128				48	3,332	1,148		
				Ajonjolí	0.7	49	34				7	1,400	392		
				Mango(UniQ)	0.2	87	15						5,800	1,450	633
				Total(Mz)	3.6	284.0	251.5	730						5,029	
				F/Labor Use Deficiency				41.90%			-4	-8	-5		

Fuente: INTA & Farm Survey Result by JICA Study Team

Remark: Some deficiency of labor force is managed through a custom so-called Man Vuelta.

Required labor force in man/day of each farm management within the available family labor during the farming season does not cause any labor shortage but the result of farmer's interview survey indicated a shortage of labor force, especially the farm operation at sowing time, weeding and harvesting operations during the season. However, this kind of labor shortage is actually managed through a custom prevailing in the rural society, so-called "Mano Vuelta" which help mutually in terms of labor shortage.

(4) Prevailing Farming Practice

Farming practice and method that prevail in the Study Area have been roughly classified into traditional farming, farming by animal traction power and commercial farming as follows.

1) Traditional farming:

Traditional farming includes manual land clearing, planting with sticks, use of unimproved seeds on marginal soils and generally on sloping terrain, which result in low productivity.

2) Farming by animal traction power:

It includes manual land clearing, plowing and sowing with use of animal traction, fertilizers and pesticides on medium to high quality soils and in some cases, improved seeds if farm budget is allowed. In some case, custom hired plowing/harrowing by tractor is involved. But there is still room to increase productivity by improving farming practice.

3) Upland Commercial farming:

It includes intensive cultural practices with use of farm machinery, agro-chemicals and improved seeds on the best quality soils under rainfed condition, thus influenced by precipitation pattern.

4) Irrigated Commercial farming:

It includes use of irrigation in addition to farming practices referred to above 3) and including paddy field technology, thus resulting in high productivity.

Most of the small-medium scale farmers in the Study Area are mainly composed of 1) and 2) levels, while 3) and 4) levels are confined to the large scale farmers, enterprises and cooperatives.

The prevailing farming practice of the major crops as well as the basic grains produced by the small-medium scale farmers are comprehended.

Basic grains and non-traditional crop like sesame are cultivated with oxen plow. Sowing operation is generally done along to ditches made by oxen plow. In stead of oxen plow, manual seeder dragged by oxen is sometimes observed but it is expensive and manual sowing method is mainly followed. Some of the farmers manages plowing/harrowing operation through the custom hired of tractor to ask near large farm but only few farmers. The farmers without animal traction power manage their farming by helping mutually through a custom prevailing in the rural society, called as "Mano Vuelta". The prevailing farming practice by crop basis is as follows;

Maize:

The most common improved variety is NB-6. In case of using non-improved seed, local variety multiplied by themselves are used. Cropping starts from April to May by sowing on hill combined with oxen cross-plow. Compound fertilizer(12-30-10) is given along the sowing ditches at a rate of 45 - 90 kg/Mz as basal dressing. Weeding practice is manually done for 2 or 3 times. Top dressing is once applied with urea at rate of 45 kg/Mz. Folding upper part of maize stalk is done in order to prevent cob from rotting due to rain as well as promoting maturity 2 weeks before harvesting. Pest control is applied at outbreak of actual damage by spraying agro-chemicals. Harvesting is done around mid-August by picking cob manually and put it into bag, and then transported to their house and shelled by woman and children. Grains are generally sold to middle-man except for self consumption and seeds for next planting.

Frijol:

Improved seeds prevailing in the Study Area is DOR-364. Frijol is mostly cultivated in Posorera season in combination with cross-plowing method by oxen. Making sowing ditches and sowing operation are conducted in late September, and followed by inter-tillage in early October with hoe. Weeding is usually managed by employing casual workers(kids) with chemical spray at outbreak of pest and disease. Harvesting operation is done by uprooting plant in December and beating them by stick on a sheet for threshing, then putting them into sack for carrying them to their farmhouse, and winnowing them at farmyard. Produce is sold to intermediate merchant after deducting home consumption and seeds for next cropping.

Sorghum:

Common variety prevailing in the Study Area is local variety like Pinolero with white head. Sorghum is cultivated in both Primera and Postorera seasons but the latter cropping is more common. Seeding ditch is made by oxen-plowing followed by cross-plowing operation, then line seeding is followed with compound fertilizer dressing. Manual weeding is one or two times done and at ripening stage, birdscarers is placed to prevent bird damage. Harvesting operation is conducted from late November to early December by picking heads, then beating heaped heads by stick for threshing. Winnowing operation is done by tossing grains on the air, then putting them into sack. Produce is kept in sack and sold to intermediate merchant except for home consumption and seed for next season.

Rice:

Cultivated variety is only long grain type, and local variety for upland. Few farmers use the improved varieties such as ECIA-213, and Oryzica Leno-4. Cropping start from early June by plowing field in cross direction with oxen plow and making sowing ditch following to line sowing. Basal dressing is applied at sowing time at rate of 90 kg/Mz of 12-24-12 compound fertilizer, and later 45 - 90 kg/Mz of urea as top dressing. Pest and disease control is usually managed by spraying agro-chemicals manually. Manual weeding is common. Harvesting method is done by cutting rice straw at ground level, then bunching and beating them on wood board for threshing. The grains are winnowed by exposing them on air, and then putting them into sacks followed by drying them few days in open air.

Sesame:

Common variety prevailing in the Study Area is Mexicana, Calibe, Chinaroja, Venezuela, ITA-R as well as local variety. Cropping in Postorera season is most common and starts from mid July by clearing land with Machete, then cross-plowing by oxen. Sowing operation is manually done along the sowing ditches, following basal dressing. Basal dressing is given at a rate of 45 kg/Mz of compound (10-30-10), then top dressing of 45 kg/Mz of Urea. Thinning is carried out one month after emergence for making plant density appropriate. Weeding is done 2 to 3 times by manpower. 2nd top dressing of urea at rate of 45 kg/Mz is applied in late September at inter-tillage operation. Harvesting operation is done to cut plants at bottom of stem and is dried 1- 2 weeks in the field, and then threshed to beat them by stick, and putting them into sack, followed by winnowing. Produce is sold to middle man except for seed of next crop.

3.4.6 Agro-chemicals and Improved Seeds

(1) Agro-chemicals

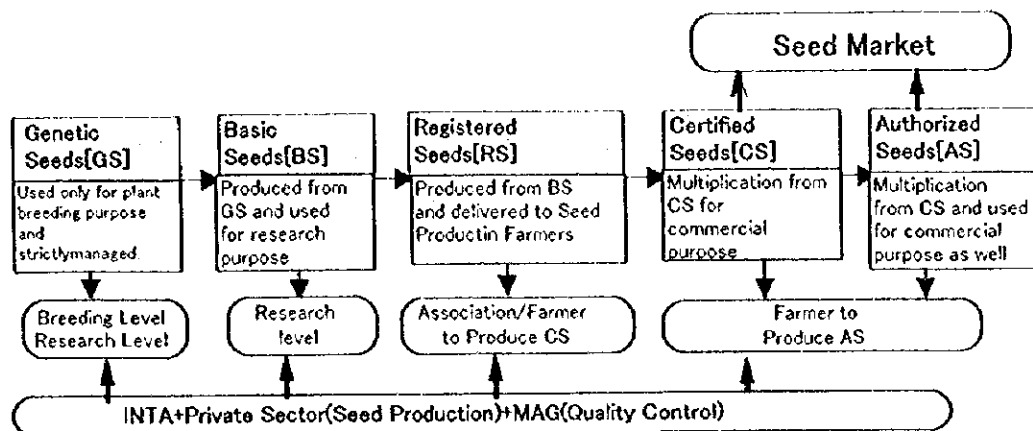
DGPSA in MAG has supervised agro-chemicals and seeds in terms of quality control and registration by stationing branch offices in nationwide. At the present, 16 agro-chemicals are banned in the country and the Agrochemical Department in MAG has officially registered about 13 type of agro-chemicals amounted to 738 products including fertilizers. There are 11 pesticide factories in the country as of 1997, which deal with importation and distribution of the formulated products.

There are many companies to sell seed and nurseries, agricultural tool, and machinery as well as agro-chemicals in both Region II and IV. According to the results of farmer's interview survey as well as questionnaire survey, pesticide are used by 80 % of farmers, fungicide 24 %, and herbicide 33 %, respectively.

(2) Improved Seeds

1) Seed Production Process in the Country

Seed production system in the country comprises of two systems; i.e., a)conventional system and b)non-conventional system. The former is strictly controlled by DGPSA in terms of stock preservation of breeding stock, while the latter is promoted by INTA which conduct to organize the small-medium scale farmers into group as seed production association in order to produce mainly frijol seed. DGSPA does not interfere this system for quality control. The seed producing farmer give an amount of distributed seeds back to INTA, then manage the rest of seed at his own discretion. The former system is indicated as shown below.



General Seed Production Flow of Conventional system in Nicaragua

2) Present situation of improved seeds dissemination

An increasing demand of basic grains with population growth in the country requires major efforts to generate enough amounts of seed from a standing point to improve productivity. INTA, together with MAG, SPA(Seed Production Association) and other institutions have been tackling to establish a national system of seed production. However, supply of improved seeds to the demand is very low and ranges from 3.5 % of frijol to 13.3% of rice as mentioned in the Table shown below. The shortage depends on imported expensive seeds to the domestic seeds, and it causes a limiting factor to stick to use of self produced seeds because of imposing a big burden of seeds and sapling cost to the small scale farmers who have no financial source.

Table Diffusion rate of improved seeds in Nicaragua Unit %

Crop	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
Maize	17.2	19.5	4.0	12.6	45.4	4.8	6.3
Sorghu	48.0	20.4	8.5	10.1	11.4	7.9	19.4
Frijoles	0.0	1.4	-	0.1	0.1	0.9	3.5
Rice			12.7	17.4	20.8	18.5	13.3
Cotton	102.7	70.7	157.9	67.2	17.8	78.6	14.0
Soya	0.0	104.2	188.8	115.3	191.2	207.5	80.0
Sesam	79.0	102.0	21.2	53.4	62.4	67.1	59.7
Peanuts					3.1	6.1	10.0

Fuente: MAG Seed Department

The major variety name registered by DGSPA is available. Imported maize variety is dominantly F1 varieties.

3) Present situation of improved seed production

There are several seed production associations in the Study Area supervised by the seed unit of INTA. In the region II, there is one non-conventional frijole seed production association consisting of 10 seeds producers in Leon department, while Region IV has four non-conventional seed production associations comprising of 92 seed production farmers who produce only frijol seeds. Two seed processing plants are stationed to Chinandega Department and dealing with rice, sesame, frijol, sorghum and peanut seeds.

(3) Agricultural input

Agricultural inputs like fertilizer, agro-chemicals, agricultural machine/equipment/tools, seeds are supplied by several private suppliers scattered in the Study Area. Extension agencies in the Region IV have supported their beneficiary clients by giving fertilizers as credit loan. The Campo Azules agricultural research station in Carazo Department also distributes fruit nurseries such as coffee, mango, and cashew nut seedlings for pay based on farmers request. Non-traditional crop enterprise for export such as Mangosa also distributes seeds and sapling to the farmers in a series of technical assistance in order to expand their share of exports

3.4.7 Production Cost

Production cost for the major crops in the Study Area is compiled based on the results of interview survey, questionnaire survey and existing documents. In this cost estimation, man/day of labor is estimated to 6 hours/head/day. This production cost is outcome for the small-medium scale farmers whose technology level are relying on a farming by animal traction power. However, tobacco and sugarcane are needed to apply advanced technology for commercial production and estimate with a technical level of the medium-large scale farmers.

3.4.8 Post-Harvest Management

INTA is responsible for post-harvest technology and carries out extension work for this technology. Assessment of post-harvest loss for agricultural commodities in the country is scarcely evaluated except for the study which was done in 1955 for the 127 small-medium scale farmers about grains storage condition, mainly maize. According to this survey, total loss including damaged grains amounted to 37 %, and even 18 % in average. Some farmers have the storage bin made of wood with high floor type but plastic bag, drum can, plastic box or wooden box are dominant for storing agro-commodities among the small-medium scale farmers.

Taking account of this survey result, an extension activity for post -harvest technology is currently on-going by disseminating traditional wooden type storage bin as well as small size of metal silo in order to mitigate damage of major cereal grains during the storage period. Controlling pests damage, aluminum phosphate-fumigation chemical is used under guidance by INTA, but effect is only temporary if storage facility with airtight function such as metal silo is not used. However, the grains with high moisture content in airtight storage bin easily causes damage due to fermentation reaction because of no air ventilation, thus the technology for drying or controlling moisture content as pre-treatment step is indispensable for extension program.

3.5 Livestock

About 20% of the total herd of cattle is found in the Regions II and IV, while as much as 60% is found in the Regions V and VI (statistics 96/97). On the other hand, more than 60% of the cattle raisers with less than 10Mz of land are found in the Regions II and IV. For these producers, the raising of small animals is an extremely important activity, one of the most nutritive sources of protein and also utilizable as draft animals.