

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE REPUBLIC OF NICARAGUA  
MINISTRY OF AGRICULTURE AND LIVESTOCK (MAG)

THE STUDY  
ON  
AGRICULTURAL DEVELOPMENT  
FOR  
THE REGION II AND IV IN THE PACIFIC COAST  
IN  
THE REPUBLIC OF NICARAGUA

MASTER PLAN REPORT

OCTOBER, 1998

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Exchange Rate (November 1997)		
US\$1	=	C\$9.70
C\$1	=	US\$0.10
US\$1.00	=	Yen 126

## PREFACE

In response to a request from the Government of the Republic of Nicaragua, the Government of Japan decided to conduct a Study on Agricultural Development for the Region II and IV in the Pacific Coast in the Republic of Nicaragua and entrusted the Study to Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Nicaragua a Study Team headed by Mr. Takashi Fujita, Pacific Consultants International, two times between August 1997 and June 1998.

The Study is expected to be completed on June 2000, however due to a request from the Government of the Republic of Nicaragua, the Master Plan included in the Study is presented earlier. The present Report is submitted as an answer from JICA to that request.

The Study Team held discussions with the officials concerned of the Government of the Republic of Nicaragua and conducted field survey in the Study Area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Nicaragua for their close cooperation extended to the Study Team.

October, 1998



Kimio Fujita

President

Japan International Cooperation Agency

Mr. Kimio Fujita  
President  
Japan International Cooperation Agency

Dear Sir,

**Letter of Transmittal**

We are pleased to submit the Final Report of the Master Plan for “THE STUDY ON AGRICULTURAL DEVELOPMENT FOR THE REGION II AND IV IN THE PACIFIC COAST IN THE REPUBLIC OF NICARAGUA”.

The report contains the formulation of the master plan for the agricultural development mainly from the view point of supporting small farmers in the Study Area, which has been made taking into account of the advises and recommendation of the officials of public organizations of the Government of Japan including your agency as well as reflecting the comments of the Nicaraguan counterpart agency presented during the course of the discussions on the Draft Final Report of the Master Plan.

The Regions II and IV are the main agricultural and livestock areas of the country, well known as cultivation areas of exporting products, such as coffee, sesame, sugarcane besides livestock production. Despite this fact, these are the zones where both poor and wealthy sectors of the population are living within the same geographical space; the majority of low-resources farmers are living an impoverished life. The reasons for poverty in the Regions can be thought to be the result of a combined bad influences of factors such as low level of agricultural technology, lack of effective access to finance, lack of production infrastructure, farmers’ tradition to rely mainly on other means rather than themselves, etc. However, it is also a fact that these areas have favorable potentials such as the fact of being traditional agricultural zones, having good climatic conditions and soils suitable for agriculture, high labor potential and accessibility to the capital city. The main aim of the Study is to lift the development constraints by utilizing these development potentials.

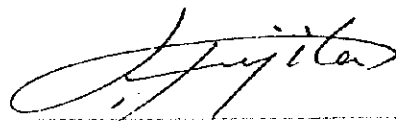


This report comprises of the formulation of twenty-three projects within eleven development fields in total, considering the characteristics of other on-going projects implemented by the international organizations. We expect that these projects will be effectively used for formulation of the future plan of agricultural development in the Republic of Nicaragua.

We wish to take this opportunity to express our sincere gratitude to the officials of your agency and the Ministry of Foreign Affairs and Ministry of Agriculture, Forestry and Fisheries of the Government of Japan for their valuable advises and recommendations for our Master Plan Study. We are also grateful to the officials of the Ministry of Agriculture and Livestock and other public organizations of the Government of Nicaragua involved in the Master Plan Study.

Cordially yours,

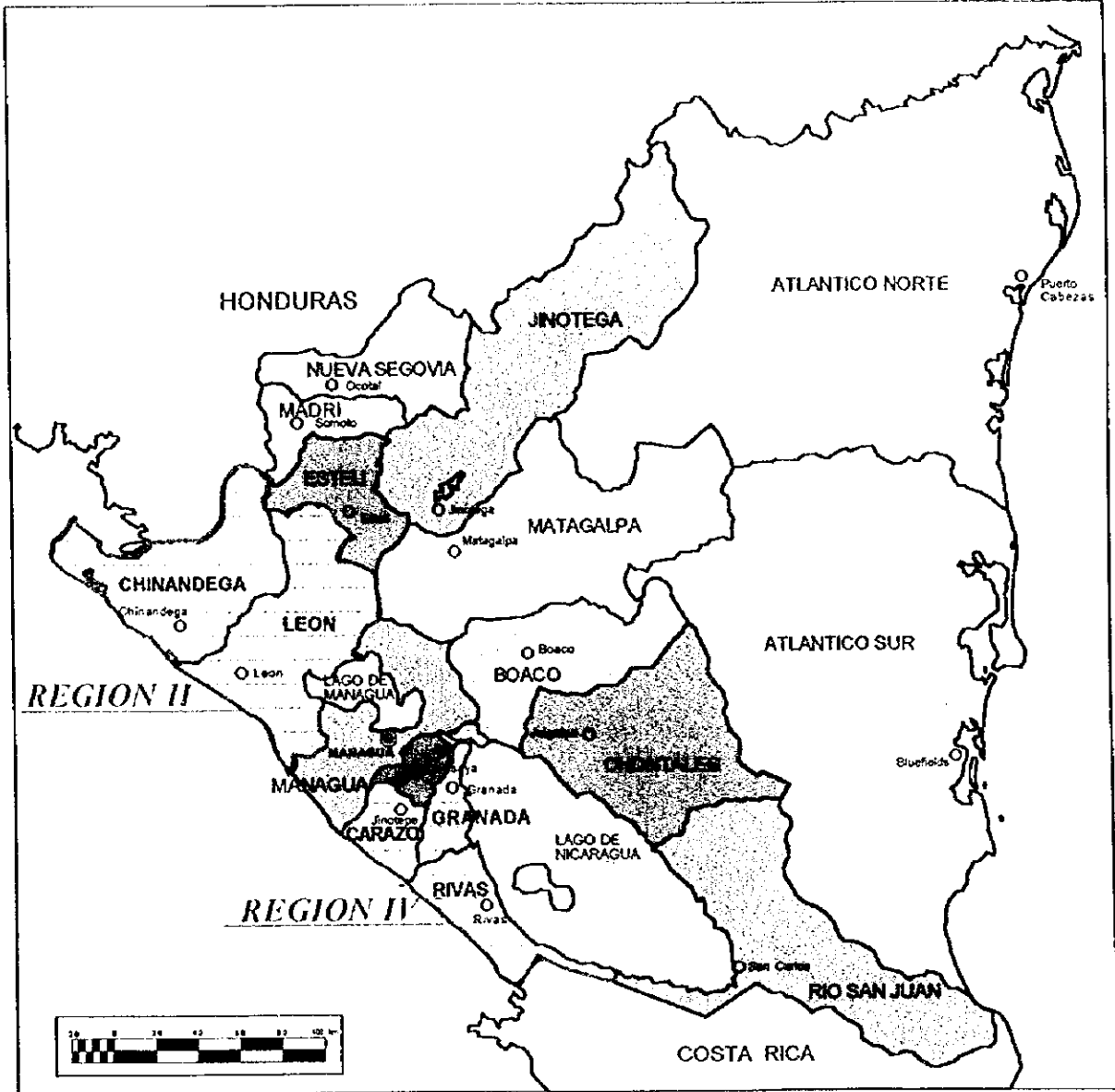
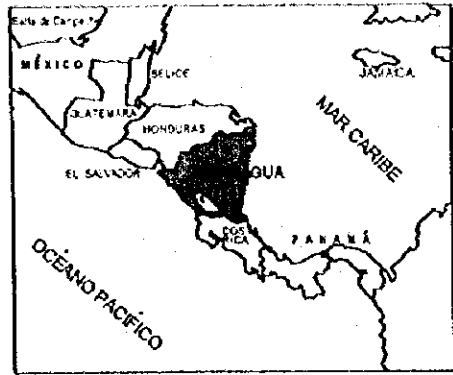
October 1998



Takashi Fujita, Team Leader

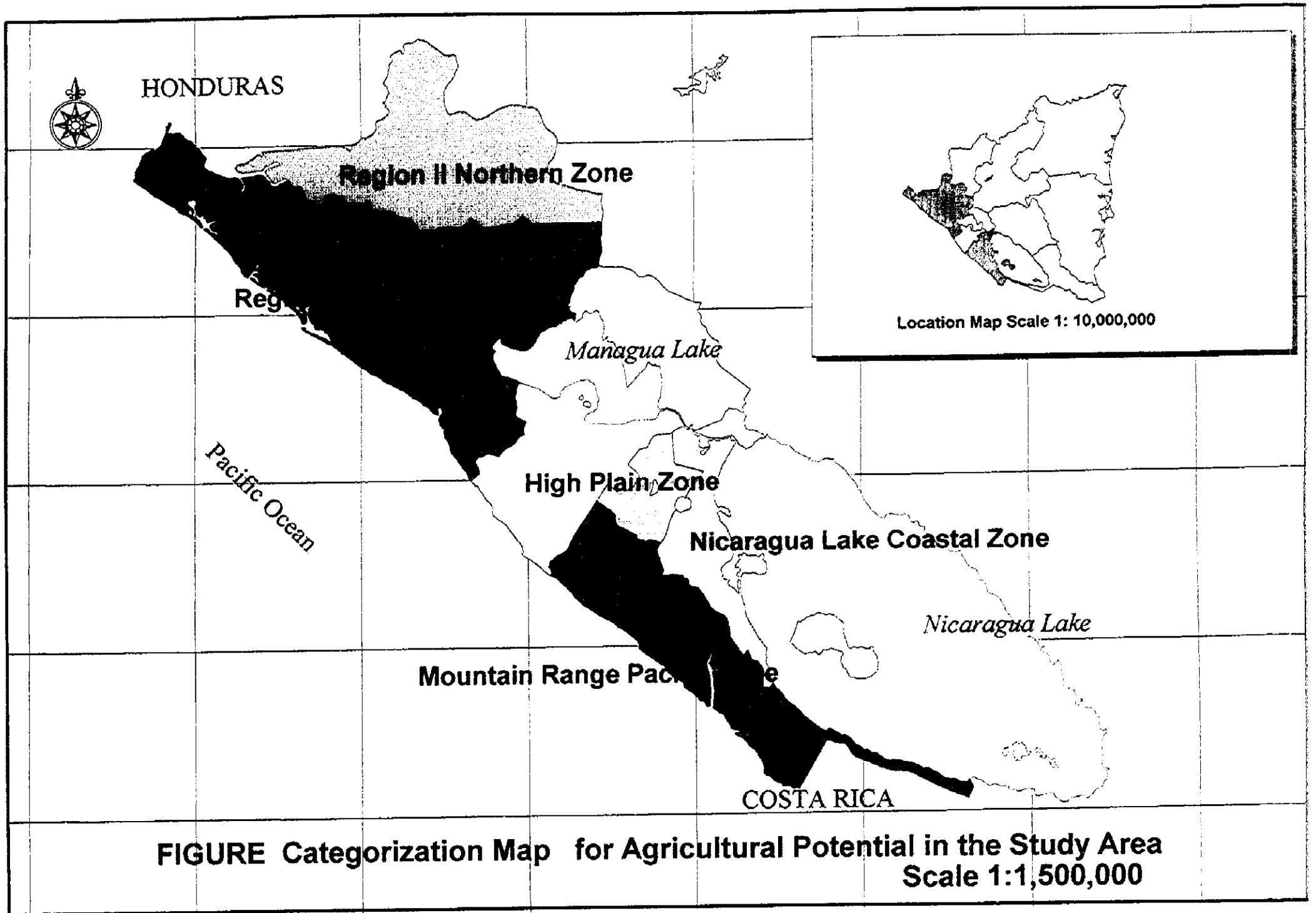
THE STUDY ON AGRICULTURAL DEVELOPMENT  
FOR THE REGION II AND IV IN THE PACIFIC COAST  
IN THE REPUBLIC OF NICARAGUA

***MAPS AND PHOTOS***



**LOCATION MAP**

SOURCE: INSTITUTO NICARAGUENSE DE ESTUDIOS TERRITORIALES





HONDURAS

Region II Northern Zone

Region II Southern Zone

Managua Lake

Location Map Scale 1:10,000,000

Pacific Ocean

High Plain Zone

Nicaragua Lake Coastal Zone

Nicaragua Lake

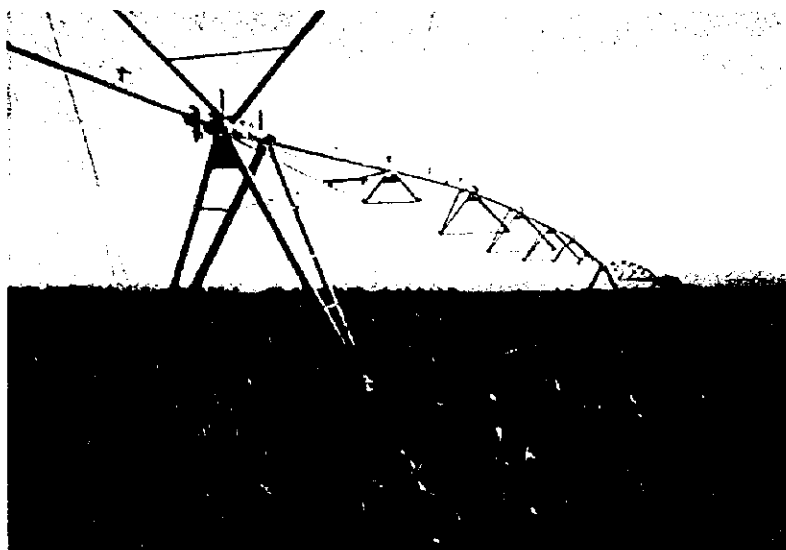
Mountain Range Pacific Zone

COSTA RICA

FIGURE Categorization Map for Agricultural Potential in the Study Area  
Scale 1:1,500,000



**Region II (León Department):** Intake weir at the Viejo river, constructed by a big-scale farmer and used exclusively for his own paddy fields.



**Region II (León Department):** Center pivot system installed during the period of the Sandinista Government and out of use at present. Main crop in the area is sorghum cultivated under rain-fed conditions.



**Region II (León Department):** Maize completely damaged by the drought caused by El Niño.



**Region II (León Department):** Nursery tree fields managed by a cooperative.



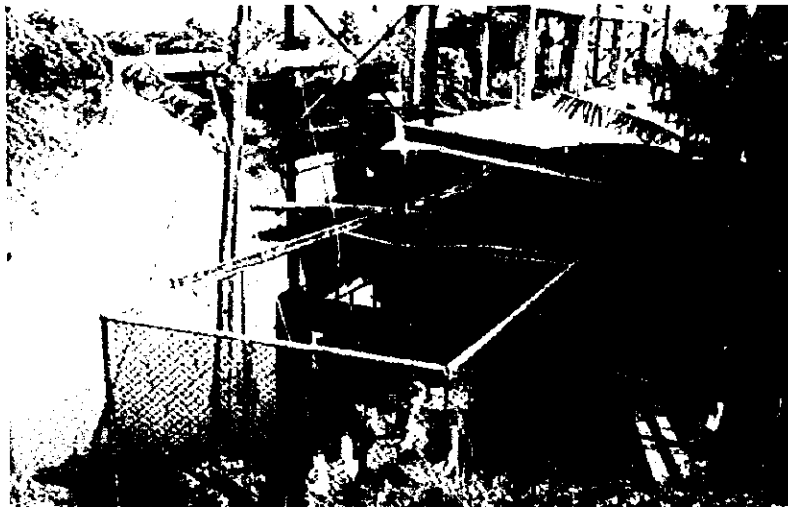
**Region II (Chinandega Department):** Banana treatment factory for export. The non-standardized products are sent for consumption at the domestic market.



**Region II:** Typical feeding conditions of pigs and fowl in the gardens of the small and medium farmers.



**Region IV (Granada Department):** Pumping station at the Malacatoya near the Lake Nicaragua, mainly used for paddy fields. The stations are generally owned by big-scale farmers and installed with a proportion of one station for about 100 hectares.



**Region IV (Rivas Department):** Large pumping station which supplies water directly from the Lake Nicaragua through a connecting canal of about 10 km. The station is owned by a private company and the pumped water is mainly used for irrigating sugarcane fields; irrigation services are partly sold to neighboring farmers.



**Region IV (Granada Department):** Small pumping station which supplies water directly from the Lake Nicaragua through a connecting canal of about 10 km. The station is owned by a private company and the pumped water is mainly used for irrigating paddy fields; irrigation services are partly sold to neighboring farmers.





**Region IV (Masaya Department):** Pineapple fields cultivated in sloppy lands, which are suffering from erosion hazard.



**Region IV (Masaya Department):** Pitaya fields cultivated in sloppy lands, which are suffering from erosion hazard.



**Region IV (Rivas Department):** Main road to Cárdenas. Its traffic conditions got worse due to rainfall even during the drought season and it is difficult for transport even using a four-wheeled vehicle.

## ***SUMMARY***



## SUMMARY

### I General

#### 01 Outline of the Study

The agricultural sector contributes about 25% of the gross domestic product, 65% of the exports and more than 40% of the employment in Nicaragua, according to 1997 data. Although the proportion of the agricultural population is slightly diminishing, there is no change in the absolute figures, and agriculture is considered as one of the main sectors of the national economy, and it is necessary to attain sustainable agricultural development. Nicaragua shall give priority to the agricultural development since most of the poor population depends on agriculture as income source, and the number one priority of the majority of the farmers is to achieve food assurance & family welfare. Besides, agriculture development is indispensable for the improvement of national nutritional conditions and food self-sufficiency.

The Regions II and IV are the main agriculture and livestock areas of the country, well known as cultivation areas of exporting products, such as coffee, sesame, sugar cane, besides the livestock. Despite this fact, these are zones where both the poor and wealthy people are living, but the majority of low income farmers are living in an impoverished life. The main causes for the poverty of the small farmers are low level of farming capability, poor extension services, and unstable climatic conditions. And they can not effectively utilize all of their land properties for cultivation.

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 coast. The Master Plan Study was carried out from August 1997 to March 1998.

#### 02 Contents of the Master Plan Study Report

This report was prepared for the agricultural development of the regions II and IV in the Pacific Coast mainly focusing on the agricultural support for the small farmers. A Master Plan was formulated for the entire regions of II and IV, and pilot projects were selected for the feasibility study. At this time of October 1998, the feasibility study is continuing and is planned to be completed in the year of 2000.

### II Agricultural Conditions of Nicaragua

#### 03 Contribution of Agriculture in 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.

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

For the last three years, the GDP in constant terms has been experiencing 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. The increase in the GDP is considered to be because of the recovery of agricultural sector.

#### 04 Labor Force and Employment Conditions

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

As shown in the Table, the unemployment rate in the urban areas is 5% is more than the rural areas.

#### 05 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 about 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: Annual Information 1993-1996, BCN

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 manufactured products. 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.

#### 06 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.

During the past seven years, the self sufficiency level of food items in Nicaragua is about 70% and the remaining 30% need to be imported and there have been no significant improvement in this food situation.

(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

### 07 Production of Main Agricultural Items

During the period of 1960-80, cotton was the main and the most profitable crop; the cultivated area for cotton during the period of 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. After the fall of cotton production, the production of basic grains and non-traditional products such as groundnuts and soybeans rapidly increased. Maize, beans, rice and sorghum are the main basic grains in Nicaragua and sesame and coffee are the main export crops. Present production of major crops in the country for the period of 1991-96 is expressed in the Table shown below.

Production of Main Crops		(Unit: 1,000 ton)				
Crops	1991	1992	1993	1994	1995	1996
<b>Exports</b>						
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
<b>Domestic Consumption</b>						
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

In 1996, the value added (VA) of major crops production was as follows : 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.

## 08 Livestock Production

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%.

### 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 about 72% of the total added value for livestock production.

## 09 Balance of Food Demand

Estimates of future food demand in the target year of 2015 is mentioned 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. It means that 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 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.

## 10 Contribution of Regional 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.

Country-wise Share of Regional Production Regions II and IV-1990-96	
Crop Name	Share(%)
<b>For Export</b>	
Sesame	0.95
Cotton	1.00
Banana	1.00
Coffee	0.13
Sugarcane	0.77
Groundnut	1.00
Tobacco	0.13
<b>For Domestic Consumption</b>	
Rice	0.37
Bean	0.15
Maize	0.15
Sorghum	0.65
Soybean	1.00

Source: MAG

### III Present Conditions of the Study Area

#### 11 Area, Population, Population Density and Urban & Rural Population

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 area of Region II is approximately the double of the Region IV. The population density in Regions II and IV are 68 and 145 inhabitants/km<sup>2</sup>, 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, equal to 62%, while the lowest one is found in the Department of Rivas, equal to 34%.

#### 12 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 of 49% in Rivas, and the minimum of 22% in Masaya.

	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



### **13 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 in the Region II is 1,717mm and 1,356mm in the 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. 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.

### **14 River Water**

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 resources for irrigation.

### **15 Lake water**

#### **- Lake Nicaragua**

The San Juan river which drains the lake water to the Caribbean sea has abundant discharge with an average discharge rate of 273.7 m<sup>3</sup>/sec. 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.

### **16 Groundwater**

The groundwater depth is as shallow as approximately G.L.-50m, and its stream capacity is higher than 0.012m<sup>3</sup>/sec/km<sup>2</sup>, 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 0.1m<sup>3</sup>/sec of water volume. However, this water volume is possible provided that only one well is installed per 1km<sup>2</sup>. 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.

## 17 Land Use

The land use conditions of the Study Area are shown below. Among the total agricultural area in Nicaragua, approx. 20% is occupied by the regions II and IV. And the annual and perennial crops occupy approx. 34-36% of the total national land use.

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

		Unit : Mz							
Region	Prefecture	Annual Crops	Perennial Crops	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	561,768
	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

## 18 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. The region II is divided into the two parts where the Estero Real river borders on the North and the South sub-regions. 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 Region IV is subdivided into 3 sub-regions, i.e., the shore of Lake Nicaragua area (1541.6 km<sup>2</sup>), the Pacific coast area (2762.3 km<sup>2</sup>) and the Carazo plateau (589.8 km<sup>2</sup>).

**In the Northern sub-region (3133.6km<sup>2</sup>)** the agricultural production in 1996 is only 425,760 QQ which is equivalent to 8.6 % of 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.

**The southern sub-region (7145.7km<sup>2</sup>)** is mostly extended with plains and is a 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 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.

**In the High Plain sub-region in the Region IV,** the Carazo plateau which ranges between 400 m and 900 m 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 close to the suburbs of the metropolitan area. 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.

**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. Annual precipitation ranges between 900 mm and 2000 mm. 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.

**In 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.

#### **19 Number of the farm households and the farm size**

The number of farmers and the agricultural area in the regions II & IV of Nicaragua are 34.3% and 20.5% respectively. While the average farm size in the country is 22.4 Mz, the farm size in the Study Area is 13.4 Mz which is approx. 60% of the country's value. And the small scale farmers (farm hold size of less than 5Mz) who represent 53.3% of the total number of farmers own 6.8% of the total farming area and 2.5% of big scale farmers (farm hold size of 100Mz or more) who represent 2.5% of the total number of farmers own a total farm size of 53.1%.

The number of farm households in region II is approx.26,000 in each of the Chinandega and Leon departments. And the numbers of farm households in region IV are approx.23,000 in Masaya department, approx. 18,000 in Rivas department, approx. 15,000 in Carazo department, and approx.12,000 in Granada department. The total number of farm households in the Study Area including regions II and IV is 121,000. The farm hold size of each family is 21.6Mz in Leon department, 15.9Mz in Chinandega department, 15.8 in Rivas department 10.2 Mz in Granada department, 10.0Mz in Carazo department, and 3.3Mz in Masaya department. In Masaya department, which has the smallest farm size, approx. 75% of the farmers have a farm holding size of less than 5 Mz and occupy a total farming area of 27.8%. However 1.4% of the big scale farmers own 32.3 % of the total farming area.

The percentage of area owned by big scale farmers of 100Mz and more is 68.7% in Granada department, 61.6% in Rivas department, 54.8% in Chinandega department, 49.2% in Leon department, 45.4% in Carazo department and 32.3% in Masaya department respectively.

#### Farm holding size in the Study Area(1996/97)

Region	Department	Number of farm households						Farm area						
		01-49	5-249	25-999	100-49	50+	Cfms	Tal	01-49	5-249	25-999	100-49	50+	Tal
Total of Regions II and IV		64,311	29,202	7,568	2,630	492	16,609	120,722	110,163	303,088	316,171	468,452	392,491	1,620,365
Region II	Sub-total	20,819	17,927	5,113	1,682	221	6,397	52,159	42,738	194,886	236,922	294,386	210,970	979,902
	Chinandega	10,714	8,770	1,638	641	105	4,204	26,072	22,683	89,383	75,526	123,367	104,176	413,135
	Leon	10,105	9,157	3,475	1,041	116	2,193	26,087	20,055	105,503	161,396	171,019	106,794	566,767
Region IV	Sub-total	43,492	11,275	2,455	918	181	10,212	68,563	67,425	108,202	109,249	174,066	181,521	610,463
	Masaya	17,329	2,678	229	92	10	2,832	23,170	21,529	21,846	9,182	16,147	8,870	77,573
	Granada	7,992	1,645	319	188	48	2,146	12,338	11,790	14,588	13,019	36,271	50,517	126,185
	Carazo	7,655	3,192	757	227	30	2,841	14,762	15,122	30,943	34,437	39,379	27,557	147,438
	Rivas	10,516	3,760	1,150	441	93	2,393	13,353	18,981	40,825	52,612	82,269	94,577	289,267

## 20 Main Cultivated Crops

According to MAG, the main crops cultivated in the Study Area are as follows;

- 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*)

During the 5 years period from 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.

#### 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

## 21 Farming Practice and Techniques

**Present Cropping System :** In the Study Area, the cropping pattern adjusting a harvesting season to the dry season prevails as shown below.

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

The main cropping types in the study area are Primera and Postorera mentioned above. And "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 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 a wide combination of 1 to 4 crops. Meanwhile, 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.

**Farming Labor Force :** The average number of labor force in the Study Area is shown below. The 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	Cropping Area (Mz)	CI (%)	Family Size	Available F.Labour/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

**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. 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 of hired tractor from nearby large farms but only a 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".

## 22 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, pesticides are used by 80 % of farmers, fungicides by 24 %, and herbicide by 33 %, respectively.

## 23 Improved Seeds

**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.

**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 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. 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.

**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 frijol 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 in Chinandega Department and dealing with rice, sesame, frijol, sorghum and peanut seeds.

## 24 Agricultural inputs

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.

## 25 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 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.

## 26 Livestock

In Nicaragua, the largest herd of bovine cattle population is distributed in Region V and VI followed by regions II, I and IV.

- Among the Pacific Regions, there are departments which have relatively high population such as Leon and Rivas. In Region IV, the cattle raising activity is more developed in the Department of Rivas due to the existence of large extensions of flatland and to some economic differences between the other departments of Masaya, Carazo and Granada, where the cattle raising activity is carried out in a smaller scale.
- Although, at present, the pastures utilization in the concerning regions presents a rate of 1-1.2 heads per Mz, being within the national average (0.7-1.4 Mz), at the long term it is difficult to impulse the increase of the herd once they are raised exclusively through the free range system.
- In these regions, the INTA is carrying out a project called Technological Transfer in the Management of Poultry and Swine, through which the elected small farmers can enjoy from a swine reproduction center (a hog and a female pig) and from a "bolsón de gallina" (one cock and 10 hens), and thus improve their animals in a rotational way. Therefore, these regions play the role of one of the pilot zones for the diffusion of agricultural techniques.

- One of the best industrial slaughterhouses of the country is located in the Department of Masaya, representing a great advantage for the cattle fattening producers.

**Classification of Main Domestic Animals :** There is no doubt that the bovine cattle perform the most important role in the regions' livestock production. The cattle raising, regardless of the exploitation system, is based on the extensive utilization of land resources, i.e., the main feeding source is the pasture lands.

Among these systems, the milking system occupies the first place, representing approximately 70% of the producers, and the milking, breeding and fattening system occupies the last place, representing 3% of the producers in the country. The majority of the regions' small farmers carry out the milking system, and afterwards the calves can be utilized either for milking or for fattening purposes.

The genetic base of the cattle in Nicaragua is fundamentally constituted by Half-breed racial groups, European races and Zebu races (specially Brown Swiss with Brahman), have a high level of adaptability to the environment, which is fundamental to attain a sustainable production in a tropical environment. The animal reproduction system is basically carried out in the natural way.

**Milk Production :** The milk is one of the main sources of protein and daily income. There is an increase in the milk production in the recent years. The rural dairy products production plants are in a very rustic condition. It must be pointed out that, according to MAG data, around 80% of the national production is commercialized informally without any type of health or quality control. Among small and large scale producers, there are differences in the production and the technical indicators, which are attributable not to the race but to the management system.

## 27 Rural Infrastructure

**Roads :** The roads linking villages with main roads are in very precarious conditions. Except for a part of the municipality center, the streets are not paved with asphalt and their maintenance is almost not carried out. Due to the lack of gutters at the sides of the streets, the pluvial drainage is very bad and there are many places where due to the accumulation of rainy water the access is not possible; it is very common in low zones. This situation affects the commercialization of agricultural products and the daily life of the population. In the future, the rehabilitation of roads, especially the secondary roads, is very necessary for the development of agricultural activities.

**Drinking Water :** The drinking water for human consumption in the Study Area mainly comes from subterranean sources. At the urban level, it is supplied by the Nicaraguan Institute of Aqueducts and Sewerage System (INAA), and at the rural level, the suppliers are the INAA, the municipal government and also through individually, either with the support of some international institution or NGO.

Percentage of Distribution by Region and Type of Service

Region	Water Service	Urban	Rural
Region II	Pipelines	84.9%	11.2%
	Well	8.7%	66.2%
	Others	6.4%	22.7%
Region IV	Pipelines	85.9%	41.7%
	Well	3.5%	26.3%
	Others	10.6%	32.1%

Source: INAA, MAG



## 28 Irrigation

Since there is a clear distinction between the rainy and dry season in the Study Area, the importance of irrigation is fully recognized. The existing irrigation infrastructure is somewhat rudimentary, and only the large-scale farmers, the sugar mills farms and a small portion of the medium-scale farmers possess irrigation facilities. The small and medium-scale farmers possess their own wells for agricultural purposes, however due to the bad operation and maintenance conditions, some of the wells are at present out of operation.

**Irrigation Area :** Among the total agricultural area, approximately 13% is under irrigation and 74% of the irrigation water is supplied from underground water, a much higher proportion than other water sources. The surface waters are not much utilized, due to the high reduction in the discharge volume during the drought period on one hand and to the high cost of infrastructure on the other hand. Furthermore, in case of the utilization of centrifugal pumps, there is also a high cost of electric energy consumption.

**Irrigation Infrastructure :** The surface waters are conveyed to the farms through the construction of an intake work in the river bed, either by gravity or pumped by pumps. The scale varies from smaller to bigger ones, and the big structures can conduct a discharge of 1.0 to 1.5 m<sup>3</sup>/s. This type of facility belongs to large-scale farmers or private companies. On the other hand, there are also small-scale farmers who independently take water from rivers through pumps. The Nicaragua lake is located in the region IV, and although being utilized for irrigation purposes, the cost is high since pumping facilities are necessary; and thus the users are mostly large-scale farmers.

The groundwater is utilized by small, medium and large-scale farmers. The depth of wells varies from the slight deep ones, around 10 m deep, and deep ones, 100 to 150 m of depth; the first ones are more abundant covering 60% of the total wells. In this Study, around 450 wells in the Region II, and 200 wells in the Region IV were localized, thus the actual number is supposed to be higher. In the deep wells, the water is pumped through vertical or submergible pumps, and in the slight deep ones, through electric pumps or mechanic generators, in a proportion of 50%.

**Types of Irrigation :** The furrow irrigation system is the most common irrigation system, representing 80% of the total. In the big farms, the sprinkler irrigation system through mobile sprinklers is utilized, as well as large gravity irrigation infrastructure combined with pumping facilities is utilized by big private companies.

Region	Center pivot	Sprinkler	Drip	Ridge & Furrow
Region II	10.24%	12.16%	0.55%	77.05%
Region IV	2.30%	13.00%	1.10%	83.70%

**Operation and Maintenance of the Irrigation Structures :** The large-scale private farmers as well as the sugar mills, which possess irrigation systems, have personnel assigned to the management, operation and maintenance of the structures. On the other hand, in the small and medium-scale farms, the irrigation structures are operated and maintained by the farmers themselves, due to the limitation of their economic resources. When they can not repair their equipment, they have to abandon the agriculture. At present, out of all the wells existing in the Study Area, around 36% are out of operation due to damages to the well or to the pump.

**Irrigation Costs :** In case of pumping irrigation, the cost varies according to the cultivation type and to the expenses with structure and equipment repairs, their reconstruction and the payment of

electric energy charge (or combustible cost). The operation costs of small and medium-scale producers varies between C\$2,000 to 3,500/ha/year. On the other hand, according to the Central Bank data, the rice production cost through irrigation is C\$6,488/Mz, out of which C\$1,202/Mz corresponds to the water management expenses, around 19% of the production cost. This represents a high cost to the small and medium-scale farmers. The water consumption charge for irrigation costs US\$40/Mz/year, which could be considered as a low charge. Nevertheless, the payment shall be done immediately by cash, or through the harvested production.

## 29 Agricultural Extension

INTA is in charge of technology generation and extension activities. The covering rate of the farm households in each jurisdictional area is around 13 %, which is absolutely low. Each extension agency headed by a technical leader consists of a few extension workers, secretary, security guard and janitor with the radio, and telephone. There are also some extension offices with no telephone facility.

## 30 Farmers Organization

Based on the discussions and interviews conducted in the Study Area and analysis of the available information, the existing conditions of agricultural institutions are described as shown below.

**Unclear Legislation & Weak Institution for Farmer Organization :** Promotion of agricultural cooperatives by the government is specifically stated in Article 109 of the Nicaraguan Constitution, but unclear legislation and a weak institution to apply the law have resulted in insufficient support to agricultural cooperatives. Unclear legislation stems from the existence of two laws: one is the General Law on Cooperatives (*Ley General de Cooperativas*) of 1971, which some consider as no longer valid, and the other is the Agriculture and Agro-industry Cooperative Law (*Ley de Cooperativas Agropecuarias y Agroindustriales*) of 1990.

**Prerequisite to join the cooperatives :** Prospective members of a cooperative are required, as a prerequisite, to undergo 40 hours of training on cooperatives. The required 40 hours of cooperative training can seldom be developed in full, being more common of an abbreviated version, since peasants have to pay themselves the initial training cost, and this is quite a heavy burden for most small farmers. It is worrisome that no concerned government institution (DIGECOOP, MAG, POLDES) supervises the content of training on agricultural cooperatives. It would be advisable to involve POLDES field personnel more closely in the training of POLDES cooperative members, but field offices of POLDES are understaffed and short of operating budget.

**Misconception and Misunderstanding of Cooperatives :** The Ministry of Agricultural Development and Agrarian Reform (MIDINRA) implemented agrarian reform in the 1980s with the prerequisite of cooperative formation.

Formation of an agricultural cooperative was sufficient to have easy access to credit, without undergoing a careful examination of the credit worthiness either of the applicant or of the objective of the credit. Worse yet, when harvest was poor, the government stepped in and condoned the debt in 1986 and 1988. There was no incentive to pursue sound management of agricultural cooperatives, peasants have come to expect the same government policy of condoning farmer debt, and originated the infamous phrase "no payment culture" (*cultura de no pago*). This "culture" is extended to farmers at large, even after the 1990 change of government. There seems to be some consensus in that, after the 1997 change of government, farmers are slowly beginning to accept the new reality of having to be accountable for their actions. The need

for qualified cooperative leaders did not exist, mainly due to policies implemented by a paternalistic government. The result was a widespread mismanagement of cooperatives, disappointment of cooperative members, breakdown of cooperatives, and contempt for agricultural cooperatives.

An agricultural cooperative is apparently perceived by many of its members as a place or a means to gain access to some resources, be it land or credit in the 1980s, and inputs, machinery and equipment in the case of POLDES cooperatives. The agricultural cooperative is not perceived as a joining of forces, of concerted actions to benefit from group strength overcoming the individual weakness. Therefore, they show interest in the cooperative only at times of access to those resources, while staying away the rest of the time. Under these circumstances, no organization can develop its full potential, and a weak agricultural cooperative decreases the farmer interest in the cooperative, thereby further weakening of the organization.

On the other hand, it is said that outsiders, or non-members of agricultural cooperatives, perceive cooperative members as opportunistic advantage takers preying on government subsidies and foreign aid. The combined perception, of both members and non-members of agricultural cooperatives, makes organization of farmers a truly difficult task.

**POLDES Cooperatives :** POLDES cooperatives were planned to have a turnover rate of 4 years, that is, after 4 years a POLDES cooperative would become self-reliable, and would be replaced by a newly set up cooperative to benefit from POLDES, and so on. In reality, probably no POLDES cooperative can become self-reliable in 4 years. The reason is more complex than the lack of supervision and monitoring of cooperatives by government institutions, and the lack of follow-up cooperative training. It is argued that even with continuous training sessions, some POLDES cooperative members would not pay their dues, would show up only to receive inputs, and would be hard to find them at pay back time.

POLDES cooperative leaders do not seem to realize how fortunate they are to have the support of the Nicaraguan government and the Japanese aid. Under normal circumstances, as agricultural cooperatives, they would have had to struggle for their own survival and advancement. The machinery, equipment and input they receive from POLDES, even if not every need is covered, give them a head start. Instead of taking advantage of their privileged situation, they seem to think that the world owes them something, that somebody else has the obligation to give them everything they need. POLDES cooperative leaders seem to be excessively aware of their rights, without the corresponding awareness on their obligations and responsibilities.

### **31 Marketing and Agro-industry**

**Commercialization of Agricultural and Livestock Products :** The present distribution system for the farmers, especially small and medium scale farmers, has been in transitional period yet to apply the free market mechanism, and farmers, especially small farmers in remote area, are facing difficulties to access the market and to intend producing more profitable crops changing from the farming practice based on self- sufficiency, mainly producing basic grains.

#### **Farmers' Level :**

- 1) The farmers interviewed tend to carry out their farming centering to their self-sufficiency, that is producing basic grains.

- 2) Major flow of agricultural products in remote area is to Managua City through middlemen. Middlemen buy and collect products from farmers, and transport them to Managua markets especially Mayoreo Market.
- 3) Due to deficient information channels, the access to the markets by individual farmers is very difficult because the collection of market information is also a big problem.
- 4) As for animal products, the small and medium farmers produce are mainly pig and chicken centering for their self-sufficiency. And farmers sell a surplus to neighboring inhabitants, stores and middlemen when sacrificing. Basically meat and pork are consumed within the region where the slaughterhouse or sacrificing place is located excepting meat for export, because the cold storage and transportation system has not been well developed yet.
- 5) The farmers who live near markets and Managua can relatively get more information than the farmers in remote area from markets who do not receive any public information.
- 6) In the area near from Managua City such as Masaya, Granada and a part of Carazo departments, some farmers in that area are used to sell their products by themselves in near markets such as Jinotepe, Diriamba and Masaya, sometime even in Managua. And it could be seen that some sellers registered in Mayoreo Market in Managua who are engaged in wholesaling as well as retailing, are farmers living in Masaya and its surrounding area.
- 7) When the farmers sell their products in markets, their trading amount is as much as a few bags and/or baskets and the public bus is the most popular means for transportation of their products with paying extra charge.

**Market Level:**

- 1) The retailers in the regional market purchase their selling commodity in Mayoreo Market in Managua, in other market and from middlemen and/or farmers at their place. Some retailers go to Mayoreo Market every some day hiring truck by retailers' group, and some others use a public bus for transportation. The retailers having their own vehicle are very rare.
- 2) The wholesaling function of Mayoreo Market is the most and also important transaction point for distribution channels not only within the metropolitan area but throughout the country.
- 3) All regional markets are belonging to each Municipality where they are located.
- 4) The trading activities inside a market are carried out through individual negotiations on a cash basis. The authorities of all markets visited do not have the function of collecting daily trading results such as quantities and prices by commodities and informing them publicly, and any control and supervising activities for performing the regulations and standards concerning the trading.

**Market Price :** The market price information was collected during Sep. 1996 - Aug. 1997 and are compiled as shown below :

- 1) There is a little difference of price among regions for basic grains such as rice, maize and frijol. The market price of maize and frijol differs seasonally compared to the stable condition of rice.

- 2) The market price of vegetables and fruits fluctuates more between seasons and regions than basic grains.
- 3) Regarding cooking banana, the wholesale price differs little among the regions and seasons and the retailing price is very stable.
- 4) The price in Mayoreo and Oriental markets in Managua which is the biggest consuming area in the country is not always higher than in other regional markets. It shows that these markets have a dominant wholesaling function not only in the metropolitan area but also in the whole country. The price in Managua of potato, onion and banana are cheaper than at almost all other regions: it could be assumed that the prices are affected by the prices of exported ones, because these commodities are used to be transported by trucks through the American Highway from out of the country and carried directly to markets in Managua. For example, the banana exported from Costa Rica is carried to Managua directly from the border without any stopping over for unloading at Rivas and Granada on the way. The same happens with the onions imported from Guatemala.

**Related Public Functions :** For an appropriate functioning of commercialization activities, it is indispensable that the public sector should create the economic environment to promote such activities. The conditions of related public functions are described below:

**Market information system :** DGIAP(Dir. Gen. de Information y Apoyo al Productor) in MAG and SIPMA (Agricultural Market Price Information System) are in charge of collecting agricultural and livestock prices in 13 markets including the 7 markets within Managua City; this is done twice a week by visiting the markets and once a month by visiting relevant companies. The information is analyzed and published weekly and monthly. The information is also disseminated by radio. The weekly reports and monthly bulletin are distributed to the MAG regional offices.

#### **Quality control and post-harvest facilities**

Not only producers, but even middlemen and traders, are rarely taking measures for quality control of agricultural products. And most of the products are handled without any packaging except grains and tubers which are transported in bags. Accordingly, as for the commodities such as tomatoes, cabbages, bananas suffer from qualitative and quantitative losses taking place during transportation and handling.

The Basic Grain Trading Agency (ENABAS) has been engaged in procurement, storage and selling activities for basic grains; it can intervene to stabilize the market price and to provide support in case of emergencies. However, it seems that ENABAS will disappear or have its functions reduced following the government decision of terminating the market price support system; as a consequence, a plan for dismantling or renovating ENABAS has been considered. ENABAS has various kinds of post-harvest facilities such as terminal silos, warehouses and rice mills in many regional locations.

### **32 Agricultural Credit**

The official credit for agricultural production has been implemented mainly through the National Development Bank (BANADES: Banco Nacional de Desarrollo). Most of these finances were executed mainly by BANADES. In this year, however, the government decided to close this official channel. Most of its branch offices have already been sold off to private firms. Within a few months, it will be closed completely. The new national credit policy for agriculture will be

established by the beginning of the next crop season. Thus, there are no public credit channels in the country.

The private banks are implementing to accommodate farmers with loans as financed in the past. This credit channel, however, was utilized mainly by larger scale farmers. These interest rates are too high to manage agricultural activities, so small- and medium-scale farmers can not afford to utilize these financial sources. The rates as of October 1997 was 25.6% on average for short-term loan. According to the hearing from persons concerned, the rates are still going high in November 1997.

In fact, small-scale farmers, particularly farmers in rural area, have scarcely received agricultural credit so far. Only 3% of the poor households obtained loan services. Even in the farming households over the poverty line, less than 7% utilized loans. An annual amount of loan aggregated to C\$3,460 per year to the poor household and to C\$14,300 per year to the non-poor household.

The credit for small farmers has been provided not by private banks but by local non-conventional entities. They are functioning not only as a credit channel but various service providers in communities. They are constituted as non-governmental organization (NGO), community bank, rural bank, caja rural and cooperatives. They could be recognized as credit channel in rural areas by the coming new credit policy in the country.

### **33 Economic Conditions of the Farming Household**

Based on survey of 200 farming households in the study area, it was estimated that the average family size was 6.8. In Region II, it was 7.4 which was larger than that in Region IV. The family owns an agricultural land of 8.7 Mzs on average. The families in Region II have 11.6 Mzs, larger than those in Region IV. The average area of agricultural land possessed by rural families was estimated at 8.2 Mzs on average, which was segregated to 11.1 Mzs in Region II and 5.3 Mzs in Region IV.

An annual household income was estimated at C\$9,941 on average in the study area. It was divided into regional level as follows: C\$8,421 in Region II and C\$11,326 in Region IV. It includes sales of crops cultivated, livestock products and side business.

Most of the families consume their crops cultivated by themselves in their own agricultural land. The total real income was estimated at C\$11,495 on average in the Study Area. It was broken down into regional level as follows: C\$9,796 in Region II and C\$13,041 in Region IV.

An annual household expenditure was estimated at C\$11,418 on average in the Study Area. That was broken down into regional level as follows: C\$11,075 in Region II and C\$11,733 in Region IV. Thus, an average household had a deficit of C\$1,477 on average, broken down as the deficits of C\$2,654 in Region II and C\$407 in Region IV.

An annual expenditure of food was estimated as C\$6,947, accounting for 70% of the total household cash income of C\$9,941. In other words, 70% of the household's cash income was spent for food procurement in the study area. This percentage is called as Engel's coefficient, which indicates a poverty level in general. In Region IV, the coefficient was 59%, which was smaller than that in Region II, 87%. Thus, the level of living conditions in Region IV is higher than that in Region II.

### 34 Agricultural Development Projects

In 1996 the investment made for the road works by the MTC had the highest share within the total investment followed by the PNDR; these two represented 76% of total investment in Region II and 67% in Region IV. In Region II, MAG represented 4% and in Region IV, not more than 3%. At present there are 19 on-going projects for rural development carried out by MAG, INTA, INRA, MARENA, INIFOM, and PNDR. The Table shown below indicates the number of on-going projects carried out by each executing agency in Regions II and IV.

Executing Agency	Component	Budget (US\$Million)		
		Foreign Resources	Domestic Resources	Total
MAG	Irrigation: 1, Agriculture and Livestock: 3, General: 1 Total: 5	170.50	13.90	184.40
MARENA	Environment (forests): 2	7.23	4.03	11.26
UNIFOM	Development of municipalities: 1	30.0	10.4	40.4
INTA	Seeds: 1, Livestock: 1 Total: 2	1.37	0.19	1.56
PNDR	Rural development: 4, Livestock: 1, Environment: 3 Total: 8	80.54	15.41	95.95

## IV Potentials and Constraints of Agriculture Development

### 35 Development Potential

#### Land use

Although the actual development in region IV is higher than the development potential, there is still a development potential area of 147,000 Mz in region II and the cultivation area of annual & perennial crops in this region can be increased by 47%.

Land use	Region II (Mzs)		Region IV (Mzs)		Total (Mzs)	
	Actual	Potential	Actual	Potential	Actual	Potential
Aptitude partition						
Agricultural land	339,063	498,300	203,631	194,004	542,694	692,304
Pasture	367,348	361,520	216,333	194,481	583,681	556,001
Total	706,411	859,820	419,964	388,485	1,126,375	1,248,305

Source: MAG "Potencialidades y Limitaciones de su Territorio"

#### Water Resource Potential

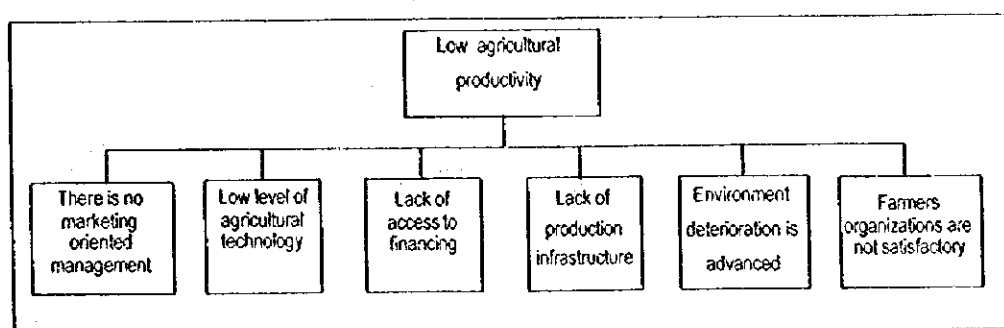
Considering the groundwater as the main source of development and the surface water from the three rivers and the Nicaragua lake in the region II, the present irrigation area of 72,673Mz can be increased upto 293,616 Mz.

In addition to the above potential resources, agriculture has been carried out traditionally for a longer time, the agriculture area is closer to the towns which increase the marketing and export potential, and there is a high labor potential for the future. All these aspects shall be considered to be favorable for the agriculture development of the area.

Estimated Irrigation Potential Area (M <sup>2</sup> )							
	Agriculture Area	Present Irrigation Area	Surface water potential area	Groundwater potential area	Potential irrigation area	Total Irrigation Area	Remaining area still to be irrigated
<b>Region II</b>							
Surface	--	11,512	10,573	--	10,573	22,085	--
Gr. Water	--	32,704	--	146,400	146,400	179,104	--
Total	339,063	44,216	10,573	146,400	156,973	201,189	137,874
<b>Region IV</b>							
Surface	--	6,948	9,070	--	9,070	16,018	--
Gr. Water	--	21,509	--	54,900	54,900	76,409	--
Sub-total	203,631	28,457	9,070	54,900	63,970	92,427	111,201
Total	542,694	72,673	19,643	201,300	220,943	293,616	249,078

### 36 Constraints of Development

The main restraining factor for the agricultural development plan in the Study Area is the low productivity of small-middle scale farmers. Some restraining factors which are impossible to solve in a conventional way are as follows; 1) Percentage of small-middle scale farmers can not increase in a limited agricultural area, 2) Limited water resources potential. The problems that became obvious through this study are presented in the problem tree.



The reasons for the low productivity of small-middle scale farmers low productivity can be resumed as follows; 1) The production is not carried out according to market needs, 2) Low agricultural technique, 3) Difficult access to funds, 4) Poor infrastructure, 5) The environment deterioration is advanced, 6) Farmers' organizations are not working satisfactorily. All problems must be solved by the small-middle scale farmers themselves, with the support of subsidies to public works and there is a high importance for the development of farmers organizations.

## V Agricultural Development Plan

### 37 Plan Year of Agricultural Development

Based on the consideration of following points and considering the basic year of 1998, the target year is planned as 2015.

- ◆ The international organizations such as FAO, World Bank normally consider a period of 15-20 years from the basic year for the long term development plan.
- ◆ The agriculture development plan include not only agricultural aspects but also other aspects such as infrastructure development, power supply, information system development etc.
- ◆ In order to expand and diffuse the agricultural technology throughout the whole area, at least 10 years are necessary.



- ♦ After the completion of the effective development of water resources and the construction of the irrigation systems, a period of around 15-20 years is necessary until it is possible to only carry out their operation and maintenance.
- ♦ The consolidation of farmers' organizations transformation requires 10 to 15 years.

### 38 Basic Guidelines for Development

For the development of the Study Area, it is undeniable that the improvement of life conditions of farmers in the zone is closely related to the development of sustainable agriculture carried out by the small and medium scale farmers who represent the majority. These farmers are facing limitations as for their own technical capacity and insufficient support services. In order to solve these problems and really improve the farmers' conditions, the following measures are necessary:

Task 1: Activation of the development potential

Task 2 : Establishment of sustainable agriculture

Task 3: Promotion of commercially oriented agriculture

Task 4 : Raising the agricultural productivity of small and medium scale farmers

Objective 1 : Increase in the production of basic grains

Objective 2 : Contribution to the national economy

#### Explanation of the Topics and Objectives :

**Activation of the development potentials :** It is necessary to eliminate the limiting factors that restrain the effective development of the regions' potentialities.

**Establishment of sustainable agriculture :** The agriculture activities are not temporary, and the activities which had allowed the expansion of the agricultural production shall be continuously maintained even after the completion of the project.

**Promotion of commercially oriented agriculture :** At present, the farmers in the Stud Area mainly carry out agriculture for self-consumption. It is necessary to change the traditional way of thinking and the surrounding conditions which lead to this situation.

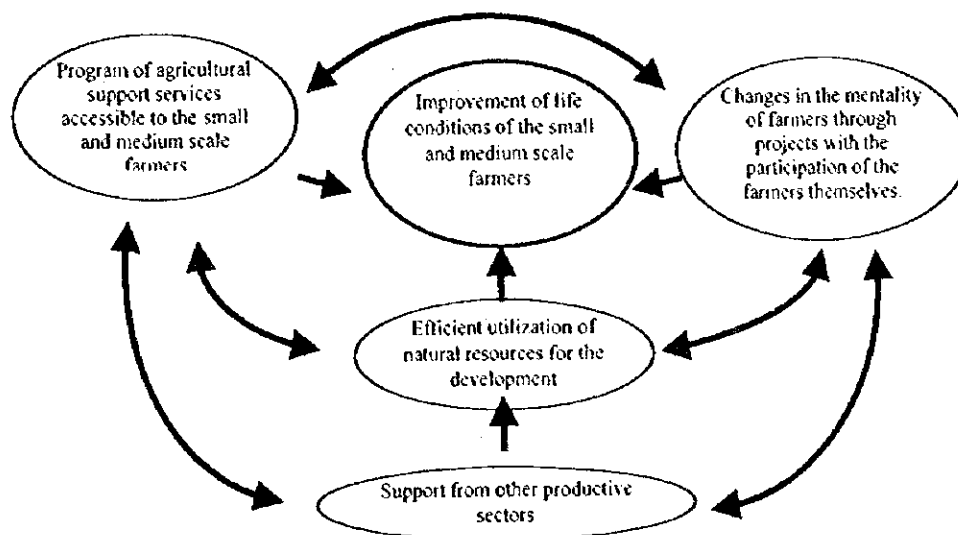
**Raising the agricultural productivity of small and medium scale farmers :** Th development projects can not be successful if the farmers themselves do not aim at the goal of increasing the agricultural productivity. Therefore, it is necessary and important to broadly support their productive activities.

**Increase in the production of basic grains :** The agricultural production of the regions in the Study Area represents almost 50% of the national production and it is considered as a very high proportion. It is necessary that the agricultural production in these regions, particularly the basic grains, is increased in order that the nutritional self-sufficiency at the national level also increases.

**Contribution to the national economy :** When the agricultural productivity is increased it will be possible to introduce cash crops that are commercially profitable. Consequently, in increasing the income of farmers, the government revenue will also increase through the collection of taxes, and as a result, the public sector finances will depend less on the international financial support.

### 39 Implementation Strategy for the Development

The following 6 points are mentioned as the implementation strategy for development taking into consideration of the natural and social factors of the Study Area.



(1) **Global Approach**

The public sector projects which are considered appropriate and which are regarded for the future can not be efficiently implemented if the capacity of the beneficiary farmers in these projects do not improve at the same time.

(2) **Farmers' organization through projects with the participation of the farmers themselves**

It is pointless to say that the agricultural activities are carried out successfully in places where there is a leader with excellent capacity to carry out the organization of farmers.

(3) **Development of high productivity agriculture**

Considering the future population in the year 2015, it can not be assured that the agricultural land will be enough to supply such a population. Therefore, it is obvious that if the agricultural productivity is not increased, this future population will face many problems.

(4) **Program of agricultural support services accessible to the small and medium scale farmers**

At present, the access to services such as rural extension, credit, market information, etc., is too difficult to the small and medium scale farmers. Therefore, an easy access support program is necessary to fulfil their needs.

(5) **Development of a sustainable agriculture through the establishment of an appropriate land use plan**

Due to the continuous deforestation of large areas, the productivity has decreased and there are frequent floods. For the development of sustainable agriculture, the elaboration of an appropriate plan for the regulation of land use is necessary.

**(6) Consistency with the projects presently in operation**

At present, in the Regions II and IV, there are several projects being carried out supported by international institutions. The projects that are proposed in the present Master Plan aim at complementing those projects.

**40 Development Plan for Each Zone**

The development plan for each zone was formulated based on the policies of land use plan and farm management development programs.

**(1) Policies of Formulating Land Use Plan**

- 1) Land use plan is formulated based on the potential land use acreage for agriculture and livestock surveyed by MAG.
- 2) Land use classification - "Tacotales" occupying a large portion over the study area should be made with the best use.
- 3) Considering the future increase of population, self-supply of the basic grains should be principally given the highest priority.
- 4) The current land use for the agriculture and livestock in the Region II and IV evidently exceeds the potential land use area, thus the land use plan should be formulated within a range of the potential land use classification.
- 5) The existing forest area should be preserved by introducing the land use system like agro-forestry or silvo-pastoral systems in order to fit in a view of environmental conservation by protecting soil erosion.
- 6) Taking a countermeasure to protect farm land by employing agronomic and civil engineering approach in the soil erosion hazard area, a sustainable land use management should be carried out.

**(2) Policies of Agriculture Development Programs**

- 1) Considering an improvement of trade imbalance and food security of the country, increasing production of the basic grains should be given the highest priority
- 2) Promotion of diversifying the farm management should be given a high priority by introducing non-traditional crops (fruits and vegetables: pitahaya, melon, citrus, mango, cassava) and increase its production, with consideration of existing the present farming system coupled to each locality.
- 3) Introducing the farming system to be easily adopted by the small-medium scale farmers
- 4) The plans for the agricultural extension and the farmer's supporting organization as the farmers supporting plan should be formulated in order to meet a situation of the market oriented agriculture.
- 5) Introduction of the farming system is managed by shifting from animal traction farming to custom hired or communal use of agricultural machinery in terms of possible farm operations to reduce labor.
- 6) The degree of fulfilling the formulated plan is achieved by 30 % of the goal over every 5 years and accomplished fully in the year of 2015.

Zone	Development Objective	Type of Crops	Area (1000 Mz)	Quantity (000qq)	Cropping intensity (%)
Region 2 -- Northern part	Support for small and medium scale farms in harmony with environment	Basic grains : Maize, Frijol, Sorghum Traditional crops (sloppy area) : Coffee Non-Traditional crops (sloppy area) : Mango, Lemon, Avocado Non-Traditional crops : Melon Oil crops : Sesame	111.0	40,311.0	46.8 to 160
Region 2 -- Southern Part	Support for small and medium scale farms with advantageous conditions	Basic grains : Maize, Frijol, Sorghum, Rice (irrigated) Traditional crops : Banana, Tobacco Non-Traditional crop : Mango, Lemon, Melon Commercial crops : Sugarcane, Tobacco Oil crops : Soybean, Peanuts, Sesame	341.0	73,731.2	57.5 to 145
Region 4 -- Coastal area of Nicaragua lake	Agricultural development with grains as the base	Basic grains : Maize, Frijol, Rice (irrig.) Non-Traditional crops : Melon, water melon Traditional crops : Sugarcane, Coffee, Banana Livestock farming crop : Taiwan grass	96.0	41,259.7	62.5 to 150
Region 4 -- Pacific Coast area	Support for the farms with disadvantageous conditions	Basic grains : Maize, Frijol, Rice, Sorghum Non-Traditional crop : Water melon, Cassava, Mango Traditional crops : Sugarcane	62.3	3,031.3	31.9 to 130
Region 4 -- Highlands in the middle part	Agricultural development support for the area closer to cities	Basic grains : Maize, Frijol Traditional crops : Coffee Non-Traditional crops: Mango, Lemon, Avocado Non-Traditional crops : Melon, Green pepper, Tomato, Cabbage, Lemon, Mango, Pipiyan, Avocado, Pineapple	39.5	11,751.2	120.7 to 160

#### 41 Development Program

Individual development projects will be formulated for the implementation of the guidelines for development of each individual zone and the basic development guidelines. In order to achieve the improvement of life conditions of the small and medium scale farmers, there are three problems that must be solved: (1) improvement of the farming techniques of those farmers and transforming the way of how they focus their activities by means of extension services; (2) how to provide a system for supporting services for the rehabilitation of basic infrastructure; (3) how to introduce and promote a farming system which matches the surrounding natural conditions.

To cope up with these problems, individual development projects that aim to solve each of the mentioned problems must be established on a basis of mutual complementability and support. However, the implementation of the projects could be difficult due to the fact that the aims are set too high and the implementation area is wide. Therefore, the scope and the target of the development projects must be cut down to a size which guarantees a successful implementation. The main aim of the projects is to improve the farming management abilities and provide development opportunities for the small and medium scale farmers.

## **42 Consideration of Development Project Model**

### **(1) Contents**

The central items of the present project are (1) improve agricultural productivity; (2) transformation towards farmers' organizations; (3) create more added value for the agricultural production.

- 1) **Improvement of agricultural productivity**
  - Introduction of new crops and farming techniques: aims to improve the farming techniques of the small and medium scale farmers
  - Improvement of farm management techniques: Aims to stabilize the income of the small and medium scale farmers
  - Introduction of improved seeds: Aims to produce crops of high quality and increase production
  - Introduction of irrigation facilities: Aims to increase and stabilize the production volume of crops and improve their quality
- 2) **Transformation of farmers' organizations**
  - Transformation of farmers' organizations: Aims to transform the way of how the small and medium scale farmers focus their production activities and carry out their daily life in order to make it possible to produce under a communal basis.
- 3) **Creation of more added value for agricultural production**
  - Improvement of marketing: Improvement of marketing activities centering on the producers, and create, in this way, more added value for agricultural products.
  - Processing of agricultural products: Simple processing activities will be introduced to create more added value.

In order to implement the above items, it will be necessary to strengthen other present supporting services besides the irrigation and processing facilities which will be provided through the project.

### **(2) Selection of areas for the implementation of the development project model**

There are three conditions for the selection of the area for the development project model: (1) Expected ripple effects of the development project model area to the areas; (2) possibility of implementation of the contents of the project; (3) Benefits of the project even if considered independently. Although there are many areas which satisfy the above requirements, the following areas (schemes) are selected as the main representative areas.

- Telica Scheme : Area nearer to city in Region II
- Malacatoya Scheme : Area surrounding Nicaragua lake in region IV
- El Espino Scheme : Area remote from the city in Region II
- Carazo, Masaya Scheme : Area nearer to city in Region IV

#### 43 Consideration of Sector Development Projects

##### (1) Important Items for the Development

In order to overcome the factors which curtail the revitalization of the present production potential, the present Master Plan has set up the basic guidelines which aims to improve the life conditions of the small and medium scale farmers; with this purpose in mind, the following items have been taken into consideration:

- Improvement of agricultural production and farming techniques
- Transformation of farmers' organizations
- Environmental protection
- Improvement of the living environment

##### (2) Selection of Projects for each Sector

In order to attain the objectives of the Master Plan, the projects to fulfill the needs of each sector are necessary. The categorization of these projects was considered based both on the basic concepts for the Master Plan and on countermeasures for the problem tree. There are 11 (eleven) of these projects as shown in the following table.

Selection of the Projects Based on the Basic Concepts of the Master Plan

	Maximized development of Regional Potential.	Improvement of Living Conditions of Small and Medium scale Farmers	Increase of the Production of Basic Grains	Extension of Farming for Marketing Purposes	Development of Sustainable Agriculture	Correspondence with the National Economy
Model Project	○	○	○	○	○	○
Irrigation	○	○	○			○
Road Rehabilitation Project		○	△	△		○
Seed Production Project		○	○	△		△
Experimental Research Project		○	○	△	△	○
Strengthening of Extension Services Project	○	○	○	○	○	○
Livestock Project		○				△
Marketing	○	○		○		○
Farmers Organization	△	○	△	○	○	△
Agricultural Credit		○	△	△		△
Environmental Protection Project	△	△			○	△

There are projects for 11 (eleven) sectors, which are divided into two categories; fundamental and complementary. The fundamental projects are oriented to 3 (three) sectors; 1) road rehabilitation for the efficient operation of agricultural activities, 2) extension services for agricultural technology, and 3) farmers' organization. The implementation of the fundamental projects is urgent considering that they will potentialize the implementation of the complementary ones. Likewise, the implementation of the model projects is also important because they corroborate the benefits of both the fundamental and complementary projects.

#### 44 Number of Individual Selected Projects

The following projects were selected based on the development policy :

Model development projects - 4, Irrigation projects - 4, Road improvement project - 1  
Seed production projects - 2, Experimental research project - 1, Supporting Services Promotion project - 1, Livestock project - 2, Marketing projects - 2, Agricultural finance project - 1, Environmental conservation project - 3.

#### 45 Outline of Model Projects

Project area	Specific Characteristics of the area	Irrigation	Irrig. Area (Mz) / Intake vol. (m <sup>3</sup> /s)	Marketing facilities
Telica area	Increase potential for agricultural Production. Located near the city Leon	Gravity irrigation using surface water from Telica river	1,571 / 0.78	Delivery and storage facilities
Malacatoya area	Arrangement of plots of small and medium farmers is necessary and the gap between large farmers need to be lessened.	Lake water supply from Nicaragua lake	1,571 / 1.71	
El Espino area	Area with small and medium scale farmers and is located far away from the city; Besides, there is soil erosion in the area.	Subsurface irrigation	700 / 0.45	
Carazo, Masaya area	Possible to promote development of agriculture in sub-urban areas with small and medium scale farms	Small scale irrigation		Delivery and storage facilities, Fruits processing facilities

#### 46 Outline of Irrigation Projects

Name of Project	Water Source / Intake Point	Irrig. Area (Mz)	Water Quantity (m <sup>3</sup> /s)	Storage Facility	Dam Capacity / Ht.
El Sauce Area Irrigation Project	Rio Grande Upstream of El Sauce	1,857	2.02	Dam Head works	1.5 x 10 <sup>6</sup> m <sup>3</sup> / 21m
Cayanlpe Area Irrigation Project	Rio Villanueva Upstream of Rio Villanueva	1,714	1.87	Dam Head works	Combined use with El Sauce
Zarzales Area Irrigation Project	Rio Sinecapa Upstream of Zarzales	1,714	2.80	Dam Head works	1.3 x 10 <sup>6</sup> m <sup>3</sup> / 21m

#### 47 Outline of Projects According to Different Fields

Project	Objectives	Project Outline
Road Network Improvement : Farm road improvement project	Increase of agricultural production and improvement of living standards of the beneficiaries through rehabilitation of the existing road network.	A plan for installation and rehabilitation of main roads, national highway and provincial roads, has already been prepared. The present rehabilitation plan is oriented to rural roads which branch off from the provincial roads and to prepare equipment necessary for the road improvement.

Seed Production : Basic Grain Seed Production Project (Region II)	Multiplying and diffusing the improved seeds by constructing a seed production center with organizing seed production association coupled to the farmer's training program	<ul style="list-style-type: none"> <li>• Construction of seed processing center</li> <li>• Selection of the seed production farmers for maize and sorghum seeds with training program for the seed production technology</li> <li>• Collection of produced seeds, processing, marketing and distributing to the farmers</li> </ul>
CESASUR (Centro de Servicio Agropecuario del Sur) Supporting Project	Increasing production of the improved seeds for the basic grains and vegetables by strengthening the existing facilities. Training the seed production farmers with regard to multiplication and diffusion of improved seeds.	A seed production center for the basic grain and vegetable seeds shall be constructed by strengthening the La Campaña station
Research and development : Reactivating Plan of the ex-Cotton Research Experimental Center (CEA)	It is aimed at establishing a base of technology generation and human resource development by reactivating CEA, and focusing on the oil crops and cotton as the research crops in order to promote the north western agriculture of the country.	<ul style="list-style-type: none"> <li>• Introduction of new varieties and genetic resources, with improvement of the current varieties of the oil crops as well as preservation of breeding stocks</li> <li>• Breeding of new varieties of oil crops and disseminate them</li> <li>• Breeding of basic seeds of the oil crops and their preservation</li> <li>• Study and generation of technology of integrated pest management(IPM), including a training program for technicians and farmers.</li> </ul>
Project for Strengthening of Extension Services System	Improvement of extension offices in each study area through provision of training room, office equipment and training program	Implementation of training program to develop the technical human resources as well as the farmers themselves, with the objective to facilitate the task of the extension personnel in the existing 8 extension offices in the Study Area.
Livestock Farming : Supporting Plan for the Production of Animals by Small and Medium Scale Farmers	Stabilizing living conditions of small scale & landless farmers through the improvement of nutritional condition and to increase the farmers' income through the selling of chicken and eggs production surplus.	Ten (10) young chickens will be distributed for each small and medium scale farming family, including the landless farmers. It is expected that the project is diffused to other zones afterwards. In order to attain an efficient diffusion of this project, the MAG and other concerning agencies shall supply the necessary support services.
Supporting Plan for the Cattle Raising Activity : Examination and Extension	It aims at supporting and complementing the activities of the cattle examination center by 1) improvement in the cattle production and animal health; 2) support to the examination about agricultural technology.	The plan should support the CENAMEGE in its cattle examination activities by providing programs and resources to carry out these activities. The cattle examination themes shall focus on attaining high quality forage and the technology for animal health control, which can be diffused to farmers through the agricultural extension system.
Marketing : Project of Strengthening of Market Activities Information Collection and Diffusion	Construction of facilities in the places of main wholesale market of Nicaragua, Mayoreo Market; three stations (one in a market) in Chinandega, Region II; three stations in the Rivas Market, Region IV. These facilities will be installed in the DGIAP (MAG) stations.	At present, market prices information are collected only twice a week in the region. It is proposed that this activity is carried out twice a day, morning and afternoon, every day. The collected information shall be sent through on-line system of DGIAP and all the 7 stations shall be kept informed. All the information collected daily will be processed and analyzed so as to be utilized by the users.



Farmers' Organization : Farmers' Organizations Strengthening Project	Creation of farmers' organizations through which the public supporting services are channeled and could produce and market the agricultural products in an organized and coordinated manner.	At the first stage, the farmers' organizations should receive guidelines and orientation from the related public institutions. These organizations shall be officially registered in order to receive the supporting public services. The members of these farmers' organizations will be benefited by the spread and diffusion of new production and management techniques, communal production and marketing of agricultural products.
Strengthening of Supporting Institutions of Farmers' Organizations	Advise on the formation of WUAs, their registration, orientation and monitoring. It also aims to achieve the modification of laws and policies related to the farmers' organizations in response of changing circumstances; the coordination with public institutions and related NGOs will be also achieved.	The farmers' organizations shall be monitored and guided from the time they are formed until the time of their dissolution. Also, through the extension services the training of the members of the farmers' organizations will be achieved and their individual skills will be up-graded. Also, within the program, the farmers' groups will receive training on communal production activities, i.e., collective collection and forwarding of products.
Project for Formation of Communal Leaders	Formation of communal leader with optimal skills; incentive for the participation of the whole population; strengthening of farmers' organizations; transformation of farm management concept; raising the level of farming technology	<ul style="list-style-type: none"> <li>• Transfer of new farming techniques</li> <li>• Transfer of new farm management techniques</li> <li>• Transfer of new procedures for rural development</li> <li>• Support for the acquired technology (orientation visits to the community)</li> </ul>
Communal Association Formation Strengthening Project	The land, capital, and labor resources owned by small-scale farmers are quite limited; and therefore it is indispensable to strengthen their organizations to attain development. The relation between the small scale farmers and the organization need to be improved and communal associations shall be formed utilizing the donations received.	A "Communal Development Fund" will be created, gathering small-scale donations. The "Development Fund" will provide the support and the people can carry out the plan themselves. If the communal association is formed and strengthened, its capital will increase and thus the opportunity of a higher development and strengthening will be created.
Agricultural Credit : Development of Agricultural Credit System for Small and Medium Scale Farmers	It aims at the creation of an agricultural credit system and is applicable for the community organizations of small and medium scale farmers. Improvement of life conditions of benefited areas populations will be attained by reactivating agricultural production through the credit.	Low cost international funds shall be obtained. Debentures will be issued at the national and international levels in order to expand the available financial resources basis for investment and loans. The credit conditions shall be coordinated between the financial public institution and the regional financial channel A credit operation manual shall be elaborated for the regional financial channels The regional financial channels personnel shall be trained about the credit operations.
Environmental Conservation : Production of Tree Seedlings in Nurseries	To prevent soil erosion and flood, the project aims at the renewal of already existing facilities for the production of nursery trees and to provide trees for the plantation in potential areas	The nursery trees of rapid growth species and high quality species are to be produced in the Project. The produced species will be taken and transplanted into deforested areas, agro-forestry areas and silviculture areas.

Reforestation	Reforestation of silviculture areas dividing into three strata; production of pastures, production of fruits, and production of construction materials & firewood	Reforestation will be divided into three strata according to its utilization; Lower stratum: Production of pastures Middle stratum: Fruits such as "jicara" Upper stratum: Construction materials and firewood The species of trees produced will be transplanted in deforested areas, agro-forestral areas and silvipasture areas.
Protection Against Erosion	Reforestation of project areas which are affected by erosion and land sliding and aims at controlling these processes; once the trees grow, they can be utilized as income source by the farmers.	The nursery trees of rapid growth and high quality species to be produced by the Project to be utilized in the control of erosion and land sliding. The produced species of trees will be taken and transplanted to areas to be reforested (those suffering from erosion and land sliding) in which terraces will be constructed. The trees will be planted in the borders of these terraces.

## VI The Project Schedule

### 48 Basic Policy of Project Schedule

For the elaboration of all programs proposed in the Master Plan, for which target year is 2015, the order of this elaboration is very important. The points which should be considered in the ranking according to priority are listed as follows; 1) Existence of poor surroundings, 2) The low abilities of the farmers, 3) Lack of experience among members. According to these considerations, the programs shall be divided along the 15 years into short, medium and long term periods.

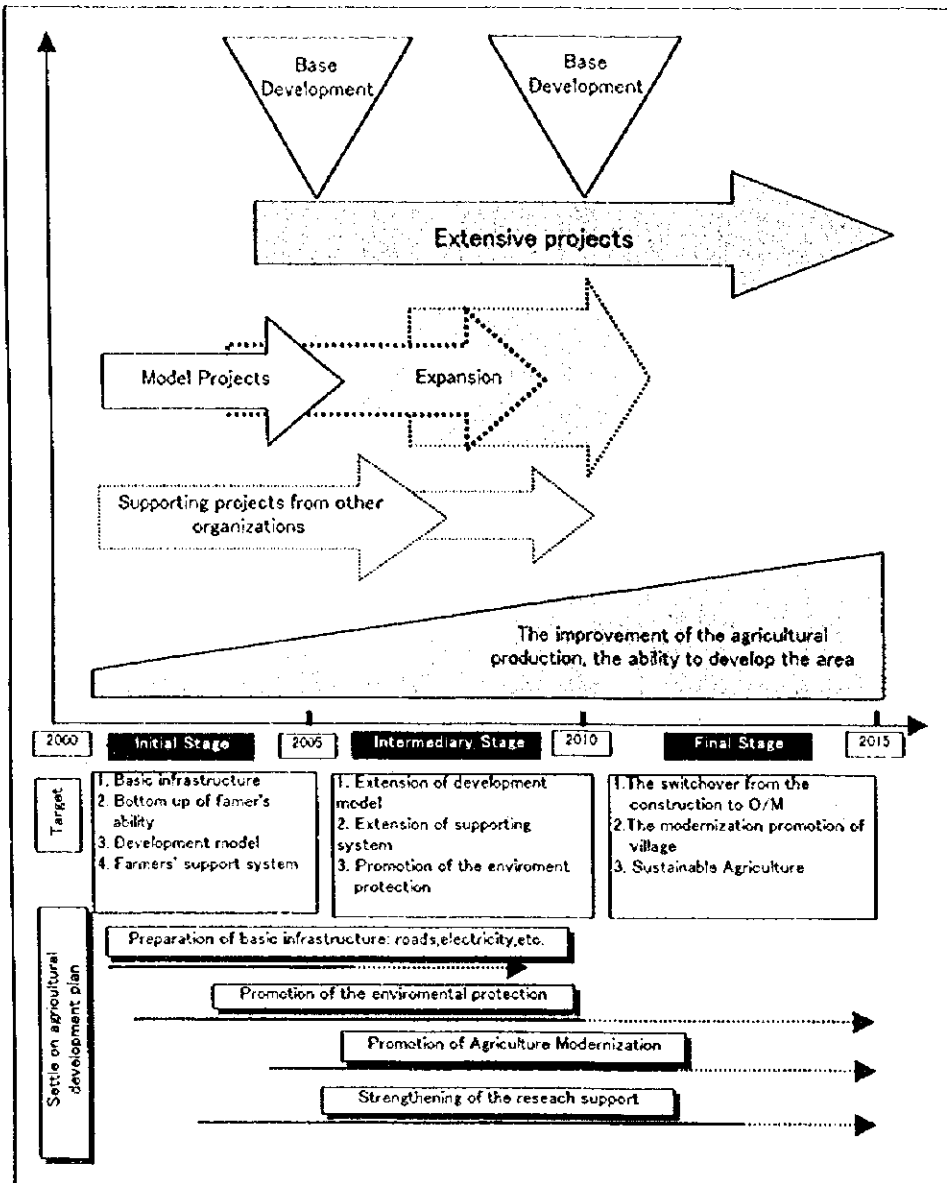
Period	Short Term 2000~2005	Medium Term 2005~2010	Long Term 2010~2015
Target	1. Basic infrastructure 2. Improvement of farmer's ability 3. Development model 4. Farmer support system	1. Extension of development model 2. Extension of support system 3. Promotion of the environment protection	1. The switchover from the construction to O/M stage 2. The modernization promotion of the agriculture in the villages 3. The establishment of sustainable agriculture

### 49 Project Schedule

The promotion of a development model in an early stage is considered to be important due to the reasons mentioned below shown below.

- 1) The management of the project of agricultural techniques improvement and the organization of farmers is very difficult. This hinders the implementation of the plan, which covers the whole area, from the beginning. The development model, limited to a certain area and number of farmers, will be useful as an experience for the implementation of the projects, stimulating the farmers of other areas to do the same.
- 2) The implementation of the development project model will become the basis for the implementation of the other projects.

The model prepared based on the Master Plan policy is shown below.



Those projects which have higher priority and need to be implemented urgently and the projects which form the basis of development are planned at the beginning. The projects, which need to be implemented after the development of region to a certain level, are planned to be implemented in accordance with the investment cost and the project details.

Term	Short					Medium					Long				
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Development Projects															
Model Projects															
Telica Area Development Project															
Malacatoya Area Development Project															
El Espino Area Development Project															
Suburb-Type Farming Group Model															
Irrigation Projects															
El Sauce Irrigation Project															
Cayanipe Irrigation Project															
Zarzales Irrigation Project															
Small-scale Irrigation Project															
Road Rehabilitation Project															
Village Road Maintenance Project															
Seed Production Projects															
CESASUR Support Project															
Basic Grains Seed Production Project															
Experimental Research Project															
Rehabilitation of Cotton Research Center															
Strengthening of Extension Services Project															
Strengthening of Extension Services Project															
Livestock Projects															
Small-scale Livestock Extension Project															
Livestock Extension and Research Project															
Marketing															
Market Information gathering and Extension Strengthening Project															
Agricultural Credit															
Agricultural Credit System for Small and Medium scale Farmers															
Farmers Organization															
Rural Leaders' Education Project															
Farmers Organizations' Formation Fund Project															
Farmers Organizations' Strengthening Project															
Extension Services Organizations Strengthening Project															
Environmental Protection Project															
Silvi-agriculture Areas Reforestation Project															
Erosion Protection Project															
Seedling Production for Reforestation Project															

## VII Selection of Priority Projects (Selection of F/S projects)

### 50 Guidelines of the selection

The 23 individual projects which can realize the improvement of small farmers' life conditions in the Study Area are important, but priority must be given to those requiring Feasibility Study and those that can be implemented in an early stage of the Master Plan. Furthermore, these projects shall become the basis of the area development. Considering these aspects, the selection of priority projects were carried out based on the following criteria;

- (1) The project shall become the basis of the area development.
- (2) The project shall improve the living conditions of small and medium scale farmers.  
These two items shall be the basic criteria for the evaluation of all the projects.
- (3) The project shall be implemented in the shorter-term possible within the plan of activities.  
Project shall be implemented within the period between 2001 and 2005.
- (4) The project shall provide direct impacts as soon as possible.  
Project which implementation can be basically realized in the shorter term as possible and which directly have impacts on the improvement of beneficiaries' life conditions.
- (5) The project shall benefit both small and medium scale farmers.  
Although, at present, the knowledge level on agricultural techniques of the small and medium scale farmers is low, the project shall be understood by the farmers and, if it is not possible, specific sub-projects to attain this goal shall be supplied.
- (6) The project by itself shall be advantageous  
Each project shall be ordered as for the priority based on the advantages they offer. Therefore, it is important that each project has its own advantages.
- (7) The project shall require a Feasibility Study  
The project, at present, shall require a feasibility study and shall have favorable characteristics for its posterior development. In other words, important components of the project, such as facilities design and budget, shall be clearly defined.
- (8) The project implementation  
Once implemented, the project shall allow the obtainment of experiences which makes it possible to implement other similar projects.
- (9) The project shall have a relatively low cost  
The project shall be relatively easy to be implemented and shall have low cost considering the present economic conditions of Nicaragua.

### 51 The selection of the priority projects

Based on the above mentioned 9 criteria, the following 3 projects were selected. And, the Feasibility Study which is the first step of the Master Plan will consider the following selected areas in Regions II and IV.

	Project Name	Outline
Region II	The Telica area model development project	This project comprehends irrigation facilities utilizing the Telica river as water resource. It will be a model in the Master Plan.
	The El Espino area model development project	This project comprehends irrigation facilities utilizing wells as water resource. It will be a model in the Master Plan.
Region IV	The CESASUR supporting plan	It is a plan of strengthening of the existing seed center which is in charge of the production, selection and approval of seeds quality (basic grains and vegetables)

The results of the evaluation of each individual project are shown in the following table.

**The Selection of the Priority Projects**

Selection Criteria	Development Projects										
	Basis for Regional Development	Key for the Improvement of Living Conditions of Small and Medium Scale Farmers	Short-term Implementation Project	Direct Impact in a Short Term	Capacity to Benefit Both Small and Medium Scale Farmers at the Same Time	Advantageous Project Even When Considered Independently	Need of F/S	Improvement of Capabilities of Related Executing Agencies	Improvement of Results Due to Relatively Low Costs	Comprehensive Evaluation	
<b>Model Projects</b>											
Telica Area Development project	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
Malacatoya Area Development project	⊙	⊙	○	⊙	⊙	⊙	⊙	⊙	⊙	○	
El Espino Area Development project	⊙	⊙	○	⊙	⊙	⊙	⊙	⊙	⊙	○	
Suburban -Type Group Farming Model	⊙	⊙	○	⊙	⊙	⊙	⊙	⊙	⊙	○	
<b>Irrigation Projects</b>											
El Sauce irrigation project	⊙	⊙	△	○	△	○	⊙	△	△	△	
Cayanlpe irrigation project	⊙	⊙	△	○	△	○	⊙	△	△	△	
Zarzales irrigation project	⊙	⊙	○	○	△	○	⊙	△	△	△	
<b>Road Rehabilitation Project</b>											
Village road maintenance project	⊙	⊙	⊙	⊙	○	⊙	△	△	⊙	○	
<b>Seed Production Project</b>											
CESASUR supporting project	⊙	⊙	⊙	⊙	⊙	○	⊙	○	⊙	⊙	
Basic grain seeds production project	⊙	⊙	○	⊙	△	△	○	○	⊙	○	
<b>Experimental Research Project</b>											
Rehabilitation of cotton research center	⊙	⊙	○	○	△	△	○	⊙	○	△	
<b>Strengthening of Extension Services Project</b>											
Strengthening of Extension Services Project	⊙	⊙	⊙	⊙	⊙	⊙	△	⊙	⊙	○	
<b>Livestock Project</b>											
Small-scale livestock extension project	⊙	⊙	⊙	⊙	⊙	⊙	△	△	⊙	△	
Livestock extension and research project	⊙	⊙	○	○	△	△	○	○	⊙	△	
<b>Marketing</b>											
Market information gathering and extension strengthening project	⊙	⊙	○	△	△	△	○	○	○	△	
<b>Agricultural Credit</b>											
Agricultural credit system for small and medium scale farmers	⊙	⊙	⊙	⊙	○	○	○	△	△	△	
<b>Farmers Organizations</b>											
Rural leaders' education project	⊙	⊙	⊙	○	⊙	○	○	○	⊙	○	
Farmers organizations' formation fund project	⊙	⊙	⊙	○	⊙	○	△	△	○	○	
Farmers organizations' strengthening project	⊙	⊙	⊙	○	⊙	○	○	△	⊙	○	
Extension Services Organizations Strengthening Project	⊙	⊙	⊙	○	⊙	△	○	○	⊙	○	
<b>Environmental Protection Project</b>											
Silvi-agricultural areas reforestation project	⊙	⊙	○	△	△	○	△	△	⊙	△	
Erosion protection project	⊙	⊙	○	△	△	○	△	△	⊙	△	
Seedlings production for reforestation project	⊙	⊙	⊙	○	○	⊙	○	○	○	○	

Note: In the column of the comprehensive evaluation, ⊙ represents a priority project (Feasibility Study), and ○ and △ represent projects with low necessity of a Feasibility Study. In the rest of the table, ⊙ represents the suitability to the selection criterion, ○ means rather suitable, and △ means no relationship.



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2	Minutes of Meeting
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***LIST OF ABBREVIATIONS***

## LIST OF ABBREVIATIONS

### Public Organizations of Nicaragua

APENN	Asociación Nicaragüense de Productores y Exportadores de Productos No Tradicionales Nicaraguan Association of Manufacturers and Exporters of Non-traditional Products
BANADES	Banco Nacional de Desarrollo National Development Bank
BANIC	Banco Nicaragüense de Industria y Comercio Nicaraguan Industry and Commerce Bank
BCN	Banco Central de Nicaragua Central Bank of Nicaragua
CEA	Centro Experimental para el Algodón Cotton Research Center
CEI	Centro de Exportaciones e Inversiones Exports and Investments Center
CNIA	Centro Nacional de Investigación Agropecuaria National Center for Agricultural and Livestock Research
COMMEMA	Cooperación Municipal de Mercados en Managua Municipality Cooperation of Markets in Managua
CONAGRO	Consejo Nacional Agraria Agricultural national Council
DIGECOOP	Dirección General de Cooperativas General Bureau for Cooperatives
DGIAP	Dirección General de Información y Apoyo al Productor General Bureau for Farmers's Information and Support
DGPSA	Dirección General Planificación Sectorial Agropecuaria General Bureau for Agriculture and Livestock Sector Planning
DGPSA	Dirección General de Protección y Sanidad Agropecuaria General Bureau for Agricultural and Livestock Protection and Health
ENABAS	Empresa Nicaragüense de Abastecimiento e Granos Básicos Nicaraguan Company for Basic Grains Supply
FENACOOOP	Federación Nacional de Cooperativas Agropecuarias National Federation of Agriculture and Livestock Cooperatives
FISE	Fondo de Inversión Social de Emergencia Emergency Social Investment Fund
FNI	Financiera Nicaragüense de Inversiones Nicaraguan Investment Finance Corporation
FUNDE	Fundación Nicaragüense de Desarrollo Nicaraguan Development Foundation
FIDEG	Fondo Internacioonal para el Desafío Económico Globa International Fund for Global Economic Challenge
INAA	Instituto Nicaragüense de Acueductos y Alcantarillados Nicaraguan Institute for Water Supply and Sewerage
INE	Instituto Nicaragüense de Electricidad Nicaraguan Institute of Energy
INEC	Instituto Nicaragüense de Estadísticas y Censos Nicaraguan Institute of Statistics and Census

INETER	Instituto Nicaragüense de Estudios Territoriales Nicaraguan Institute of Geographical Studies
INIFOM	Instituto Nicaragüense de Fomento Municipal Nicaraguan Institute for Municipal Development
INRA	Instituto Nicaragüense de Reforma Agraria Nicaraguan Institute of Agrarian Reform
INSSBI	Instituto Nicaragüense de Seguridad Social y Bienestar Nicaraguan Institute of Social Welfare
INTA	Instituto Nicaragüense de Tecnología Agraria Nicaraguan Institute of Agricultural Technology
MAG	Ministerio de Agricultura y Ganadería Ministry of Agriculture and Livestock
MARENA	Ministerio del Ambiente y Recursos Naturales Ministry of Environment and Natural Resources
MAS	Ministerio de Acción Social Ministry of Social Action
MCE	Ministerio de Cooperación Exterior Ministry of Foreign Cooperation
MCT	Ministerio de Construcción y Transportes Ministry of Construction and Transport
MED	Ministerio de Educación Ministry of Education
MEDE	Ministerio de Economía y Desarrollo Ministry of Economy and Development
MIDINRA	Ministerio de Desarrollo Agropecuario y Reforma Agraria Ministry of Agriculture and Livestock Development and Agrarian Reform
MIFIN	Ministerio de Finanzas Ministry of Finance
MINGO	Ministerio de Gobernación Ministry of Governance
MINSA	Ministerio de Salud Ministry of Health
MIPRES	Ministerio de la Presidencia Ministry of the Presidency
PNDR	Programa Nacional de Desarrollo Rural Rural Development National Program
POLDES	Programa de Polos de Desarrollo Development Poles Program
SIPMA	Sistema de Información de los Precios del Mercado Agrícola Agricultural Market Prices Information System
SNIP	Sistema Nacional de Inversión Pública Public Investment National System
SPA	Sector Público Agrícola Agricultural Public Sector
SPA	Asociación de Productores de Semillas Seeds Producers Association
UCA	Universidad Centroamericana Central American University

UNA	Universidad Nacional Agraria Agricultural National University
UNAN	Universidad Nacional Autónoma de Nicaragua Autonomous National University of Nicaragua
UNICAFE	Unión Nicaragüense de Cafetaleros Coffee Producers Union of Nicaragua

#### International Organizations

BCIE	Banco Centroamericano de Integración Económica Economic Integration Central American Bank
BID(IDB)	Banco de Interamericano de Desarrollo InterAmerican Development Bank
BM	Banco Mundial World Bank
FAO	Organización para la Agricultura y la Alimentación Food and Agricultural Organization
IDA	Asociación Internacional para el Desarrollo International Development Association
IFAD	Fondo Internacional para el Desarrollo Agrícola International Fund for Agricultural Development
IMF	Fondo Monetario Internacional International Monetary Fund
JICA	Agencia de Cooperación Internacional del Japón Japan International Cooperation Agency
NGO	Non-Governmental Organization Organización No Gubernamental
OEA	Organización de Estados Americanos American States Organization
OECD	Organización para la Cooperación y Desarrollo Económico Organization for Economic Cooperation and Development
UNDP	Programa de Desarrollo de las Naciones Unidas United Nations Development Program
PMA	Programa Mundial de Alimentos World Food Program

#### Exchange Rate

C\$	C\$ 1.0	=	US\$ 0.10 (November, 1997)
US\$	US\$ 1.0	=	C\$ 9.70 (November, 1997)
JY¥	US\$1.0	=	¥126.0 (November, 1997)

#### Weights and Measures

Mz	1.0 Mz = 0.701 ha
ha	1.0 ha = 1.42 Mz
qq	1.0 qq = 46kg
gal	1.0 Gallon = 3.785 Liter