

3.5.1 General Characteristics of Regions

(1) Number and Distribution of Animals

Number of Domestic Animals and Extension of Livestock Raising Land

Region	Department	Bovine	Equine	Swine	Pasture (Mz)	Mz/Cow
Region I		271,543	61,114	43,660	378,539	1.39
Region II	Chinandega	126,115	22,487	14,490	145,721	1.16
	León	212,828	34,627	37,220	221,627	1.04
Sub-total		338,943	57,114	51,710	367,348	1.08
Region III	(Managua)	78,819	15,944	6,596	84,935	1.08
Region IV	Masaya	17,501	3,702	1,290	15,753	0.90
	Granada	34,211	5,577	7,078	37,877	1.11
	Carazo	40,332	7,048	9,017	34,616	0.86
	Rivas	87,101	18,960	19,264	128,087	1.47
Sub-total		179,145	35,287	36,649	216,333	1.21
Region V		993,697	136,546	63,664	1,674,306	1.68
Region VI		648,331	118,630	97,173	1,018,798	1.57
San Juan		126,125	18,951	9,272	239,951	1.90
Total of the Country		2,636,603	443,586	308,724	3,980,210	1.51

Source: MAG

- In the above Table, it can be observed that the largest herd of bovine cattle population is distributed in Region V and VI. However, among the Pacific Regions, there are departments which present relatively outstanding figures, for instance; Leon and Rivas.
- Recently, an animal health laboratory was opened by MAG in Leon, as part of a strategy to promote the livestock raising activity in this Department, since the fall of the cotton cultivation, the national policy is to impulse the livestock raising activity as an alternative. 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.

In the following Table, the number of animals, in recent years are presented.

Number of Cattle Heads					
	Unit: 1,000 heads				
	1952	1963	1971	1986	1995
Bovine cattle	1,182	1,251	1,828	1,600	2,590

Source: MAG

It can be observed that, since the 50's until the recent time, the number of bovine cattle is gradually increasing.

Although the composition of animals in small farms varies, the following cases are very common;

- Yoke of oxen
- 1 - 2 horses
- 3-10 half-breed cows for double purpose
- Calves, heifers
- Pigs (4-5)
- Hens (20-30)

(2) Classification of the 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.

The most common system is the dual purpose system, though there are other four systems in the country;

- Milking System
- Milking and Breeding System
- Milking, Breeding and Fattening System
- Breeding or Fattening System

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.

The milk is one of the main sources of protein and daily income. The rural dairy products production plants are very rustic. The production of milk in Regions II and IV is presented as follows;

Milk Production in Regions II and IV

	unit: 1,000kl	
	1996	1997 (first)
Region II	91,860	57,300
Region IV	50,643	24,010
total	142,503	81,310

Source: MAG

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. Some indicators are presented as follows :

Productive and Reproductive Indicators

	Nicaragua	Japan
Artificial Insemination Rate (%)	Very low	Almost 100%
Interval between Births (m)	21	13
Age of the Heifer at the first birth (m)	48	27
Fattening period (m)	48	<20
Production of milk/cow/day (L)	3.2	>25

Source: MAG

(3) Equine

Except for the hippic animals, the main use of horses is as draft animals for agriculture and transportation. Therefore, regardless of the size of the farm, this "tool" is very much indispensable for the farmers in these regions.

(4) Swine

The most predominant race in Nicaragua is "criolla" which is found in the Latin Countries although the strict meaning of criolla varies according to the country. This race is characterized by the rusticity and resistance to the arid environment, specially in barren fields. On the other hand, the production yield is low and the fattening process takes time. In these zones, the pigs are processed in an individual and illegal way, creating serious health problems, specially the Cisticircosis. Nevertheless, the number of producers carrying out a modern exploitation, utilizing pure race hybrids and taking their production to processing plants, is slightly increasing, although this number is low for the commercialization at the national level. Some of these processing plants are located in León and Managua.

(5) Poultry

Likewise the swine, the majority of poultry is raised in the backyards and is consumed by the farmers themselves. The selling to the public depends on the proximity to markets, transportation infrastructure, etc.

3.5.2 Magnitude of Cattle Raising Farms

In general, the cattle raising farms are classified according to the size of the herd as follows;

	Number of Heads
Large Scale Farms	> 50
Medium Scale Farms	20 ~ 50
Small Scale Farms	< 20

3.6 Rural Infrastructure

3.6.1 Roads

The roads linking villages with main roads are in very precarious conditions. Except 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. Except for the important roads, there are several rivers and brooks without bridges. This situation affects the commercialization of agricultural products and the daily life of the population. The population of the Study Area constantly demands the repair of the roads but actually doesn't expect hopefully for the fulfillment of this demand. In the future, the rehabilitation of roads, especially the secondary roads, is very necessary for the development of agricultural activities.

Length of Roads and Vial Density

	Department	Principal	Secondary	Vial Density	Vial Density
		(km)	(km)	Principal m/km ²	Secondary m/km ²
REGION II	Chinandega	156	633	0.45	128.50
	León	198	699	0.59	136.87
	Total	354	1,332	35.28	132.76
REGION IV	Masaya	50	228	84.75	386.44
	Granada	52	231	55.97	248.65
	Carazo	42	218	40.00	207.62
	Rivas	86	422	39.91	195.82
	Total	230	1,099	48.69	232.64

Source: MCT

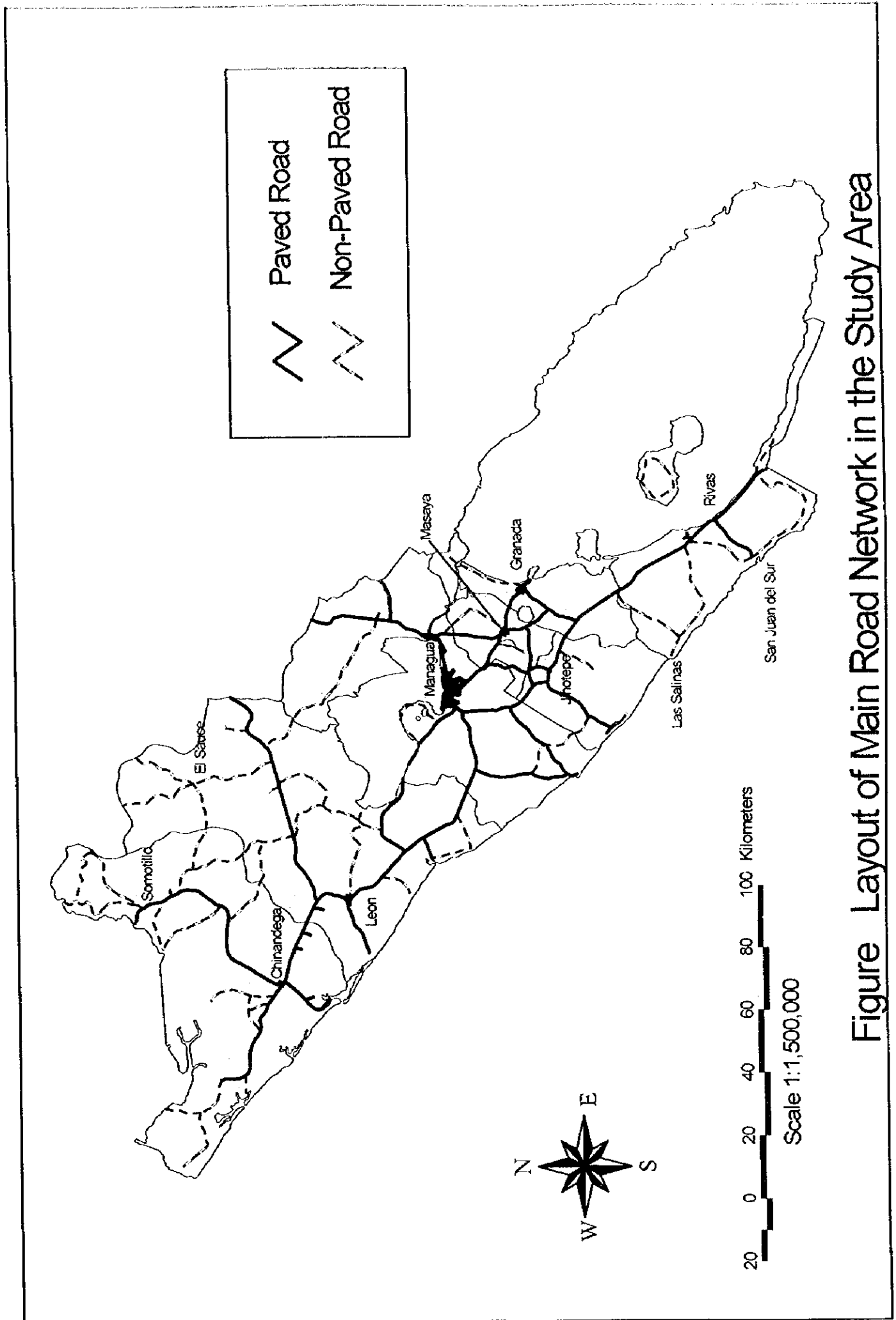


Figure Layout of Main Road Network in the Study Area

3.6.2 Drinking Water and Sewerage System

(1) 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.

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

The water charge differs according to the use; The INAA established an average charge of C\$1.71/m³. Furthermore, in the rural area controlled by the INAA, the established volume of distribution is 37.8/person/day.

(2) Sewerage System

There is sewerage system in only 11 out of the 31 municipalities of the Study Area, though it can only be seen in the cities' centers. In the Study Area, there is treatment for residual waters only in the five biggest cities; León, Chinandega, Granada, Rivas and San Juan del Sur. The sewerage system charge is equivalent to 30% of the charge established for the water supply system.

3.6.3 Electricity and Communication

(1) Electricity

The Nicaraguan Institute of Energy (INE) is the organization in charge for the supply of electric energy in Nicaragua. There are two sources, by generation and by transmission. The behavior of electric energy supply both at the urban and at the rural levels, in the Study Area, is presented as follows;

Region	Urban	Rural
Region II	84.2%	30.3%
Region IV	69.3%	39.5%

Source: INE

The charge for electric energy is classified according to the use; for agricultural use the basic charge is higher than the usual domestic use charge. On the other hand, although the consumption charge is low in comparison with the domestic one, the cost is still high due to the high consumption rate mainly in the summer time.

Domestic use charge	: Minimum charge	C\$20.80
	: Consumption charge	C\$0.8321/KWH (the first 25KW)
Agricultural use charge	: Basic charge	C\$1,575.88
	: Consumption charge	C\$0.7382/KWH

(2) Communication

The proportion of telephone lines installed in Regions II and IV is low, specially in the rural areas..

Regional Distribution of Telephone Lines

Region	Urban Area	Rural Area
Region II	47.3%	11.2%
Region IV	46.3%	13.7%

Source: ENTEL.

3.6.4 Education

The education system in Nicaragua includes 3 years for pre-school, 6 years for middle school, 5 years for high school and an average of 5 years for college. The pre-school years together to the middle school are conducted as compulsory education. The literacy rate at the urban level is approximately 90%, while at the rural level it is reduced by 10%. In almost all municipalities there are middle and high schools.

3.6.5 Hospitals

The big medical centers are located in the departments, although there are hospitals and private clinics in the municipalities.

3.7 Irrigation and Drainage

3.7.1 Characteristics of the Irrigation Conditions in the Study Area

In general, the existing irrigation infrastructure is somehow rudimentary, and only the large-scale farmers, the sugar mills farms and a small portion of the medium-scale farmers possess this facility. 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. The main characteristics of the irrigation in the Study Area can be resumed as follows;

- The large-scale irrigation facilities, which are in operation, belong to the private sector, i.e., the large-scale farmers and the sugar mill farms.
- Small and medium-scale farmers integrated in irrigation systems are scarce.
- The small and medium-scale farmers carry out the irrigation utilizing manually excavated wells, utilizing small pumps to bring up the water from the wells or from some river running near their farms.
- Out of the total land with good land suitability, only 13% are utilizing irrigation.

- The efficient utilization of surface water resources demands large-scale civil works, the reason why the present users are large-scale farmers and private companies.
- In the drought period, the majority of rivers have their discharge volume remarkably reduced.
- The small and medium-scale producers do not have enough capital to operate and maintain the wells and the pumping equipment, therefore many of them abandon the irrigation.
- The Government does not have or manage any organized irrigation infrastructure, and does not have enough experience for the implementation as well as for the management of an organized irrigation system carried out together with the farmers.

3.7.2 Present Irrigation Area

In analyzing the present irrigation area by water source in the Study Area, it is verified that 74% of the water resources come from underground water, 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 Area in the Study Area				
Region	Water Source	Agricultural Area (Mzs)	Irrigation Area (Mzs)	Proportion of Irrigation (%)
Region II	Surface water	-	11,512	-
	Groundwater	-	32,704	-
	Subtotal	339,063	44,216	13.0
Region IV	Surface water	-	6,948	-
	Groundwater	-	21,509	-
	Subtotal	203,631	28,457	14.0
Total		542,694	72,673	13.4

Source: MAG

(Note) Within the agricultural area, the fallow lands, "tacotales" and pastures are not included

The existing irrigation infrastructures are located in the following regions; the Pacific coastal zone in the Region II, and the zones comprehended within the Nicaragua Lake utilization area, in Region IV.

3.7.3 Existing 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 m³/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 the 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% for each one.

3.7.4 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.

3.7.5 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. There are also some farmers associations which carry out the irrigation in a rotational system, thus due to the small scale of their farms, there are no major problems in the equipment.

3.7.6 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.

3.7.7 Drainage Facility

Although open canals as drainage facilities have been installed in the paddy fields, there are no drainage facilities such as open canals and underdrains in the upland fields. However, there is no damage in the fields since it can be smoothly drained of rainy water in spite of suffering from heavy rain in the rainy season. On the other hand, there are some irrigable areas located near the swamp area, but it is impossible to cultivate the fields due to drainage difficulties. Consequently, these areas are expected to be utilized as pastures.

3.7.8 Constraints for Irrigation Facilities

It is necessary to install irrigation facilities to increase agricultural production. However there are some constraints for provision of irrigation facilities in the Study Area. The constraints are described below;

- Engineering Aspects for Utilization of Surface water

- There are only few rivers utilized for irrigation purpose throughout the year in the Study Area.
- Most of the rivers with abundant water resources for irrigation are already exploited by large-scale farmers and private enterprises.
- In case of taking the irrigation water from the rivers, small and medium scale farmers must collaborate with large-scale farmers to share the irrigation water.

- Engineering Aspects for Utilization of Groundwater

- If the irrigable area is less than 20ha, it is costly to install well facilities for irrigation.
- It is impossible to install the deep well for irrigation inexhaustibly considering groundwater potential.
- Installation cost becomes expensive when it is done at an high altitude areas like hilled rural areas because well depth will be deeper comparing with lowlands.

- Social Aspects for Farmers Association and Farming

- Farmers' associations must be established for efficient operation and maintenance of irrigation systems.
- Cash crops must be introduced in order to provide funds for covering O&M costs and improving the living standards of the farm households.

- Social Aspects for Agricultural Credit and Administrative Conditions

- Credit has been insufficient to cover the construction cost for provision of irrigation systems
- Lack of funds for irrigation facilities
- A system for the provision of loans to farmers to cover the construction costs of irrigation system is required
- The government should provide subsidies to cover the construction costs for irrigation projects
- An efficient executing agency for agricultural projects is required

Countermeasures for these constraints are described in Chapter 5.

3.8 Extension Organization

3.8.1 Extension Organization and its Present Situation

INTA is in charge of technology generation and transfer activities. The Table shown below indicates the agriculture extension agencies stationed in the Region II and IV with outline of extension work. It is obvious from this Table that a covering rate of the farm households in each jurisdictional area is around 13 %, which is absolutely short. Each extension agency headed by a technical leader consists of few extension workers, secretary, security guard and janitor with the radio, and telephone except for INTA A-2 regional office and Granada office at Nandaime in Granada Department.

Agriculture Extension Agency and Service Condition in the Study Area

Zone	Department	No of Farmers	Agency	No of Ext. Workers	Covered Municipio	ATPB ATP1	ATP2	Coverage Region(%)
A-1	Chinandega	27,035	Chinandeg	7	4	1,461		
			Somotillo	3	3	647		
	Leon	24,650	Leon	5	5	2,223		
			El Sauce	3	2	691		
Sub Total Region II		51,685		18		5,022	1,693	130
A-2	Granada	9,087	Nandaime	3		525		
	Rivas	8,357	Rivas	7		1,352		
	Masaya	6,238	Masaya	3		1,153		
	Carazo	27,064	Carazo	3		540		
Sub Total Region IV		50,746		16		3,570	3,460	139

Fuente: INTA A-1 & A-2 Office

Extension service for ATP2 is carried out by 4 private entities such as SETAGRO, S.A. in the Region II and FIDER, ESTECA, AGRODERSA, S.A in the Region IV by making contract with INTA. In addition to INTA's extension work, several non-governmental organizations and other governmental entities are implementing projects in the Study Area

3.8.2 Agricultural Research Organization

The following governmental research stations are included in the Study Area and its surroundings.

(1) Campos Azules Research Station

This station is located at Masatepe, Carazo Department and focuses on the research of fruit trees like avocado, citrus fruits and pitahaya in the 40 ha experimental field with around of 15 staffs. Research subject is mainly to improve farming practice of the fruit trees and to multiply fruit saplings like coffee, avocado, mango and cashew nut for distribution to the farmers on request basis.

(2) La Compañia sub research station

This sub-station of the Campos Azules Research Station has been established since 1980 and 3 researchers are involved in the research with a research field of 60 ha. Major research subjects are specialized to test the frijol bean varieties bred by CNIA in terms of resistance, adaptability, potential yield and quality.

(3) Ex-Cotton research center(CEA)

This research facility is located at Posoltega in Leon Department and was once transferred to the private sector and has been returned to MAG at present. Currently, the seeds section in the Regional MAG office has utilized this facility for inoculation of soybean and its seed production. At present, the reactivation plan of this ex-cotton research center has been examined by MAG with concerned governmental entities in order to strengthen the agriculture of the western area in the country by focusing the research subject on oil crops like peanut, soybean, sesame and cotton.

(4) National Agriculture and Livestock Research Center(CNIA)

This research station is located in Managua, Region III and plays an important role for technology generation of extension source and human resource development related to the Study Area as a core of the country's research organs. There are 37 research staff with a 105 Mz experimental field and study basic grains, soil and water conservation, integrated pest management, crop diversification, post-harvest technology and seed production(basic grains and forage crops). One expert from JICA has been dispatched and involved in the field of seed production program. A training program for the youth in the rural society has been restarted since 1996 under the USAID backup.

3.9 Diagnosis on Farmer Organization

Diagnosis on farmer organization is based on discussions and interviews conducted in the Study Area and analysis of the available information. The results of the analysis of the existing agricultural institutions are mentioned below.

(1) Present Conditions: 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.

(a) Unclear Legislation

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 Agroindustry Cooperative Law (*Ley de Cooperativas Agropecuarias y Agroindustriales*) of 1990. Even though both laws fall under the jurisdiction of the Labor Ministry, the present day Labor Ministry is structured differently from that of 1971. And the Nicaraguan Constitution was partially amended in 1995. It appears that there is a need to revise the General Law on Cooperatives (1971), so as to adjust it to the present institutional arrangement, and either to consolidate or to set the precedence order of the two laws.

(b) Institutional Weakness

One office of the Labor Ministry is the General Directorate of Cooperatives (DIGECOOP), comprising of 3 divisions in charge of Manufacturing & Service Cooperatives, Agriculture & Livestock Cooperatives, and National Registry of Cooperatives, with a total staff of 11. In reality, only the Registry of Cooperatives is operational, since understaffing and budget cuts preclude training and supervision of cooperatives.

The Registry of Cooperatives restricts its role to that of registration and granting of juridical personality to cooperatives, but is unable to keep track of how many of the 5,000 plus registered cooperatives are active and how many have ceased to operate. An estimated 80% of registered cooperatives belong to the agriculture and livestock sector. It is clear that DIGECOOP needs more human and financial resources to properly fulfill its role, but strengthening a government office may be difficult in this time of shrinking

government. An alternative may be an autonomous Cooperative Institute made up by representatives of government and cooperatives.

Prospective members of a cooperative are required, as a prerequisite, to undergo 40 hours of training on cooperatives. In the case of POLDES, this initial training is entrusted to FUNDE. 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 should be pointed out that this does not mean distrust of FUNDE, since it has earned a solid reputation over a quarter century of work. 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. An additional negative aspect of shortage in operating budget refers to the insufficient absorptive capacity of POLDES, if increasing foreign aid comes forth.

(2) Distorted Interpretation & Representation of Cooperatives

The word "cooperative" evokes different images in the mind, usually not very positive. This unfortunate phenomenon is not exclusive of Nicaragua, but has occurred in many parts of the world. Agricultural cooperatives, in particular, have been victims of misinterpretations and misrepresentations. This has generally resulted from an excessive politicizing of the cooperative movement, which has had adverse effects on the management of cooperatives and on the attitude of cooperative members, ultimately resulting in the distrust and deteriorated image of agricultural cooperatives.

1) Government Level: Sequel of Paternalistic Actions

The Ministry of Agricultural Development and Agrarian Reform (MIDINRA) implemented agrarian reform in the 1980s with the prerequisite of cooperative formation. This requirement should have been examined in consideration of the first of the universal principles of cooperatives, which is the freedom to join and leave a cooperative at any time. In addition to the purported land redistribution, agrarian reform was a political means to enlarge a loyal electorate, and a basis for setting up paramilitary groups geared for national defense purposes.

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" 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.

2) Cooperative Level: Lack of Development of Capable Leaders

Capable cooperative leaders refer to those experienced in agricultural cooperatives and competent in management skills. It was already explained that the need for such 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.

Reportedly, many of the agricultural cooperatives are too small to be efficiently managed. This resulted from the legal requirement of only 10 persons to start an agricultural cooperative, which could be made up of members of one family. Small cooperatives may gain competitive advantage if consolidated into larger cooperatives or into unions of cooperatives (second degree cooperatives), and this is the measure being pursued by FENACCOOP and POLDES.

3) Farmer Level: Distrust and Misconception of 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 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. A dramatic change in the farmer mind-set and attitude should be attained as a necessary prerequisite to organize farmers.

(3) POLDES Cooperatives

The following impression on POLDES cooperatives was obtained from interviewing leaders of 14 out of 15 cooperatives in Region II, and 13 out of 16 cooperatives in Region IV. The meetings were held with a group of cooperative leaders and the presence of POLDES agency heads in 4 cooperatives of Region II and 2 cooperatives of Region IV. In the remaining POLDES cooperatives, only one leader was interviewed per cooperative, giving rise to the question of fair representation of opinions, but overall there was not much variety in the viewpoints expressed by these leaders.

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 state that most members are unwilling or unable to pay C\$ 5 or C\$10 per month for administrative expenses of the cooperative, or the monthly fee for the INTA technical assistance. According to one POLDES field office head, Japanese input bags had to be printed "cooperation from Japan" instead of "donation from Japan", because farmers simply refuse to pay when they see the word "donation". This strongly reflects the "no payment culture".

Overall, there is a disappointing lack of initiative and willingness among POLDES cooperative leaders to do something on their own, to solve at least the smallest of their problems by themselves. It is always "we can improve the cooperative if we get more financing, if we get more inputs, if you give us drilling machines, if you give us windmills", and on and on. The idea of working together as a cooperative, on their own initiative, in the solution of a single problem is generally alien to them. Only one POLDES cooperative leader (Cárdenas, Rivas Dept.) requested road improvement, instead of something for the cooperative, with the rationale that marketing incentive from improved road will induce cooperative members to engage in more profitable enterprises, like plantain production, thereby strengthening the cooperative.

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.

(4) Conclusions

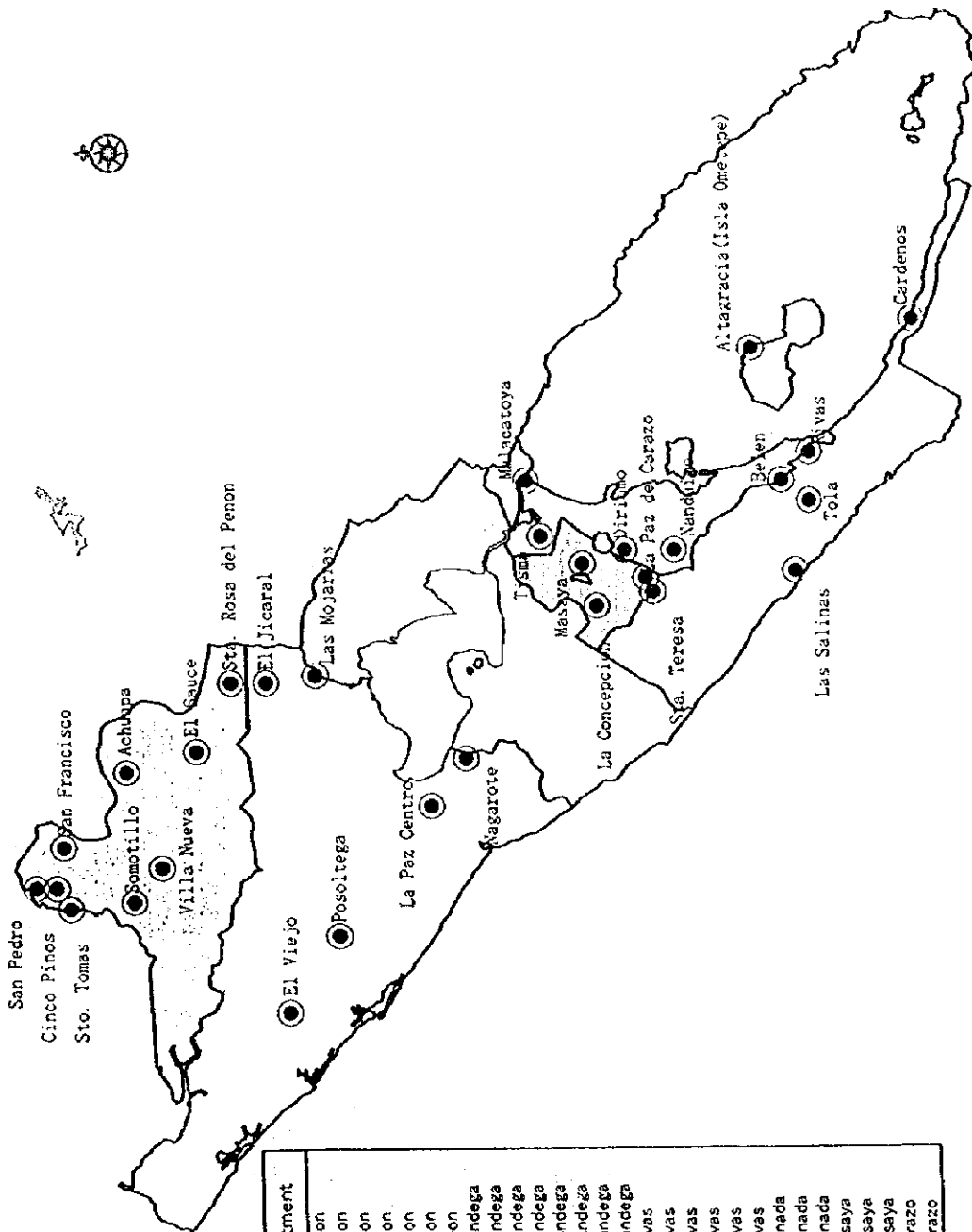
Farmers organizations face difficulties, which originate mostly from misconceptions. Although farmers are the ultimate targets, correction of misconceptions must be undertaken on two fronts, namely, government and farmers. Government institutions should be given the means to undertake a campaign against misconceptions, including the "no payment culture". This requires, as a prerequisite, that government officers be perfectly knowledgeable on the message they have to transmit to farmers during the misconception correction campaign, which demands a long term commitment.

It is a campaign to change the farmer's conscience, a campaign to get farmers to understand their rights and obligations, a campaign to get farmers to assume the most basic sense of responsibility. It is not as simple a matter as training farmers on cooperative organizations. This assertion is proven by a few agricultural cooperatives in Region II and Region IV, which after the failed management style of the 1980s decided to change to become self-reliable, and are well on their way to do so, having regained the confidence of conventional credit institutions.

The change of the mind-set to become self-reliable seems to be the key factor characterizing viable cooperatives. As shown by the viable cooperatives, the strength of a cooperative is not in collective work, but in services, such as bulk purchase of inputs and joint marketing of

members' production, as a way to increase negotiating strength. Direct export of quality controlled farm products seems to be a promising activity of these relatively successful cooperatives. Common features shared by relatively successful cooperatives are the following:

- (a) Decision to become self-reliable
- (b) Land tenure security, leading to access to credit
- (c) Managerial skills, either hired or among members
- (d) Profitability, even if modest
- (e) Neutral with regards to political affiliation



Name of POLODES	Department
Nagarote	Leon
La Paz Centro	Leon
El Sauce	Leon
Las Mojarras	Leon
Achuapa	Leon
Sta. Rosa del Penon	Leon
El Jicaral	Leon
Somotillo	Chinandega
Villa Nueva	Chinandega
Sto. Tomas	Chinandega
Cinco Pinos	Chinandega
San Pedro	Chinandega
San Francisco	Chinandega
El Viejo	Chinandega
Posotegea	Rivas
Cardenos	Rivas
Bejen	Rivas
Las Salinas	Rivas
Atagracia (Isla Ometepe)	Rivas
Tola	Rivas
Nandaimo	Granada
Malacatoya	Granada
Diriomo	Granada
La Concepcion	Masaya
Masaya	Masaya
Tisma	Masaya
Sta. Teresa	Carazo
La Paz de Carazo	Carazo

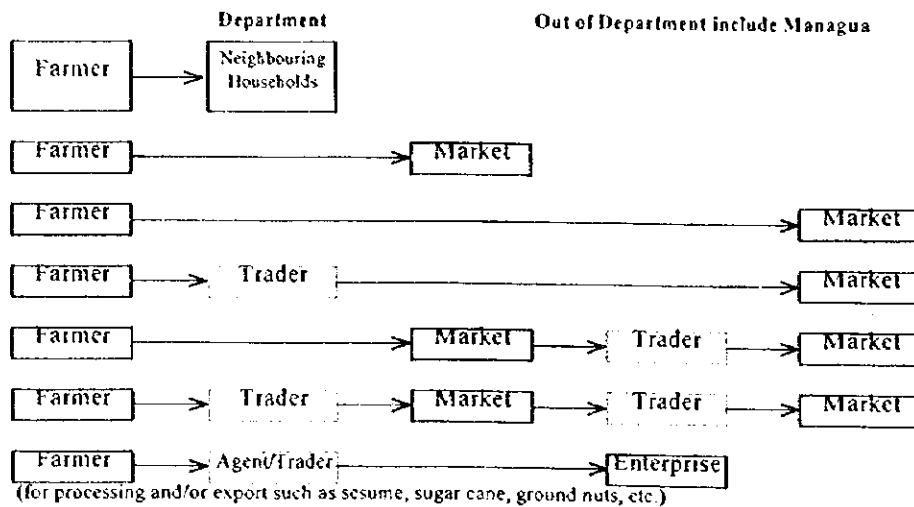
Figure Location Map of Farmer's Association "POLODES" in the Study Area

3.10 Marketing and Agro-industry

(1) 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 seemed that they 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. In this reflection, there are various channels generated by farmers, middlemen and traders. Principal distribution channels for agricultural products focusing on the project Regions are categorized below:

Principal Distribution Channels for Agricultural Products



The distinguished points recognized in the survey on the distribution system for small and medium farmers in this area are summarized below:

Farmers' Level:

- 1) The farmers interviewed tend to carry out their farming centering to their self-sufficiency, that is producing basic grains.
- 2) The farming area is limited by their manpower capacity even though they may have more area, because the farmers having and borrowing machinery such as tractor and harvester are very rare.
- 3) 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.
- 4) 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.

- 5) As for animal products that the small and medium farmers produce are mainly the 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.
- 6) 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.
- 7) 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 engaging wholesaling as well as retailing are farmers living in Masaya and its surrounding area.
- 8) 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 mean 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 important transaction point for distribution channels not only within the metropolitan area but throughout the country. However, wholesaling and retailing function are not separated clearly and mixed in each market even in Mayoreo Market.
- 3) All regional markets are belonging to each Municipality where they are located. But in Managua, the Municipal Cooperation of Markets in Managua (COMMEMA), an autonomy under the Municipality, is solely responsible to manage nine markets in Managua.
- 4) The trading activities inside a market are carried out through individual negotiations on a cash basis. The authorities of all markets visited have not 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. It seems that their only main responsibilities are collecting charge from sellers and manage their facilities. The facilities are not enough to give a place for the merchants in most of the markets and those who do not get a site inside the market building must put their stalls at the nearby roadsides. Road access, sanitation, water supply and drainage, lighting, and communication conditions faced by the merchants are bad.

(2) Market Price

The market price information was collected mainly from DGIAP in MAG during the field survey. The wholesaling and retailing price during Sep. 1996 - Aug. 1997 in major 10 markets of the country including Mayoreo and Oriental markets in Managua regarding ten kinds of agricultural commodities are compiled. The following results can be mentioned:

- 1) There is 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. The reason is judged that the banana is consumed in the same manners as the basic grains and can be harvested all year long.
- 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.

(3) Agro-industry

Although official statistic data on detailed conditions of the agro-industry was unavailable, the current conditions of the agro-industry in the Study Area are summarized as shown below and are based on the information the Study Team could get by visiting the factories and interviewing the relevant persons.

- 1) To promote the free market mechanism, the Government eliminated all intervening programs and is taking measures for giving preferential treatment to export activities. Therefore, propitious conditions for the private entrepreneurs to start and expand businesses export oriented activities are being created. Compared with the small and medium entrepreneurs, private investors who have enough funds have an edge as they can get adequate marketing information and technology even from foreign countries, without relying on official support.
- 2) Regarding small and medium farmers as the raw material suppliers to the private businesses above, the persons in charge of the factories visited pointed out the lack of technical support to farmers from official services. There are supporting services such as seed supply and technical transference in some cases, but in most of the cases there are no supporting services because of financial difficulties and the public organizations do not commit the farmers on a contract basis.

- 3) The two factories visited which were managed by labor unions and farmers' cooperatives seems to be facing difficulties to success. The reasons are as follows:
They have not been producing based on proper market research.
They can not procure necessary fund by themselves to continue the activities. As a result, they are only expecting financial support by donors, without which they can not proceed further.
- 4) For the entrepreneurs who do not have enough information on markets and technology and/or operational funds, the partnership with competent foreign companies may be convenient. The case of a banana producers group that cooperated with DOLE is an example. They import seedling of excellent quality from DOLE's Research Institute of Costa Rica and take care of them at the local nursery center. They also obtain the support for investments and commercialization as well as technological cooperation.
- 5) For export promotion, there are private organizations (CEI, APENN etc.) that give guidance on export procedures and supply export information, and collects funds aid of international organizations or foreign countries. However, they are used only for limited numbers of enterprises and companies without sufficient advertisement and manpower to manage the funds.

(4) 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:

1) Laws and regulations

a. Trading Law

Recently the Basic Trading Law was implemented since 7th July, 1997, revising the old Law drastically to be more suitable to the free market system. Therefore, the regulations and rules following the new Law to be applied for various aspects in commercial activities will be considered and established in future. MEDE is responsible to manage and coordinate the procedure mentioned above.

In this regard, it is conceivable that the legal confusion of trading activity due to rapid liberalization continues for a while, even though various temporary measures would be taken to solve it as usual.

b. Regulations and Standards

The regulations such as measurement and food sanitary and the standards such as for agricultural products are being applied by the norms of international organizations and/or developed countries in place of the own norms. But the official agencies in charge of application for these norms are institutionally too weak and functionless to promote the proper market condition.

2) 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, but all small and medium farmers interviewed in the both Regions did not receive any market information by official service. It is considered that most of the farmers especially small farmers can not access the distribution channels of this information.

3) Quarantine

The General Direction of Protection and Sanitary for Agriculture and Animal Husbandry (DGPSA) under MAG is in charge of quarantine services for related export and import merchandise. The examinations are carried out based on norms and requirements of export agreements; after passing the inspection, the DGPSA issues the certification to exporters.

4) Food Sanitary Control

The Direction of Food Sanitary Control (Dirección de Control de Alimentos y Zoonosis) under MINSA is in charge of supervise and control activities on food sanitary in the fields of production and trading. They have not established their own norms applied to field work under the Food Administratively they are allocated in three institutional levels, a head office (in Managua), Department (17 offices) and Municipality (143 depots).

5) 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.

Also, even basic grading and classification for distribution are not implemented, because a standard for agricultural products is not being adopted at all. At most, onions are occasionally classified by size due to the demand pressure from the consumers; this practice is not based on a public standard, just on an individual standard.

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. The World Bank has dispatched a survey team for that purpose and it is expected that the plan will be established in the first half of 1998. ENABAS has various kinds of post-harvest facilities such as terminal silos, warehouses and rice mills in many regional locations. Therefore, it is important to consider how these facilities will be affected by the plan mentioned above.

3.11 Agricultural Economy

3.11.1 Agricultural Production Volume

The Table shown below indicates the shares of the production of the Study Area. The regional production relative to the whole country is also shown. Four crops such as cotton, banana, peanuts and soybeans are cultivated only in the study area. Sesame is also specialized in the Study Area. On the other hand, the share of coffee, tobacco, corn and beans is nearly 10% of the national production. The crop yield in the study area is by and large higher than that of the national average, except beans, although the yield itself still leaves a lot to be desired.

Crop	Cultivated Area		Production		Yield	
	Ratio to Whole		Ratio to Whole		Ratio to Whole	
	Study Area (1,000Mz)	Country (%)	Study Area (1,000qq)	Country (%)	Study Area (qq/Mz)	Country (%)
For Exportation	129	51				
Sesame	35	95	260	95	7.4	99
Cotton	23	100	650	100	28.6	100
Banana *1	3	100	4,266	100	187.3	100
Coffee	14	12	118	13	8.7	106
Sugar Cane	43	73	2,101	77	48.7	106
Peanuts	11	100	446	100	40.1	100
Tobacco	0	12	6	1	0.5	108
For Domestic Use	138	23				
Rice	26	37	772	37	29.7	101
Beans	25	16	223	15	8.9	93
Corn	39	13	826	15	21.4	114
Sorghum	41	62	1,177	65	29.0	105
Soybean	8	100	230	100	30.2	100
Total Cultivated Area	267					

Note: *1 Unit: 1000boxes. Yield unit: Box/Mz.

Average ratio for the 5 years period from 1991/92 to 1995/96

The annual production between 1994 and 1996 is shown in the Table below. Around 30% of the total cattle production was obtained for milking purposes. In 1996, the gross production value of milk was C\$467 million and its VA was C\$374 million. The registered production of milk was 13 million gallons (approximately 50,000m³) in the country. It is said that the formally registered production of milk is only 13% of the actual production. It means that 87% of the total production is being consumed without any official control.

Product	Region II	Region IV	Nicaragua
Number of Cattle (1000 Heads)	30	92	342
Beef Production (Million Lbs)	9	30	110
Export of Cattle (1000 Heads)	-	-	19
Total of Consumed (1000 Heads)	-	-	361

3.11.2 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.

3.11.3 Economic Conditions of the Farming Household

In the study area, an average family size was estimated as 6.8. In Region II, it was 7.4 which was larger than that in Region IV. An age of family head was 49 years old on average, who got primary education of 2.1 years on average. 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, as shown in the Table above. In terms of the entire 200 samples, 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. That was broken down 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.

3.12 Agricultural Development Projects

3.12.1 Public Investment in Regions II and IV

The Table shown below indicates the public investment carried out by diverse public institutions for the years 1996 and 1997. 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%. For the year 1997, the INIFOM rural development project showed a big share in Region II while INAA water supply project did the same in Region IV.

Region II

Agency	1996		1997	
	C\$1000	%	C\$1000	%
MCT	139,953	0.40	34,321	0.26
PNDR	123,684	0.36	23,037	0.18
INAA	32,976	0.10	18,846	0.15
MAG	12,502	0.04	5,840	0.05
MARENA	10,211	0.03	7,491	0.06
MAS	8,448	0.02	5,328	0.04
INTA	6,223	0.02	2,396	0.02
INRA	2,054	0.01	1,186	0.01
INIFOM	0	0.00	26,304	0.20
Others	10,735	0.03	4,986	0.04
TOTAL	346,786	1.00	129,735	1.00

Fuente: MED

Region IV

Agency	1996		1997	
	C\$1000	%	C\$1000	%
MCT	99,421	0.37	23,746	0.10
PNDR	79,814	0.30	33,976	0.15
INAA	48,097	0.18	75,000	0.33
MARENA	9,562	0.04	11,363	0.05
MAG	8,528	0.03	7,722	0.03
INRA	5,135	0.02	619	0.00
INTA	3,163	0.01	455	0.00
INIFOM	0	0.00	68	0.00
Others	15,871	0.06	75,958	0.33
TOTAL	269,591	1.00	228,907	1.00

Fuente: MED

3.12.2 On-going Agriculture Development Projects

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

3.12.3 List of Agricultural Development Projects to be Implemented

The following list shows the projects which are not new but are being implemented or will be in the future in Regions II and IV.

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Irrigation Agricultural Development in Western Region	MAG	China (Taiwan)	Foreign: \$20.2 Domestic: Total: \$		León and Chinyega		Reduce climatic crisis and increase production productivity of the sector	<ul style="list-style-type: none"> - Rehabilitate and exchange irrigation equipment and system - Transfer technology and of use and management of the irrigation system - Develop a program of capability - Monitoring and evaluation of the principal groundwater
Reinforcement Program of Agricultural Services (FOSEMAG)	MAG	BID	Foreign: \$16.0 Domestic: \$4.0 Total: \$20.8	1994-1998	Nationwide, one laboratory in León		<ul style="list-style-type: none"> - Reinforcement of the services of agricultural sanitation and seeds certification - Reinforcement of the services of information and support for farmers. 	<ul style="list-style-type: none"> - Construction and provision of 6 laboratories of animal health, 8 units for plant salinity and services, 10 agricultural quarantine stations for control, 1 laboratory and of seeds analysis - Industrial sanitation control, sanitary vigilance, and improvement of seeds - Technical assistance and capacity building - Institutional strengthening of the Information General Department and support the farmers
Program of Extermination of del Gusano Barrenador	MAG	USAID	Foreign: \$67.0 Domestic: Total: \$	1997-	Nationwide		Eradication of gusano barrenador in livestock	<ul style="list-style-type: none"> - Extermination of sterile mosquitoes - On-site technical action, identification of epidemics, quarantine, quality control, dissemination and extension

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Project for Prevention, Control and Eradication of typical draught ion deficiency fever in Nicaragua	MAG- Directorate of Animal Health	OIRSA	Foreign: \$15.0 Domestic: Total: \$	1994-2002	Nationwide, inter region, Region IV: Masay, Granada, Carazo; Region II: León and Chinvega	<ul style="list-style-type: none"> - 100,000 small producers - Agroindustry and advanced swine farmers in the country 	Eradication of draught fever in Nicaragua	<ul style="list-style-type: none"> - Control and supervision of vaccination - Control of movement of swines - Vigilance of epidemics - Education of public health - Diagnosis of laboratory investigations - Improving Technical Capacity - Periodical Evaluation
Special Program for Food Security	MAG, INTA	FAO	Foreign: \$3.0 Domestic: \$0.6 Total: \$3.6	1997-	Masay, La Conquistia and San Francisco Libre	1,110 Mzs. Direct: 215 Fam, Indirect: 6,000 Fam.	Supporting the small scale farmers	<ul style="list-style-type: none"> - Intensification of sustainable farming - Diversification of sustainable farming - Small scale irrigation - Farmers' Organization and Management - Analysis of limitations in achieving food security
Project for farm technology improvement and classification of agricultural properties	MAG, INRA, INTA and MARENA	AIF (Association for International Agriculture) and COSUDE (Coop. De Desart. Suizo)	Foreign: \$48.50 Domestic: \$9.0 Farmers: \$0.3 Total: \$57.80	1993-1998	Nationwide	34,500 small and medium farmers and 50,000 property titles	Farm Technology Transfer in and development of demand based service	<ul style="list-style-type: none"> - Technology transfer to small and medium farmers - Integrated Pest Management - Conservation of ground water - Technical capability building

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Conservation and Management of Natural Resources, community participation in vertiente chain of western Maribios mountain	MARENA	FAO-Holand	Foreign: \$6.7 Domestic: \$3.8 Total: \$10.5	1989-1998	León and Chinyega	First Phase: 1,500 rural families and 30 village schools. Second: 3,000 farming families and 40 schools.	Conservation and enhancement of production capacity of land and Forests in Maribios mountain chain.	<ul style="list-style-type: none"> - Strengthening the capacity of farmers organization in agricultural planning, implementation of activities for conservation and protection of ground water resources, and natural forests. - Prevention and control of forest fires - Satisfying the necessities of wood materials and firewood, enhancement of the supply of fire wood and other wood products for urban population and industrial use. - Designing, organizing and operating the incentive programs for promoting afforestation
Management of Natural Latifoliate Forests NYAROLA	MARENA	AGROACC, ALEMENA, German Agency for Technical and Social Cooperation	Foreign: \$0.53 Domestic: \$0.23 Total: \$0.76	1992-1998	Granada, Nyaime Municipality	1,500 ha of Forest area	Achieving efficient use of existing natural forests and plantations with adequate technologies	<ul style="list-style-type: none"> - Planning the management measures of forest community, which guaranties conservation of resources and steady production of forest. - Capacity building of direct beneficiaries and improvement of techniques in natural forest management - Development of organizational capacity - Guaranteed supply of fire wood for community use and self consumption of cooperatives and satisfying the present engineering demands. - Establishing work resources

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Projects for Rural Municipalities PROTIERRA	INIFOM and local Governments	FIDA/World Bank	Foreign: \$30.0 Municipal: \$2.7 Beneficiaries: \$4.4 Government: \$3.3 Total: \$40.4	1996-2001	Region II: León and Chinyega, San Juan river, Chontales and RAAS	50,000 small and middle farmers	Municipal Development and political reforms of natural resources and institutional strengthening	<ul style="list-style-type: none"> - Assistance to Municipal Governments - Municipal and communal sub-projects - Institutional development - Strengthening of MARENA - Inter-institutional assistance program
Development of the National Production of Basic Grains Seeds	INTA	Japan	Foreign: \$0.67 Domestic: \$0.17 Total: \$0.84	1993-1997	Nation-wide	Farmers	To improve the productivity of basic grains through the introduction of improved seeds	<ul style="list-style-type: none"> - To increase the availability of improved seeds - To increase its utilization - To contribute to the increase of basic grains in the Country
Technology transfer in management of poultry and swine	INTA	NORAD	Foreign: \$0.70 Domestic: \$0.02 Total: \$ 0.72	1997-1999	Region II and IV	Small producers	Technological transfer of poultry and swine management	<ul style="list-style-type: none"> - To provide swine and poultry farms - Technical qualification of the farmers
Program of Development Poles	PNDR	Japan-European Union	Foreign: \$26.7 Domestic: \$8.6 Total: \$35.4	1993-1998	Chinyega, León, Rivas, Carazo, and the whole country	Producers Organizing Poles	To raise the life style of the rural population through the increase of small and middle scale farmers production	<ul style="list-style-type: none"> - Rural extension - Organization - Environment and forestry development - Agricultural production - Credit - Infrastructure - Machinery and equipment, implements and agricultural inputs (KR-II) - Institutional strengthening

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Rural Development in the Region of León and Chin and ega (PROCHILEO N)	PNDR	GTZ	Foreign: \$9.8 Domestic: \$0.1 Total: \$9.9	1996-2008	León and Chinvega	18,427 persons	Economic, social and ecological improvement and implementation of pilot projects	<ul style="list-style-type: none"> - Rural extension - Organization - Environment and forestry development - Institutional strengthening
Rural Development Project of the Dry Area in the South Pacific Region (PROSESUR)	PNDR	FIDA, BID	FIDA: \$12.2 BID: \$4.8 GONIC: \$1.9 Total: \$18.9	1996-2001	Region IV: Rivas, Carazo Region III: Managua	72,000 families out of which 32,000 are rural families (44%)	To reverse the socioeconomic and environmental deterioration process among the rural poor population	<ul style="list-style-type: none"> - Improved multiple support services for the agricultural production - Sustainable exploitation systems of the natural resources improved with proper technology - Development of micro-enterprises - Development of self-managerial capabilities of the rural population in farmers and local organizations
Development of the Agricultural Production in the Region IV	PNDR	CEE	Foreign: \$6.7 Domestic: \$2.7 Total: \$9.4	1989-1997	Región IV: Carazo, Masay and Granada		To develop and diversify the agriculture, as well as the rehabilitation of agro-industrial units, development of the small cattle raising activity support to the traditional cultivation and introduction of new varieties.	<ul style="list-style-type: none"> - Agriculture and cattle raising production - Qualification and technical assistance - Soil conservation - Commercialization - Agricultural credit - Bee keeping activity

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Milk Production Development Project in Regions: II, IV, V, VI	PNDR	PMA	Foreign: \$14.2 Domestic: \$1.2 Total: \$15.3	1990-1998	Regions II, IV, V and VI Region II: Paz Centro and Nagarote Region: IV; Ormetepe Isly	Small and middle milk producers	To attain the increase of meat and milk production level through the funds obtained from the milk selling	<ul style="list-style-type: none"> - Credit to individual producers and cooperatives - Gathering network - Technical assistance and capacity building
Conservation for the Sustainable Development of Mangrove OLAF0 II	PNDR	NORAD, ASDI	Foreign: \$0.84 Domestic: \$0.21 Total: \$1.05	1989-1998	Region II: León and Chinandega	100 families	Promotion of adequate management measures for mangrove resources	<ul style="list-style-type: none"> - To restrain the deterioration process and the recover of mangrove ecosystem. - To implement integral forms of mangrove utilization - To diversify the production operations and to improve the management of mangrove resources. - To contribute for the communal organization strengthening - To contribute for the institutional strengthening
Establishment of Real Mangrove	PNDR	DANIDA	Foreign: \$1.0 Domestic: \$0.3 Total: \$1.3	1993-1998	Region II: Chinandega	Population in the area	Reforestation and sustainable use of natural resources especially in the mangroves which are being utilized for fire wood and log in communities	<ul style="list-style-type: none"> - Sustainable use of natural resources of Estero Real - Determination of mangrove potential and implementation of alternatives for its rational use. - Environmental education, capacity building and diffusion - Productive programs: Raising of iguanas, familiar vegetable garden, bee keeping and agro-forestry - Raising of shrimps

List of On-going Projects of Agricultural Sector

Name of Project	Organization in charge	International financing Organization	Budget US\$ Millions	Implementation Period	Location	Beneficiaries	Objectives	Contents
Agro-forestry project in Chibola-Pikin Guerrero	PNDR	NORAD	Foreign: \$1.3 Domestic: \$0.4 Total: \$2.7	1990-1998	Region II: Complejo volcano Chongo, San Cristobal and Casitas	18,500 ha., 2,200 families	Protection of the highest parts of the volcanoes slope and reduction of the negative effects of mismanagement of natural resources in those slopes.	<ul style="list-style-type: none"> - Soil and Water Conservation - Protection and prevention of forest fires - Forests, nurseries and fruit trees - Establishment of new plantations - Agricultural support - Qualification

3.13 Environmental Conservation

3.13.1 Environmental Organizations and Present Activities

In Nicaragua, the main organizations related to environmental protection are MARENA and various Non-Governmental Organizations (NGO).

(1) Government Organizations

MARENA is the main government organization in charge of environmental protection. It has four main divisions:

- a. Environmental Division
- b. Land Allocation Division
- c. Forestry Division
- d. Natural Areas Protection Division

The environmental and forestry divisions are the ones related to the present study. The environmental division is in charge of evaluating the environmental impact of big-scale development projects; the forestry division is in charge of providing the information concerning reforestation activities.

(2) Non-Governmental Organizations

The regulations concerning the formation and activities of the NGOs were officially enacted through a presidential decree in 1996. At present there are small and big size NGOs working in Nicaragua; the number of existing NGOs is not known. The members of big-scale NGOs usually have financial resources and technical cooperation from foreign sources; the main activities carried out by these NGOs are to help the small and medium scale farmers on farming practices, tree plantation for reforestation purposes, livestock raising, and technical extension.

3.13.2 Central American Countries Agreement on Environmental Protection

In 1989, the seven Central American governments concluded a treaty to promote coherent and coordinated programs for flora and fauna, endangered species, and environmental protection. The programs agreed by these countries are:

(1) Central American Commission for Environment and Development (CCAD, 1989)

Agreed by the respective Ministers for the Environment for conservation and protection of biodiversity and protection of priority wild areas in Central America

(2) Central American Fund for Environment and Development (1996).

This fund is built with the contribution of the related countries for the financing of environmental protection activities.

It must be mentioned that the funds coming from these programs are not enough to cover the activities for environmental protection in Nicaragua; therefore, supplementary funds must be provided by other countries.

3.13.3 Natural Reserves Within the Study Area

In Nicaragua there are 72 natural reserves; within the Study Area there are 20 of them. They include areas for the protection of sea turtles, mangroves, etc. in order to protect the flora and fauna.

(1) Present Conditions of Natural Reserves, protected fauna and flora and cultural patrimony.

Natural Reserves in Regions II and IV

Region II: 9 Reserve Areas		Region IV: 11 Reserve Areas	
Natural Reserve	8	National Park	2
Genetic Protected Area	1	Wild Life Protection Area	2
		Natural Reserve	7
Total Area (ha)	125, 180*		40, 809

* Including 50,000 ha in the Estero Real Swampy area.

Source : MARENA

Reserves areas can be found in the Mountain Range of the Pacific Coast Zone and the Volcanic Area. The works to be carried out within the plan of the present study do not affect these reserves.

(2) Cultural Inheritance and Ruins

Considering that there are only some of these structures in the centers of the cities of León, Granada, etc., and no such structures in the rural portion of the Study Area, it is considered that environmental impacts which could possibly be caused by construction activities should not be too strong. Nevertheless, the project proposal shall be presented to the Ministry of Culture; its EIE procedures shall be examined by this Ministry through the MARENA.

3.13.4 Protected Fauna or Flora

MARENA has classified the flora and fauna rare species into three categories; (a) endangered species, (b) threatened species, and (c) protected species. There are 293 fauna species and 75 flora species under protection.

In Nicaragua, the ecosystems are divided as follows; (1) Pacific Ecosystem, (2) Central Ecosystem, (3) Atlantic Ecosystem. The constructions to be carried out within the project are not expected to cause significant environmental impact once the majority of the endangered and threatened species habitats are located in the rain forest zone, along the Atlantic Ecosystem, on the other side of the Study Area.

3.13.5 Water Quality

(1) Water Quality Survey

The water quality survey was carried out through the analysis of the quality of the irrigation water in the Study Area. A total of 40 samples (20 sites, two times). The samples were taken from the following sites:

- 1) 16 sites (8 points, 2 times) at rivers
- 2) 16 sites (8 points, 2 times) at wells
- 3) 8 sites (5 points, 2 times) at lakes

The parameters of the water quality analysis are as follows:

B	SO ₄	CO ₃
CL	HCO ₃	Fe
CaCO ₃	S ₂ O ₃ -S ₁	Total Nitrogen
SS	Total Phosphorus	SD
Na	Chlorine Pesticide(10 sorts)	Ca
K	Phosphorus Pesticide(8 sorts)	Mg

(2) Results of the Water Quality Analysis

Water for Agricultural Purpose

According to the results of the water quality analysis carried out for this study, the items present in excessive amounts as for the environmental standards of Nicaragua are shown in the following Table.

Number of the Point	Sampling Site	Analyzed Value	Environmental Standards	Remarks
P-10	Puerto Momotombo	pH: 9.21	6.5 – 8.5	
		Boron: 1.71	1.0	1 st sampling
		Boron: 1.29	1.0	2 nd sampling

The values of boron and pH exceed the environmental standards at Puerto Momotombo in Lake of Managua. The value of electric conductivity related to salty concentration is lower than the environmental standard, however this value is high comparing with other sampling sites. The value of electric conductivity in Managua Lake will be studied in the future considering the inflow of wastewater from domestic use. These results have been already pointed out in “*Results of the Water Quality Analysis of Managua Lake*”.

Number of the Point	Sampling Site	Analyzed Value	Environmental Standards	Remarks
P-1	Rio Grande	pH: 8.75	6.5 – 8.5	1 st sampling
		pH: 8.83	6.5 – 8.5	2 nd sampling
P-4	Tisma	pH: 8.67	6.5 – 8.5	2 nd sampling

The pH value remarkably exceeds the environmental standard at Rio Grande in Region IV. The pH values in river, groundwater and lake in Republic of Nicaragua exceed the pH values of Japan. This reason is supposed to be due to the difference between the brown forest soil in Japan and the volcanic ash soil in Nicaragua. Besides the pH, no other item for water quality analysis exceeded the environmental standards.

Results for Fertilizer

Targeted item: 37 items including 18 items of organic-chlorine and organic-phosphoric pesticides.

- Organic-chlorine

- PP'DDT
- ALDRIN
- HCH
- LINDANO
- PP'TDE
- OXICLORDANO
- PP'DDE
- DIELDRIN
- HCB
- HEPTACLOROEP

- Organic-phosphoric pesticides

- DICLORVOS
- CLORPIRIFOS
- ETHION
- DIAZINON
- MALATHION
- RONNEL
- CARBOFENOTION
- RTHIL PARATHION

The values of the Panama's environmental standards which are utilized in Central America, were utilized in this study water quality analysis. At present, MARENA which is the organization in charge for such control is still preparing the national own standards. The items exceeding the environmental standards are shown in the following Table.

- Analysis Results

Sampling Point	Sampling Area	Agro-chemical	Analysis Results	Environmental Standard
P-3(Region II)	Estero Real	HCH	0.0245	0.0108
P-3(Region II)	Estero Real	LINDANO	0.0520	0.0126
P-10(Region IV)	San Jorge	LINDANO	0.0380	0.0126
P-8(Region II)	Posoltega well	HCH	0.0180	0.0108
P-8(Region II)	Posoltega well	LINDANO	0.0150	0.0126
P-8(Region II)	Posoltega well	OXICLOROEP	0.0300	0.0274

- Organic-chlorine pesticides (1st sampling)

Although the values of both HCH and LINDANO exceed the environmental standards in Estero Real in the 1st sampling, these values were lower than the environmental standards in the 2nd sampling. The reason is because the water inflow and outflow in the sampling area is influenced by tides' pattern, making the Estero Real a brackish area. Then, ingredients of fertilizer were detected in the 1st sampling due to the effect of the tides.

The values of LINDANO exceed the environmental standards in San Jorge in the 1st Sampling, but LINDANO's presence is not detected in the 2nd Sampling. The reason is that as the sampling was taken after a rainy day, the agrochemicals were carried into the sampling point from the surrounding banana and sugarcane plantations by the flowing rainwater.

The value of HCH, LINDANO, and OXICLOROEP exceed the environmental standards in the Posoltega Well in the 1st Sampling; however, their presence were not detected in the 2nd Sampling. The reason could be that when the 1st sampling was done after a rainy day, the rainwater carrying agrochemicals flowed from the surrounding agricultural fields into the shallow parts of the sampling well during a rainy day. However, the non-

presence of the agrochemicals in the 2nd Sampling implies that these do not permanently taint the well's water.

- Organic-phosphoric pesticides (1st sampling)

There are no ingredients of fertilizer in the 1st sampling.

- Organic-chlorine (2nd sampling)

LINDANO was detected in small quantities in the samplings at the Tolla-well and El Sauce. However, the quantity of LINDANO was within the environmental standards of Panama. Besides, no other ingredients of fertilizer were detected in the samplings at Tolla-well and El Sauce. Ingredients of fertilizer were not detected in 2nd sampling in Estero Real.

- Organic-phosphoric pesticides (2nd sampling)

No trace of fertilizers was detected in 2nd sampling site.

(3) Water Quality Conditions in the Study Area

Based on the results of the water quality analysis, the following conclusions can be reached:

- Water quality in the Managua Lake according to existing data;

The closed basin system of the Managua Lake, together with the discharge of domestic, industrial (factories) wastes from the capital and deposits of eruptive material from the weathering of basic rocks, contribute more and more for its increasing contamination. This contamination can be verified specially through the high contents of boron and high conductivity, deriving from eruptive natural rocks, and ionic contents of sodium, which although do not exceed the limit for tributaries, do not allow the lake water to become a proper source for irrigation.

- Water quality in the Nicaragua Lake according to existing data;

The Nicaragua lake connects with the Atlantic Ocean through the San Juan river, and its size is larger than the Managua lake. The water quality in the Nicaragua lake is also better than that in the Managua lake as for its chemical composition. The utilization of its water for irrigation purpose is proposed for arable lands surrounding the lake.

(4) Rehabilitation of Forests in the Study Area

The following subjects about forestation were identified;

- 1) While around 80% the forest areas, including the protected areas in the Pacific area, are property of the private sector, the Government will not be able to control the deforestation process.
- 2) There is a lack of technical support in the forest management.
- 3) There is a lack of tree seedlings, despite the fact that there are many nurseries.

There is no will to plant trees.

The reforestation and management projects should be planned to promote the following activities; provision of seedlings, cultivation of trees, control of deforestation and selling of wood resources. This sequence of forest management shall rehabilitate the forest resources and the rural households.

Ownership of Forest Lands (Percentage)

State	19%
Private Sector, NGOs	81%

Volume of Deforestation (M³)

Year	Volume
1992	4,660
1993	7,210
1994	26,960
1995	55,390

Source: MARENA

Production Volume of Firewood and Charcoal

Department	Firewood Production (ton) []: firewood prod./population	Charcoal Production (bags)	Income from Firewood and Charcoal
Managua	13,980 [12.78kg]	29,430	Firewood income C\$ 962,180
León	4,240 [12.58kg]	11,150	
Chinandega	3,700 [10.56kg]	40	Charcoal income C\$ 122,860
Carazo	3,670 [24.56kg]	120	
Granada	2,500 [16.06kg]	220	Firewood/Charcoal (89 % / 11%)
Matagalpa	2,600 [6.77kg]	-	
Chontales	1,160 [8.02kg]	140	

Source: MARENA, 1995

Through FUNDOSILVA which was established in 1993 with the support of foreign assistance due to the lack of funds, MARENA has been making efforts to carry out reforestation activities. Such reforestation activities are, among others, subsidizing small and medium scale farmers to buy nursery trees and providing technical assistance for the selection of the adequate type of trees.

Total reforested area in the last five years and the reforested area per capita by FUNDOSILVA are available. The residents who live in highly-densed populated areas of the Pacific in Nicaragua have been collecting firewood from the forest to be used as fuel source since long time ago and still now they are doing so. On the other hand, extended tree felling has taken place in order to develop pasture areas. It is important to oblige the farmers to replant trees after tree felling operations. It is important to raise the interest of the farmers on environmental conservation through reforestation activities.

Characteristics of the recommended species

Fast growth species for firewood	Timber-yielding species
Eucalyptus spp.	Pochote spp.
Leucaena spp.	Casia spp.spp.
Casuarina spp.	Mahogany
Acacia spp.	Teca

Number of Nurseries in the Study Area and in Managua

Department	Number of Nurseries
León	31
Granada	13
Masaya	13
Chinandega	10
Managua	13

Source: MARENA

CHAPTER 4
POTENTIALS AND CONSTRAINTS OF
AGRICULTURAL DEVELOPMENT

CHAPTER 4

POTENTIALS AND CONSTRAINTS OF AGRICULTURE DEVELOPMENT

4.1 Introduction

The Regions II and IV are the main agricultural production areas, especially of exports products. It is a very important factor in the development of both regions. However, there are also several constraints for the development of sustainable agriculture. The main restrains are resumed as follows.

4.2 Development Potential

4.2.1 Land use

The MAG divided the land use potential, in the whole Nicaragua, taking into consideration the conditions of topography, declivity, soil texture and climate. The potentials and present land use is presented in the following Table

Land use	Region II (Mzs)			Region IV (Mzs)			Total (Mzs)		
	Potential	Actual	Difference	Potential	Actual	Difference	Potential	Actual	Difference
Agricultural land	486,329	339,063	147,266	185,136	203,631	-18,495	671,464	542,694	128,770
Pasture	305,886	367,348	-61,462	88,557	216,333	-127,776	394,443	583,681	-189,238
Woodland Agro-Pasture	73,750			101,807			175,557		
AF (with coffee, etc.)	23,943		11,971	17,736		8,868	41,679		20,839
SP (more than 50% Pasture)	49,807		24,904	84,071		42,036	133,879		66,939
Forest Area	378,214			249,786			628,000		
Conservation Area	189,107			6,900			196,007		
Total	1,433,286			632,186			2,065,471		

Source: MAG "Potencialidades y Limitaciones de su Territorio"

Some trends could be observed in the above Table. ① More than the potential area for livestock farming was developed in both regions. It became a cause of soil erosion in the mountainous area. ② Same things could be observed in agricultural land in Region IV. Ten percent of the area is not fertile. ③ There is a possibility to expand the agricultural land of 147,000 Mzs in Region II.

The land use shall take into consideration of the soil aptitude aiming at the development of sustainable agriculture. In case forest areas are utilized for agriculture, afforestation and erosion prevention measures shall be adopted.

Actual Land use	Land use Potential	Prevention countermeasure	Land use in future
Agricultural Land Pasture	Woodland Agro-Pasture Forest	Afforestation Erosion protection	Woodland Agro-Pasture Forest

When the pastures are converted to Woodland Agro-pastures for securing agricultural areas, the land use potential will be changed as follows.

Land use Potential			unit : Mzs.
	Region II	Region IV	Total
Agricultural Area	498,300	194,004	692,304
Pasture	361,520	194,481	556,001
Total	859,820	388,485	1,248,305

4.2.2 Water Resources

The annual rainfall varies between 1100mm and 2200mm in the Region II and 850mm and 2100mm in the Region IV. According to FAO definition, both regions are characterized as sub-tropical climate, which means that the crop growing period is more than 180 days a year, reckoning only on the rainfall. However, both regions present a clear difference between the dry and rainy seasons; sometimes there are long dry periods within the rainy season, thus being necessary for the introduction of irrigation system to increase the agricultural productivity.

High potential areas in Regions II and IV had already become agricultural land, for instance, the flatland close to the Managua and Nicaragua Lakes or the flatland between León and Chinandega. However, in the mountainous area where the poor people are living is not utilized as agricultural land.

(1) River Water

Telica, Villanueva, and Sinecapa rivers are located in Region II and can be considered as new water resources. The water discharge volume of the Villanueva and Sinecapa rivers varies between the dry and rainy seasons, and therefore the storage dams are necessary during the dry season. The intake volume in all rivers is only 1m³/s and thus the irrigation potential areas are very limited.

(2) Lake Water

There is a 237m³/sec discharge from Lake Nicaragua to San Juan river, in a drought year. Therefore the lake offers a high irrigation potential to the surroundings.

(3) Groundwater

There is a high groundwater potential in both regions, which is being utilized for irrigation, domestic and industrial purposes. In the Pacific Coastal Zone, Region IV, the groundwater potential is very low due to the geological structure.

The groundwater potential is higher than 0.011m³/s/km² in the Region IV, except for the Pacific Coastal Zone. Around 10~ 100 lit/s of groundwater is pumped in this area. In special high potential areas, more than 40lit/s are pumped in places such as the flatland at the north of Chinandega, Sinecapa which are located at the north of Managua Lake, Viejo river basin, north of Granada, and the flatland around the Nicaragua Lake.

4.2.3 Human Resources

In the definition of the Potential Human Resources, quality and quantity criteria are taken into consideration. As for the quality, the tendency of dependence among farmers is the main restraining factor for the development plan. However, this restriction can be eliminated through several education programs to the farmers.

As for the quantity, there is sufficient potential of human resources since the population growth is higher than the expansion of agricultural land.

	Region II		Region IV		Total	
	Annual Crop	Perennial Crop	Annual Crop	Perennial Crop	Annual Crop	Perennial Crop
Areas in 1996(Mzs)	269,264	69,799	126,479	77,152	395,743	146,951
" (Mzs./house)	5.1	1.3	1.8	1.1	3.3	1.2
Areas in 2015(Mzs)	395,721	102,579	120,499	73,505	516,220	176,084
" (Mzs./house)	4.5	1.2	1.0	0.6	2.5	0.9

4.2.4 Others

(1) Location of the capital and exportation destination

A population growth in the capital area is expected, as well as in Regions II and IV which are located close to this big consumption center. Furthermore, the biggest international port of Corinto is also located in this area, as well as the Panamerican Highway which connects the country with Costa Rica, to the south, and with Honduras, to the north, running through both regions. Therefore, both regions present good conditions for exportation.

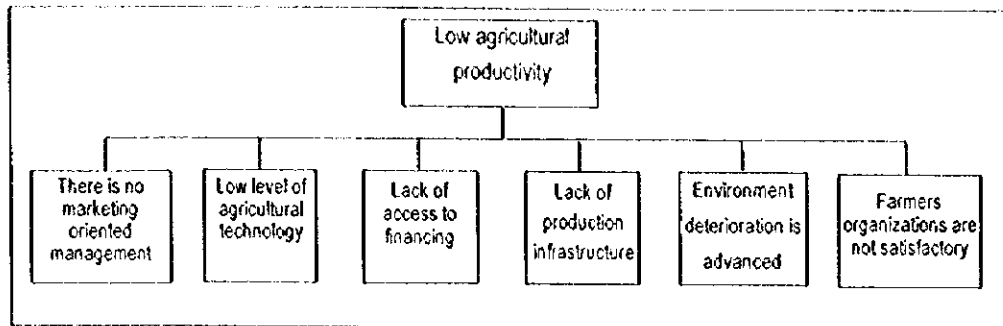
(2) Coordination of international organizations' projects

Many support projects for Nicaragua are carried out or planned. These projects are expected to create good investment conditions for the development.

4.3 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 because of the following reason. Although the necessary facilities will be maintained by the public sector in the initial period, the farmers shall have to manage them by themselves at the latter period. Besides, if the public sector alone provides the technical support for all the activities, the constraints of the development can not be solved fully.

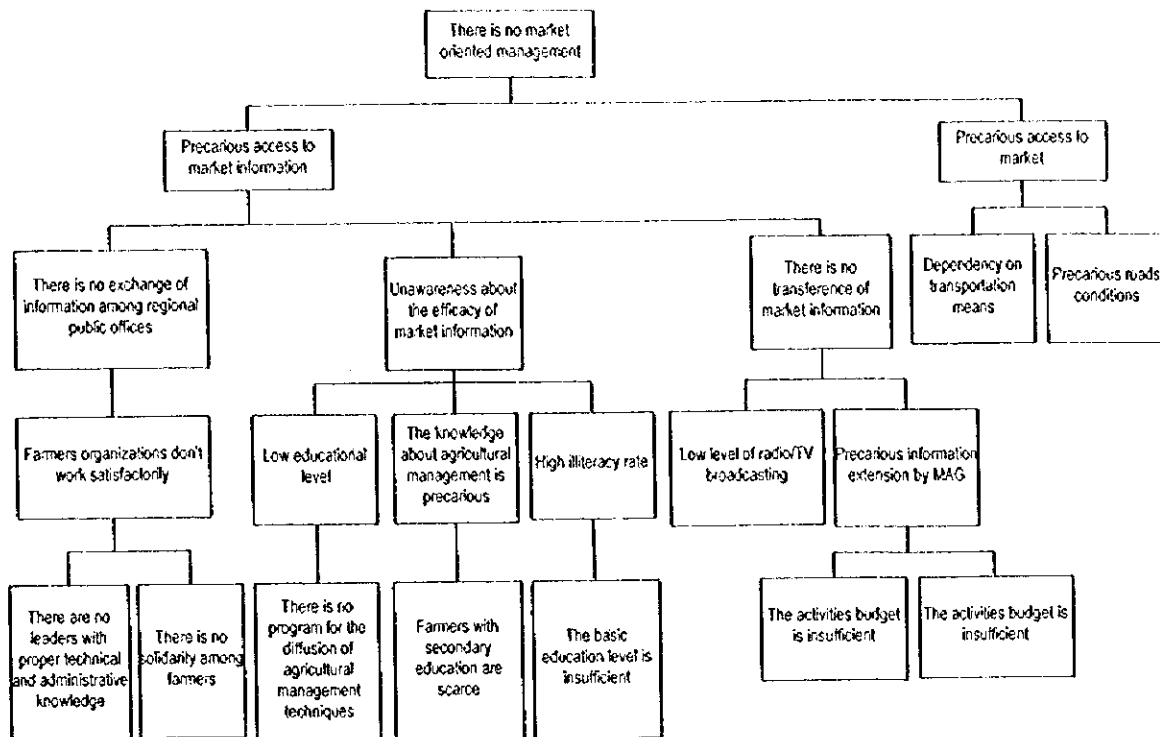
The solution of the constraints shall be the responsibility of the farmers themselves, except those which depend on basic infrastructure and large-scale development works. The agricultural policy of Nicaragua is a policy of minimum services which are necessary to assure the sustainable development of small-middle scale farmers.

However, at present, the farmers are not capable to solve these constraints and it is necessary to receive the support from the public sector.

(1) Marketing

The reasons for the small-middle scale farmers not managing their business according to market needs are presented as follows;

- They do not have a proper access to the market. The roads conditions are precarious and the farmers have to utilize buses or other types of low capacity transportation means.
- Market information is not available to these farmers due to the precarious information system. Besides, the exchange of information among farmers is poor since their organizations are not working satisfactorily. Another problem is the unawareness about the information, leading to a lack of interest.
- The farmers do not obtain reasonable results due to the lack of organization, and therefore they sell their products in unfair conditions.



(2) Farming Techniques

The constraints of farming in the Study Area are presented as follows;

Poor management techniques:

The small-middle scale farmers can not calculate the balance between income and expenses because they do not have basic education (they can not read nor make basic calculations such as addition and subtraction). They also can not understand the concept of agro-business, resulting in a precarious extension activity.

They do not comprehend the importance of new agricultural materials, such as improved seeds, for the expansion of the agricultural production. Some farmers' groups understood this necessity through the guidance from INTA. However, many of them gave up of the utilization of these new materials due to their cost.

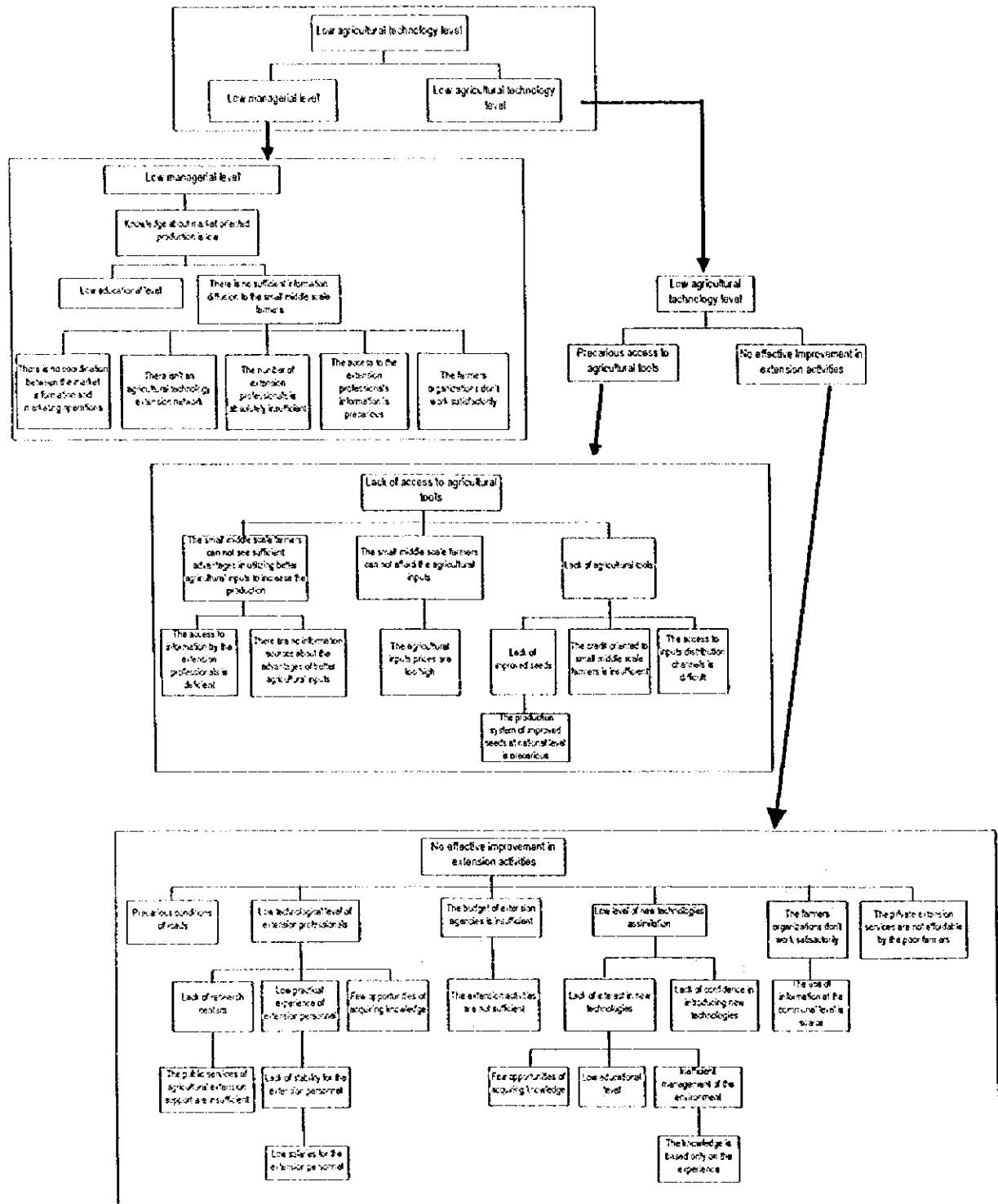
Poor farming techniques:

The main cause for the precarious development of agricultural techniques is the low extension activity. The result is the low capacity to accept new techniques due to fear of abandoning traditional techniques.

The extension services present quantitative and qualitative problems for their personnel. One of the problems is the lack of experience due to the instability in the employment and low salaries, resulting in short time working period for the professionals.

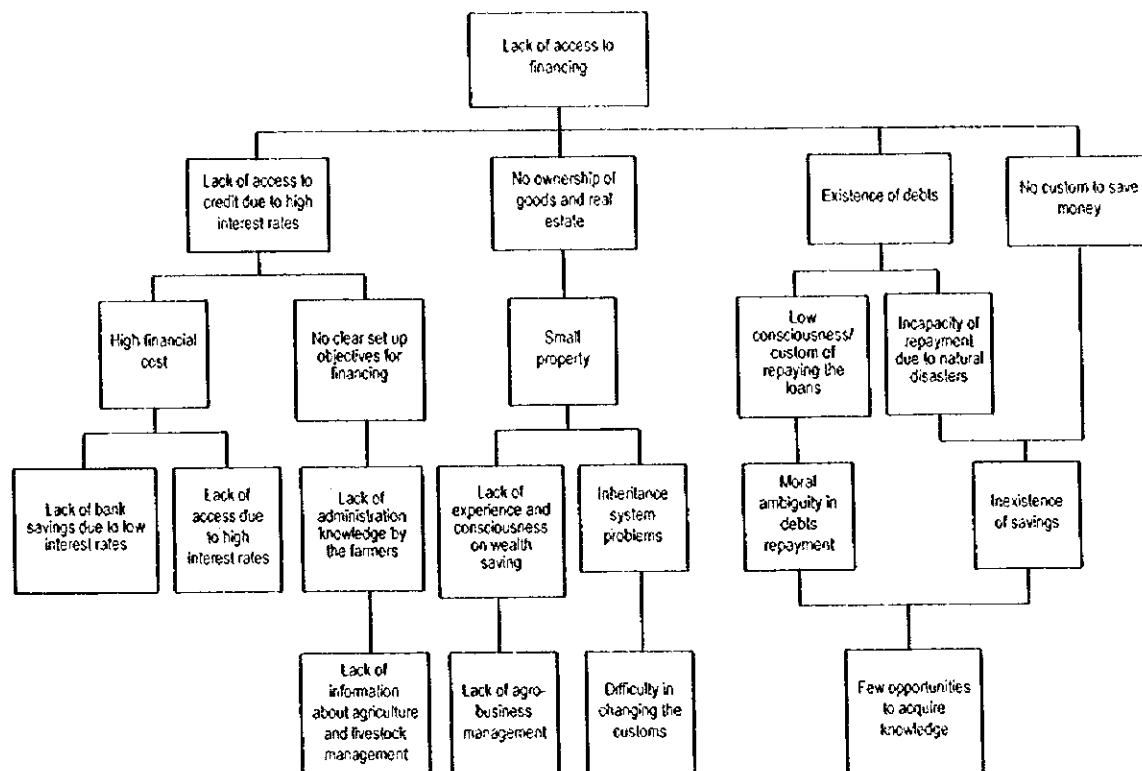
Furthermore, there are some districts without extension services due to the low

number of professionals. The lack of farmers' organizations is also a problem, since there is no one to become responsible for the extension activity.



(3) Funds

The small-middle scale farmers obtain funds from no conventional sources such as NGOs, cooperatives and communal banks. They have difficulties in access and utilize the credit systems. The reasons that make the credit systems not appropriate for these farmers are, the high interest rate which is incompatible with their agricultural activities, the existence of former debts and lack of knowledge about the best way to manage their agricultural business.



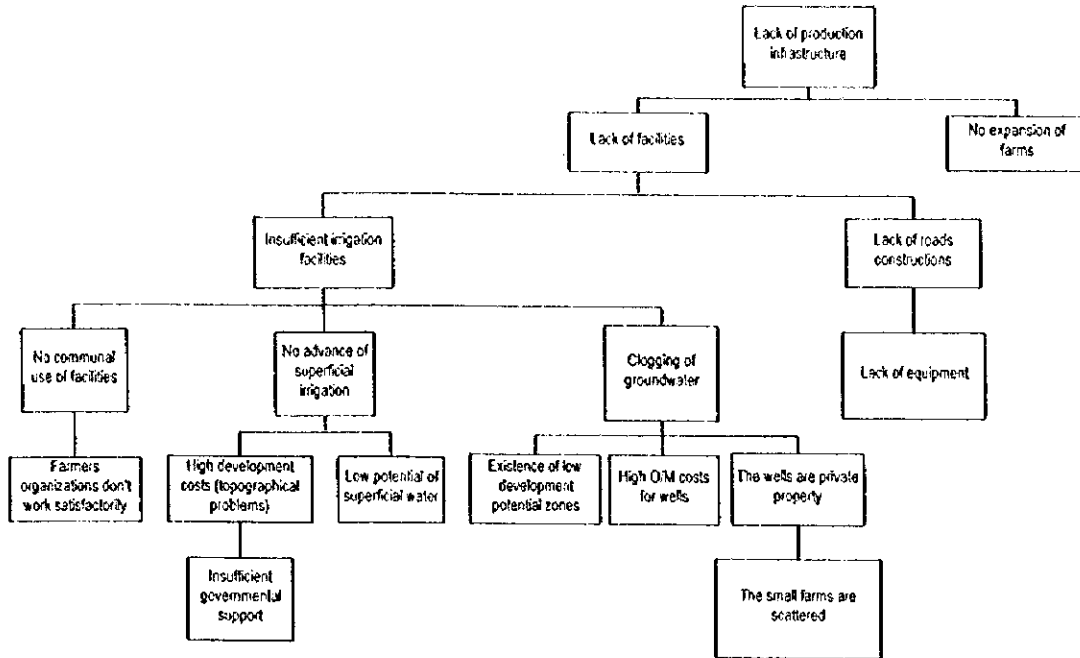
(4) Infrastructure

There are few rivers in the Study Area which can be used for irrigation purposes during the whole year. The few rivers which satisfy the conditions for irrigation are already utilized by large-scale farmers. Traditionally, there are no irrigation systems being managed by small-middle scale farmers.

The groundwater irrigation is one of the most traditional types of irrigation, carried out on an individual basis due to its nature. Therefore this system is not developed by farmers' organizations.

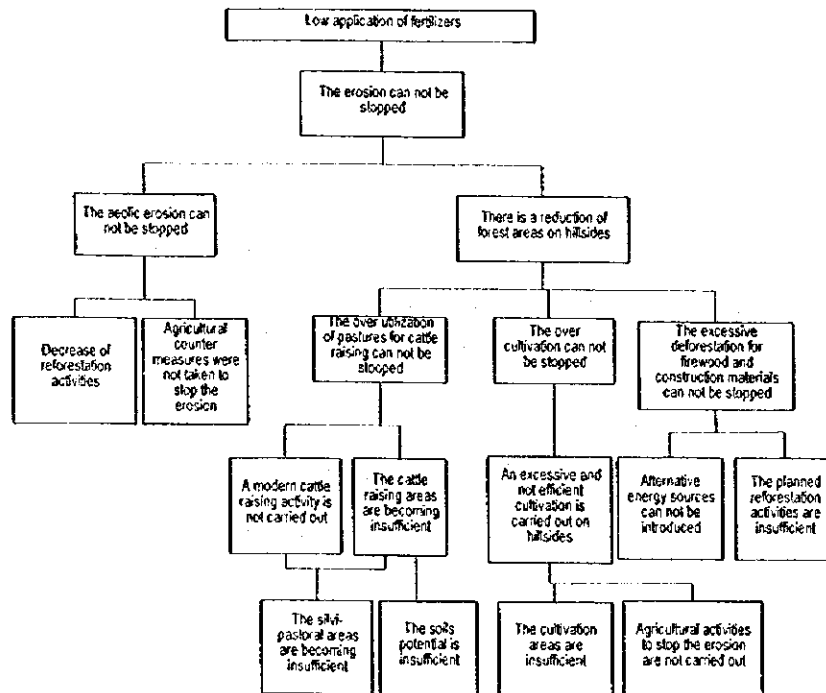
The areas of small-middle scale farmers are scattered and they do not have the capacity to construct groundwater irrigation facilities by themselves. These problems hamper a good irrigation development among farmers.

The access conditions between the farms and the main roads to the embarkation ports are very precarious. This is due to the fact that the Municipalities, which are responsible for the administration of these roads, do not have enough budget or maintenance systems.



(5) Deterioration of Environment

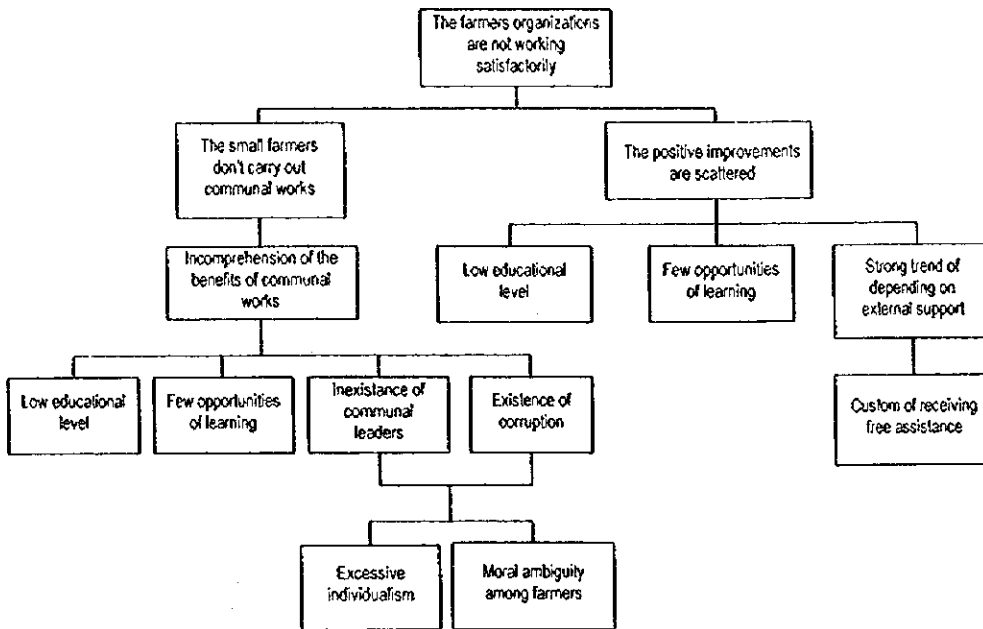
The forest areas are getting smaller in the Study Area due to the excess of pastures, utilization as firewood, and also due to excess of agricultural activities. The erosion is caused by these factors. Other reasons are the lack of forestation and agriculture techniques extension to prevent the soil erosion.

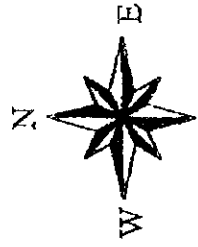
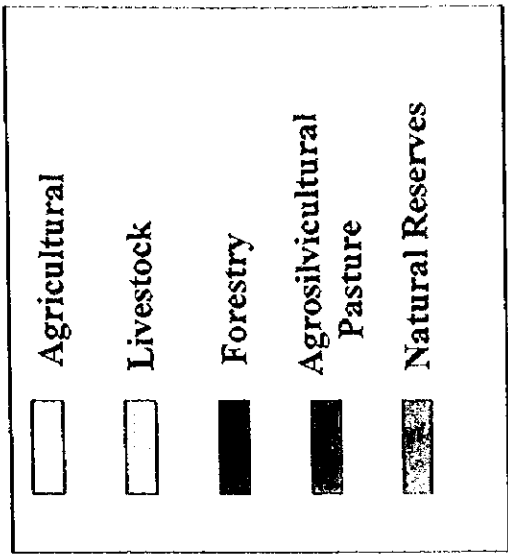
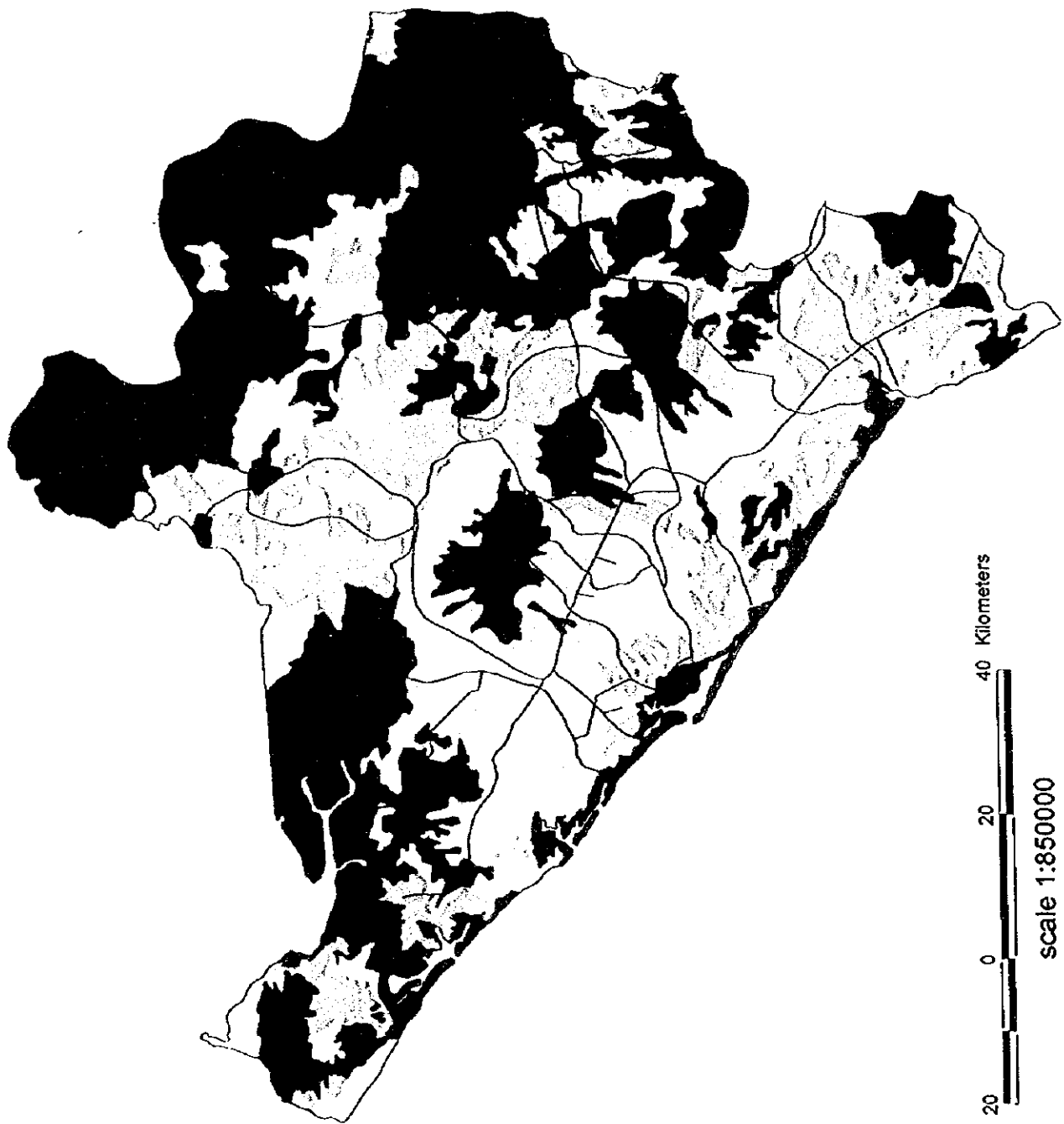


(6) Farmers' organizations

The farmers organizations are not working satisfactorily, thus becoming the cause for the constraints already mentioned. The farmers' organizations are a fundamental factor for the development of agricultural activities and public services.

The characteristics and the history of these organizations can explain the motif of their problems. Besides the high illiteracy rate among farmers, they got used to receive assistance from international organizations, not developing their own initiative.





40 Kilometers



scale 1:850000

FIGURE Potential Land Use Map for Region II

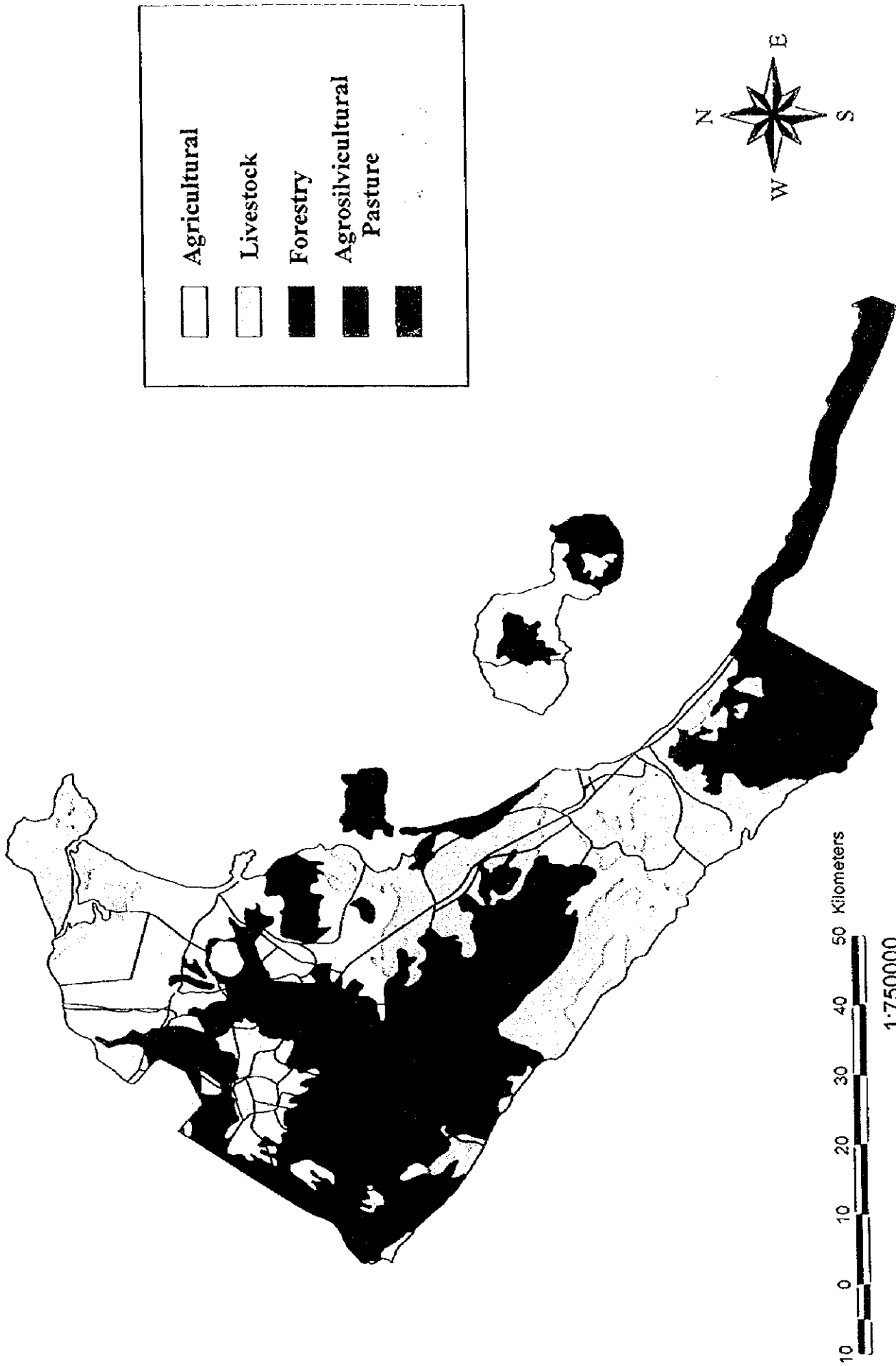
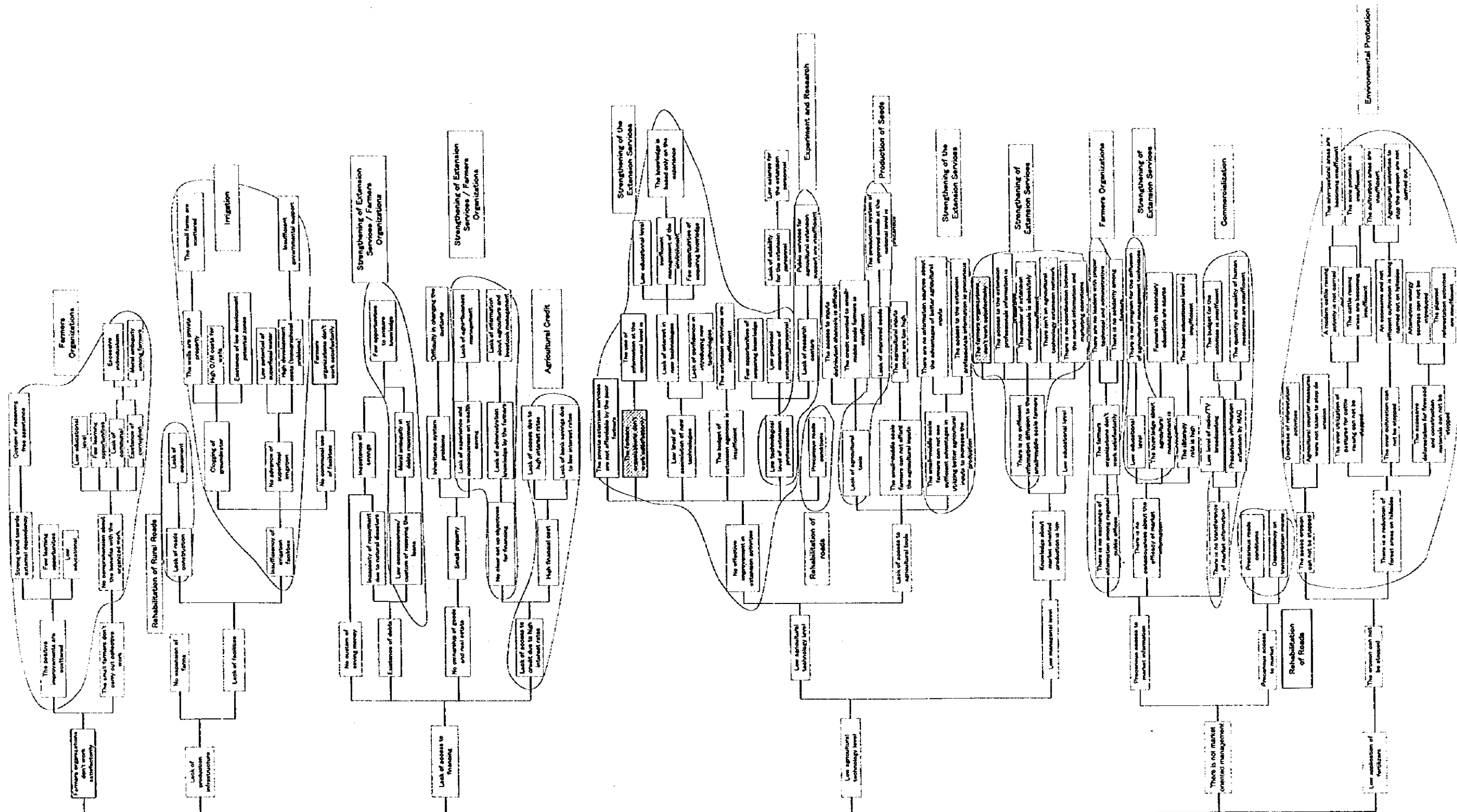


FIGURE Potential Land Use Map for Region IV



Tree Problems for the Agricultural and Livestock Development

CHAPTER 5
DEVELOPMENT SCENARIO

CHAPTER 5

DEVELOPMENT SCENARIO

5.1 General

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, the absolute figures are increasing, the reason why agriculture is one of the main sectors of the national economy, necessary for the attainment of sustainable development. Nicaragua shall give priority to the agricultural development in order to attain a politically and economically stable increase. The motives for this are; 1) the living conditions of soldiers who had come back to agriculture after the civil war shall be fulfilled, 2) most of the poor population depends on agriculture as income source, 3) the number one priority of the majority of the farmers is to achieve nutritional assurance and family welfare, and 4) the agriculture development is indispensable for the improvement of national nutritional conditions and self-sufficiency in foods.

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 people and wealthy people are living together, but the majority of low resources farmers are living a miserable life. The main cause for the poverty of the small farmers is that they can not effectively exploit all the extension of their properties. The main restrictions could be summarized as follows; 1) no access to agricultural technology for the effective utilization of the land, 2) no access to financing for the cultivation of the entire area, 3) insufficient labor force for the farming, 4) few transportation means to commercialize their products, 5) there are soils not suitable for agriculture, 6) fear of a reduction in the harvest due to instability in the climate.

Nevertheless, the Regions II and IV also have potential for the development of agriculture, and this potential can be summarized as follows; 1) there are proper climate conditions (sunlight hours and temperature), 2) there are large areas of fertile soils, 3) there is sufficient labor force, and 4) there is easy access to the metropolitan area.

The fundamental point for the formulation of this plan is to verify and solve the factors which restrict the development, making good use of the favorable resources available in this two regions. The solution for this problem will depend on the efforts of the farmers with the support of governmental institutions, the effective and conjoint operation of both sectors' structure and organization, besides a deep comprehension of the rural community situation. Pointing to the same direction, at present there are projects being carried out by international cooperation organisations. In the same manner, in order to attain this plan objective in a soon future, a master plan of agriculture and livestock development will be prepared, with an integral strategy which covers different fields of action and the large extension comprehended by these two regions that are potentially exploitable.

5.2 Objectives for the Development

5.2.1 Establishment of the Target Year

In Nicaragua, there are no regulations or guidelines, at the long term, for the preparation of the agriculture and livestock master plan. The points taken into consideration for the definition of the target year (year 2015) of this plan are listed as follows:

- (1) Analyzing the cases of projects executed at a long term, it can be visualized that between the base year and the goal year, there is a span of about 15-20 years. The completion of this Study is programmed for the year 2000, therefore it was considered appropriate to adopt the goal year of 2015.

Base Year and Goal Year of Long Term Projects

	Base Year	Goal Year
FAO ¹	1988-1990	2010
World Bank ²	1992	2010
USDA ³	1990-1992	2005
Japan ⁴	1992	2010

Source: 1: World Agriculture: Towards 2010

2: The World Food Outlook

3: Long Term World Agricultural Commodity Baseline Projections

4: Ministry of Agriculture.

- (2) The agricultural sector of the Regions II and IV does not show a remarkable progress. Important infrastructure items such as the roads network demands time for its improvement; the main highways demand a minimum of 10 years, and to finalize the secondary roads, an additional 5 years should be necessary. Furthermore, for the construction of the communication network, the diffusion or expansion of the communication network in the rural areas is necessary, all together demanding around 10 years. Likewise, in order to modernize the electricity services in the rural areas, around 10 years should be necessary. All the big projects demand a period of around 10-15 years.
- (3) In order to expand and diffuse the agricultural technology throughout the whole area, at least 10 years should be necessary.
- (4) 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.
- (5) The consolidation of farmers' organizations transformation requires a period of 10 to 15 years.

5.2.2 Objectives of the Agriculture and Livestock Development

The agriculture and livestock sector represents an important foreign exchange source, which is the reason that one of the main objectives of this Study is to attain the expansion of the sector capacity, necessary to raise the productive stratum and to allow the recovery of the self-sufficiency in the national provisions. The small and medium scale producers mainly cultivate basic grains; if the production increases, like the self-sufficiency rate increases and the of land and labor force could be utilized for the cultivation of cash crop and exports commodities.

5.3 Basic Guidelines for Development

5.3.1 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 a 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 that are offered to them. 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 a sustainable agriculture

Task 3: Promotion of a commercially oriented agriculture

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

Bearing in mind the position of the Study Area within Nicaragua, an increase of the agricultural production in the area will bring about the following:

Task 5: Increase in the production of basic grains

Task 6: Contribution to the national economy

The relation among the factors mentioned above in the elaboration of the Master Plan is shown below.

(1) Activation of the development potentialities

It is necessary to eliminate the limiting factors that restrain the effective development of the regions' potentialities. The natural and social conditions within each region are also different and such differences are important and shall be taken into consideration.

(2) Establishment of a sustainable agriculture

Even in the case that the regions' development through the projects is implemented in a short time, the farmers will carry out their activities for long time. That means that the activation of agriculture is not a temporal undertaking, but that the activities which had allowed the expansion of the agricultural production shall be continuously maintained by the farmers themselves even after the completion of the project.

(3) Promotion of a commercially oriented agriculture

At present, the farmers in the Study 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.

(4) Raising the agricultural productivity of small and medium scale farmers

The 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.

(5) Increase in the production of basic grains

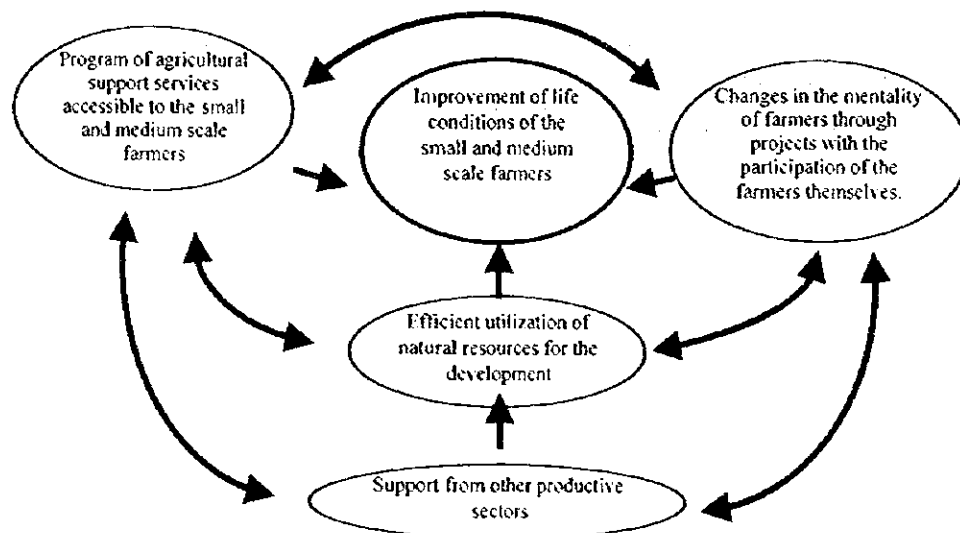
The agricultural production of the regions in the Study Area represents almost 50% of the national production and it is considered as a very high proportion. On the other hand, the self-supply rate of basic grains in Nicaragua is around 70%, considering a low rate. For this reason, it is necessary that 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.

(4) Contribution to the national economy

For Nicaragua, the agriculture is an important source of revenue. Although, at present, the small and medium scale farmers are producing for their self-consumption, 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.

5.3.2 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 organisation 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, several projects are carried out supported by international institutions. The projects that are proposed in the present Master Plan aim at complementing those projects.

5.4 Position of the Agricultural Development Projects to be Implemented

The proposed projects within the Master Plan shall be adjusted to the presently implemented agricultural development projects. However, as mentioned in section 3.12, there are no projects to be implemented in the future and it should be coordinated with the projects proposed within the Master Plan. The main projects now in implementation stage are as shown in the following page.

The Project No.1 is a rehabilitation project for the existing irrigation facilities utilizing underground water in the Region II; this project is oriented towards the large scale farmers and do not compete with the projects of the Master Plan. The Projects No.2 and No.3 are livestock development projects. The Project No.2 is the larger one and shall be implemented by MAG in 1998. The Project No.4 is an integrated agricultural development project, a small scale one, and covers the Region IV, in the area of Masaya (200 Mz).

The Project No.5 consists in the financing of the agricultural production (39% of the total of funds), preparation of basic infrastructure (58%), and activities to improve the agriculture self-management by the farmers themselves (3%). Two or three sub-projects within this project aim at this last objective. This project will contribute to the improvement of rural infrastructure. Nevertheless, for a smooth implementation, limitations regarding to available budget and services shall be overcome.

No.	Project Name	Implementing Organization	Project Term	Project Area	Project Aim
1	Western Region Irrigation Development Project	MAG Taiwan	1997 ~	Region II Leon, Chinandega	Reduction the risk caused by the weather change and increase of the agricultural production.
2	Cattle Grub Larva Extermination Project	MAG AID-USA	1997 ~	Whole Country	Extermination of Cattle Grub Larva in livestock
3	Swine Cholera Extermination Project	MAG OIRSA	1994 ~	Whole Country	Extermination of swine cholera
4	The special plan for food security	MAG, INTA FAO	1997 ~	Region II Masaya	Farming support for small scale farmers
5	Rural District Development Project PROTIFRA	INIFOM, MARENA FIDA, BM	1996 ~ 2001	Region II San Juan, Chontales, RAAS	<ul style="list-style-type: none"> • Poverty Reduction • Natural Environment Protection • Activation of Rural Area
6	Northern Part of Leon, Chinandega Area Rural Development Project PROCH-I EON	PNDR GTZ	1996 ~ 2008	Region II Northern Part of Leon, Chinandega	Improvement of living standards of the population
7	The Pacific Coast Dry Area Rural Development Project PROSESUR	PNDR FIDA, BID	1996 ~ 2001	Region IV RIVAS, CARAZO, MANAGUA	Agricultural production support system for small scale farmers
8	The Project of Sustainable Protection and Development of Mangroves OLAFI II	PNDR, NORAD ASDI	1998	Region II Leon Chinandega	Promotion of the protection and sustainable development of mangroves
9	The Estero Real Area Mangrove Sustainable Protection and Development Project	PNDR NPRAD	1996 ~ 2001	Region II Chinandega	Promotion of the continuous and sustainable use of the forest and natural resources

The Project No.6 is a long term project which will last 12 years (1996-2008), and that aims at improving the production abilities of the benefited area population with their own participation. It covers the northern part of the Region II. This project is very important to upgrade the abilities of farmers and is given much attention. Even when the project offices are in operation, the project contents are required to be more diffused. A large part of the project contents is related to the preparation of infrastructure such as roads' maintenance.

The Projects No.8 and No.9 are projects of mangrove protection and both are going to be completed in 1998. It is necessary to wait for both projects completion in order to evaluate the impacts and whether complementary protection projects will be necessary.

5.5 Study Area Zoning

In the previous chapters, the specific characteristics of each zone within the Study Area have been studied. Therefore, in the formulation of the Master Plan for the agricultural development, these specific characteristics were taken into consideration.

- (1) Agricultural conditions (distribution of small and medium scale farmers, land use plan, crops patterns, livestock farming)

- (2) Natural conditions (topography, geology, climate, subterranean water resources)
- (3) Potentials for the agricultural development
- (4) Agricultural development level
- (5) Water resources potential (surface and ground water)
- (6) Marketing Conditions
- (7) Administrative division

Taking into consideration of the above mentioned conditions, the special characteristics were classified. Based on the obtained results, 2 zones were classified in the Region II and 3 zones in the Region IV.

Region II:	Northern Zone Southern Zone
Region IV:	Nicaragua Lake Coastal Zone Mountain Range Pacific Zone High Plain Zone

The details of each zone characteristics are presented as follows.

5.5.1 Region II, Northern Zone

This zone is located in the north part of the Region II, limited at the southwest by the right margin of the Estero Real river and at the north by the regional boundary. The annual rainfall varies, approximately, between 1,400 and 2,400 mm.

In the surrounding areas of the Estero Real river, there is a large swampy zone, with altitudes varying between 200 and 1,300m. This zone is located among mountains, with an irregular topography, not appropriate for the utilization of water, and deficient in terms of transportation, etc. On the other hand, the irrigation activities are scarce. The immigrant farmers who are not used to work in agricultural activities are predominant in this zone, the reason why the agriculture is not much developed there. The oriental part, comparing to the north part, is a little more developed in terms of agriculture. The most representative rivers are the Estero Real and Negro, which rise in the mountains and run from east to west until flowing into the Fonseca Gulf. There is relatively abundant groundwater, though at deep locations, the reason why it is necessary to construct deep wells. The main crops are basic grains, sesame and others. The biggest and closest cities are; León (340,000 inhabitants) and Chinandega (350,000 inhabitants). Since these cities are located in a far north portion, their road conditions are precarious as well as the access to commercialization markets. On the other hand, in the oriental part there is a good trunk road with very good access.

5.5.2 Region II, Southern Zone

This zone is limited to the north by the Estero Real river, and to the south by the Pacific Ocean coast. The annual rainfall ranges from 1,400 to 2,000mm. Several small and medium flow rivers run into the Pacific Ocean, which run long distances until there. The most representative river flowing into the Pacific Ocean is the Telica river. The tributaries of the Viejo and Sinecapa rivers flow into the Managua Lake. The groundwater potential is relatively high, and nowadays it is being used for agricultural purposes.

In the northwest part, there is the volcanic flatland with altitudes of lower than 200m. In the past decades, large cotton plantations were cultivated in this flatland, and nowadays sugarcane is being cultivated by big farmers. The main crops are; basic grains, sesame, soybean, peanuts,

sugar cane, cotton, and banana, with a production of 199,667 ton (1996-1997), the largest in Nicaragua. The national trunk highway runs in the central part from north to west, thus having relatively good access to commercialization markets. However, the other roads, secondary and tertiary roads, are deteriorated. The international port of Corinto is located in the central zone of the Pacific Ocean coast, being a very important point for export as well as for import of several different commodities.

5.5.3 Region IV, Nicaragua Lake Coastal Zone

This zone is limited at the eastern part by the Nicaragua Lake (altitude: 30 m), and at the western part, it is separated from the Pacific mountain range and the Panamericana Highway. The annual rainfall ranges from 1,200 to 1,300. The topography is relatively flat, and the highest zone is found in the surrounding areas of the Panamericana Highway, with altitudes from 80 to 100m. This presents a narrow and long surface along the margin of the Nicaragua Lake, only crossed by small rivers.

In the coast of the Nicaragua Lake there are large-scale farms being irrigated by a large amount of water, from the Nicaragua Lake as well as from groundwater. It can be said that these zones are well developed. The main crops are; basic grains, sugar cane, vegetables, fruits and others. This zone comprehends a population of 160,000 inhabitants, including the capital of Granada, and its surroundings (around an hour distant) has good access to the city capital allowing a good contact with the commercialization markets.

The island of Ometepe, which is located inside the Nicaragua Lake, has an annual rainfall ranging from 1,400 to 1,700mm. In the island, there are volcanic mountains with altitudes of 1,610m and 1,394, respectively. The agricultural land was expanded up to the mountain foot due to the indiscriminate deforestation process. This land presents a large amounts of volcanic residues. The irrigation is facilitated by the existence of abundant water from the Nicaragua Lake, however due to limiting factors such as lack of electric capacity, fast communication means, insufficient supply of combustibles, etc., this area is not being developed properly. The main crops are; basic grains, sesame, watermelon, banana, coffee and others.

5.5.4 Region IV, Mountain Range Pacific Zone

This zone is limited at one side by the Pacific Ocean coast, with rainfall ranging from 1,200 to 1,400mm. As much as it goes farther from the coast, the topography tends to rise from 300m up to 800m in the different mountain ranges crossing the zone. The hydrographic basins are relatively small, the reason why the length of the few rivers in the zone are very short and their water volume is very limited. The groundwater is found in deep locations, thus being necessary to perforate deep wells for its utilization. In general, the water supply for irrigation as well as the local roads are precarious, and only the cattle raising activity is being developed. The main crops are; basic grains, sugar cane and fruits.

The San Juan del Sur city is located in the Pacific coast, comprehending a tourist zone. On the other hand, close to the Las Salinas city, there are natural habitat of the marine turtles who lay down their eggs in specific periods, thus this zone is strictly protected. The zone is limited at East by the Panamericana Highway and therefore it is kept far away from any center, specially because the roads and accesses to the commercialization centers are too much deteriorated.