J. SOILS AND AGRICULTURE

List of Appendix

Appendix J-1 Soils

J.1.1 Soils in the Dominican Republic

Based on the study done by SEA (Estudio de Zonificacion de Cultivos Segun la Capacidad Productiva de los Suelos En Republica Dominicana, Sep. 1999), the soils in the Dominican Republic are classified into eight classes according to the production capacity determined by nine factors (rainfall, temperature, humidity, wind, elevation, daily hours of sunshine, soil, pH, organic contents). The major characteristics and distributions of these soil classes are shown below in the table.

Tab. J.1.1 Soils in the Dominican Republic

Soil Class	Major Characteristics	Distribution
Class I	Highly arable: Productivity is very high without irrigation. Lands are basically flat. All kinds of crops can be cultivated intensively.	Occupies about 53,000 ha (1.2 % of the national land). Most of the soil is distributed in the Cibao region.
Class II	Moderately arable and capable for irrigation: Productivity is high with moderately intensive farm management. Short duration crops are highly recommendable.	Represents 5.6 % of the country surface with 245,000 ha. The dominant regions are Northeast, Southwest and Central.
Class III	Arable and capable for irrigation: Because the soil has some limitations for agriculture such as low fertility, stony, excessive drainage, thin soil depth, saline and aridity, it is productive only with intensive management.	Represents 7.6 % of the country surface with 335,000 ha. The East, Southwest and Central Regions are main areas for this soil class.
Class IV	Limitedly arable and not capable for irrigation: Soil has severe restrictive factors for cultivation so the productivity is medium to low. Soil conservation practices and fertilizers are commonly necessary.	9 % of the national land (400,000 ha) correspond to this soil class. Three major areas are East, Northwest and Central Regions.
Class V	Not arable but capable for pasture: Soil has severe restrictive factors but has medium productivity only for improved pasture and rice in some areas with intensive farming management.	Occupies about 700,000 ha (15.8 % of the national land). The East Region has the largest distribution of this soil and the Central and Northwest Regions are following.
Class VI	Not arable except for forest and pasture: The soil is shallow, rocky and easy to erosion. Topography is also steep so soil conservation practices are necessary.	Represents 8.5 % of the national surface (375,000 ha). Mainly distributed around Northern Mountain ranges and the mountains near Neyba and Bahoruco.
Class VII	Not arable, only for forest: The land is basically mountainous and rocky so the soil layer is thin.	49.5 % of the country surface corresponds to this soil class and it is typically found in the Central and Northern mountains, Bahoruco, Neyba and Seybo.
Class VIII	Not arable: Only for national parks, wild animal areas, recreational zones or protected areas for water resources.	Occupies 2.9 % of the national land with 126,000 ha. This soil is distributed all around the country.

Source: SEA (Estudio de Zonificacion de Cultivos Segun la Capacidad Productiva de los Suelos En Republica Dominicana, Sep. 1999)

J.1.2 Soils in La Luisa

According to the survey for farmland zoning done by SEA, the area around La Luisa is classified into Class II (productive and suitable for irrigation but undulating) and V (relatively low productivity and poor drainage but possible to increase productivity).

Another survey conducted by JAD in March 1999, reveals that the soils in La Luisa are generally composed of Inceptisol and sub-classified into three sub-types (III, IV and V). The features of each soil type are described below and the distribution is shown in Figure J.1.1.

Table J.1.2 Characteristics of soils in La Luisa

Soil Type	Features
III	Mainly distributed in lowlands (slope:0-3%). Generally deep soil structure (0-150 cm). The soil pH of upper two layers ranges 5.5 - 6.8. Also the upper two layers have high biological activity due to their highly porous and permeable structures. The contents of potassium, phosphorus and zinc are low but calcium, iron and manganese are relatively high. Generally soil fertility is high.
IV	Most clayey soil in La Luisa (36-72%). Distributed in undulated land (3-15%) and have deep soil structure (0-150 cm). Natural drainage is low but not serious erosion. Soil surface is porous but biological activity is not high. Soil pH and organic matter content ranges 5.5 - 5.9 and 0.6 - 3.5%, respectively. While abundant iron content, low potassium, phosphorus, calcium and magnesium contents. Generally soil fertility is moderate.
V	The worst soil physical conditions among the three types. Although there is 35-cm depth soil, it contains 42 - 66% clay and it increases as deepens. Mainly distributed in lowlands (slope:0-1%). Although very low drainage ability, there is no erosion. Organic content is not low (2.8%) but phosphorus, potassium, calcium, magnesium and zinc contents are low. Both iron and manganese are abundant. Soil fertility is low.

J.1.3 Soils in Tamayo

It is inferred that the land of the area was formed by flooded or riverbed sediments of the Yaque del Sur River. The sediments contained sandy deposit with gravels, and the present hilly topography was made by partial erosion at flat sedimental plain when the land got a geological upheaval or a fall of sea level. The area covered by natural bushes and shrubs was abandoned because the land was not suitable for farming.

The soil in the area is dominated by sandy soils with less organic contents. Some places in the area contain many types of gravel (50-100 mm diameter). Light soils are distributed in the southeast of the area.

According to the report made by INDRHI, the soil in the area corresponds to Tamayo Soil Series, which has following features.

- Soil pH : generally alkaline
- High base saturation and cation exchange capacity
- Very low organic matter content

- High drainage capacity with relatively good retention of humidity

The survey for farmland zoning done by SEA indicates that the area around Tamayo is classified into Class III (suitable for irrigation but medium productivity due to some limiting factors such as dry climate, saline soils, low fertility, many gravels, thin surface soils and so forth).

J.1.4 Soils in Esperanza III

The area was formed by sediments on a fringe of an alluvial fan made by tributaries of the Yaque del Norte River running from the Septentrional Mountains. The dominant soil in the area is loamy but relatively clayey and possible to use as paddy fields. These sedimentary soils originated from alluvial materials in the Septentrional Mountains and carried by the Yaque del Norte River.

According to the survey for farmland zoning done by SEA, the farmland of Esperanza III is classified into Class III (suitable for irrigation but medium productivity due to some limiting factors such as dry climate, saline soils, low fertility, many gravels, thin surface soils and so forth) and the northern part is classified into Class IV (low to medium productivity and not suitable for irrigation but possible to use as orchards or pasture/grazing land if desirable measures are applied to soil erosion, irrigation and drainage, nutrition and so forth).

J.1.5 Soils in Los Hatillos I

The soils originated from the weathered igneous rock are loamy. The depth of soil on the ridge of hills is shallow and not suitable for crop farming. Some areas along the streams keep relatively thick soil because of sedimentation charged by the erosion of soils at the hilly area. Intensive crop farming is possible even though the kind of farming depends upon the thickness of soil.

Based on the survey for farmland zoning done by SEA, the area around Los Hatillos is classified into V (relatively low productivity and poor drainage but possible to increase productivity).

Appendix J-2 Agriculture

J.2.1 Agricultural Production and Trade in the Dominican Republic

(1) Agricultural Production

According to the report published by SEA (Diagnostico del Sector Agropecuario 2000), recent situations of agricultural production in the country were analyzed. The total harvested area of major 27 crops had been ranged between 13 and 15 million tareas until 1998 since 1989. However, the area dropped drastically to 11.4 million tareas in 1999, 17-percent down from the previous year. This drop mainly caused by the decrease of sugarcane cultivation, from 3.1 million tareas in 1998 to 1.9 million tareas in 1999. Because the Hurricane George hit the Dominican Republic in September 1998, the sharp decline of the harvested area in 1999 might result from the damages of George. In 2000, cacao has the largest harvested area, 2.4 million tareas, among the 27 major crops. Coffee, rice and sugarcane are following it and the top four crops represent 70-percent of the total harvested area. (See Table J.2.1 and Figure J.2.1.)

Under the initiatives of INDRHI, the national government has promoted construction of irrigation facilities but irrigated farmlands are still minor. The ratio of the irrigated land to the harvested areas of 27 crops has been relatively low since 1992, 15.0 - 27.9 %, because the irrigated land area has not constantly increased since 1992. However the role of irrigated lands in food production is very important since their yield levels are very high compared to the yields of non-irrigated lands. For instance, the yield level of pigeon peas in irrigated land in 2001 is assumed to be 2.83 quintals/tarea, 67 % more than the yield of non-irrigated pigeon peas, 1.69 quintals/tarea. The yield level differences are especially significant among vegetable crops. (See Table J.2.2.)

The production of sugarcane has also been stagnating since 1993. Since 1989 the maximum production had recorded in 1993, 162 million quintals, however, the production level decreased to less than 100 million quintals in both 1999 and 2000. On the other hand, the production of banana rapidly increased to 17 million bunches in 1992 from 9 million bunches in 1991, and since then the production amount has ranged between 12 and 18 million bunches. Also the production of tomato for processing extremely increased to 5.4 million quintals in 1997, 4.6 times larger than the production in 1996, although the harvested area is relatively small due to its drastic yield improvement. The production of rice has gradually increased since 1994 and has reached 8 million quintals in 2000 for the first time in 8 years. (See Table J.2.1. and Figure J.2.2 and J.2.3.)

(2) Agricultural Trade

Although the exportation of traditional farm produce such as sugar and sugar products, coffee, tobacco and cacao are recently decreasing, it still has an important role in trade. The average FOB export value of sugar and its products from 1992 to 2001 records US$ 133 million. (See Table J.2.3.)

Since 1998, the exportation of non-traditional farm products, particularly fruits, has been increasing. In 2001, the FOB exportation value of fruits (banana, avocado, plantain, papaya, citrus, pineapple, melon and mango) amounted to more than US$ 55 million, and this figure exceeded some traditional exporting crops of the Dominican Republic such as cacao, coffee and tobacco.

On the other hand, several agricultural products have been constantly imported. Four major importing products in terms of value are milk, maize, wheat and cooking oil. In 2000, 20 agricultural products were imported and amounted to US$ 314 million. Among them, 32 and 30 % of the total value counted to milk and maize, respectively. If wheat and cooking oil were included, 83 % of the total imported value is counted. (See Figure J.2.4.)

J.2.2 Agriculture in La Luisa

(1) Present situations

After the cease of CEA's operation in La Luisa in the late 1990s, most farmlands extended in south of the study area were abandoned. Some local people are cultivating the abandoned land or using it as grazing land. According to the agricultural statistics of SEA, crops such as maize, pigeon peas, cassava, field pumpkin and rice are cultivated in La Luisa and its surrounding areas. As for rice, majority of rice is cultivated in La Estrella where is located in the east of the study area utilizing irrigation water from Mijo Dam. La Estrella is one of the beneficial villages of agrarian reforms (AC-40) conducted by IAD in the 1960s and some farmers in La Luisa own farmlands there. Some other crops including sweet potato, banana, plantain, mango, coconuts, cacao, taro and passion fruits were observed during field surveys.

In the study area, there are few people who own farmlands and most local people do small-scale farming for self-consumption around their homesteads. In El Laurel and La Luisa Blanca, there seems to be more land-owned farmers than in La Luisa Prieta and Batey La Luisa. Some landless rent farmlands outside the study area (e.g. La Estrella) or work as a casual labor for other farmers.

Because subsistence agriculture generally dominates the area, mixed cropping (eg. plantain + pigeon peas, cassava + field pumpkin + pigeon peas) is common and there is no technologically advanced agriculture. Some commercial farmers use chemical fertilizers (15-15-15, 15-10-10), pesticides and herbicides but these chemical materials are not popularly used.

As for agricultural extension services, only few farmers receive them. There are no available agricultural credit systems except for Banco Agrícola. In La Luisa Blanca, Ozama Cooperative provides various services (distribution of rice seeds and input materials, tractor plowing, transportation and sales of rice) but users are not many.

In La Luisa, there are no large-scale livestock farmers but many people keep small animals. In particular, chickens and pigs are widely kept among many families, and some keep rabbits. These small animals are

important not only for self-consumption but also for alternative income sources. In La Luisa Prieta, there is a cheese factory that buys milk from small farmers around the study area.

(2) Development plan

For the La Luisa Area, there are three approaches for agricultural development: (1) rehabilitation or development of agricultural infrastructures, (2) utilization of unused land and (3) strengthening of agricultural extension services. The first approach intends to increase the production amount and the components mainly include farm roads and drainage system improvement. The second one intends to increase farm production by effective utilization of the uncultivated land that extended in the southern part of La Luisa. The third approach includes two purposes, namely, the increment of production amount through better farming practices and the improvement of agricultural produce quality.

For the agricultural development plan in La Luisa, several points should be considered in relation to the approaches mentioned above.

Specific Conditions	Related Approaches	Reasons
The farmland area is next to the Ozama River which often causes flooding. Moreover, drainage system in the area is not working effectively because it is very old.	(1)	Considering the situation that there is no plans for flood protection of Capital District and river improvement of the Ozama River, rehabilitation of existing old drainage system is very important.
There are large former sugarcane plantation areas in the south but there are no good access roads.	(1), (2), (3)	With the improvement of access road system in the farmland area, utilization of former sugarcane plantation areas can be promoted.
In the area, low productive extensive farming is prevailing.	(3)	More intensive agriculture which utilizes the good geographical and social conditions of the area (near to the Capital) is possible.

Taking these specific conditions into consideration, the targets of the agricultural development are summarized and short, medium and long-term programs are also summarized in the following tables.

Sector	Present Situations	Targets (15 years later)	Remarks
Crop production	In the area, various soils distribute in terms of fertility, drainage and topography. In addition, unused farmlands are many due to possible flood damage. Home consumption crops are mainly cultivated.	Most farmlands are utilized according to the land conditions (fertility, irrigation, drainage). Various crops including cash crops are cultivated.	Since the area has more than 2000-mm annual rainfall, soil conservation measures are indispensable. In the lowland where flood damage is possible, farming plan should be made with the assumption of flood occurrence.
Livestock	No commercial livestock farming presently exists. Only small scale livestock for home consumption is common.	Livestock for income generation and home consumption is extended. Pasture land is properly managed according to the land use plan.	Because the one plot size is not large, individual commercial livestock is difficult.
Agricultural Marketing and Processing	Farmers sell most of their product within their communities and few of them sell to Santo Domingo. A cheese factory in the area is operated with locally produced milk.	Farmers sell their product to Santo Domingo with stable marketing channels. Small-scale agricultural processing which adds value to farm produce is practiced in the area.	To establish the stable marketing channels, both quality and quantity is necessary. Technical supports for agricultural processing are important.

Sector	Item	Short term	Medium term	Long term	Implementation body (approach)
		1-5 years later	6-10 years later	11-15 years later	
Crop production	Appropriate land use planning and crop production system based on a variety of land conditions	Survey of the farmland conditions (access, slope, irrigation and drainage, etc.) Selection of suitable crops for each land type	Trial cultivation of promising crops for each land use type	Development of cultivation methods for the crops selected Promotion of agricultural production based on the land use plan	Farmers' Organization (F.O.), SEA, IAD (2. utilization of unused land, 3. strengthening of agricultural extension services)
Livestock	Small animals livestock for both income generation and home consumption	Introduction of small animals livestock	Development of raising methods for the promising animals Marketing of livestock product	Extension of raising methods Extension of marketing	F.O., SEA, IAD (3. strengthening of agricultural extension services)
Agricultural marketing and processing	Marketing to Santo Domingo markets Introduction of small-scale processing	Survey of demands and supply for farm produce	Trial of promising farm produce marketing Training of small-scale processing technology	Introduction of group activities for transportation and marketing Extension of small-scale processing	F.O., SEA, IAD (3. strengthening of agricultural extension services)

(3) Land use and cultivation plan

For the formulation of land use plan of La Luisa Area, following matters were considered.

- Present land use conditions
- Inundation frequency by flooding
- Topographical conditions

Most farmland area – former sugarcane fields – distributed in south is not being utilized and the present land utilization rate is estimated less than 10%.

It is assumed that the land use patterns for the village areas distributed from central to north and their adjacent areas would not change drastically. This assumption comes from the two facts. Firstly, for El Laurel that is the most northern part of the study area, this study only covers the area with houses and homesteads along the trunk road. Secondly, the central areas where La Luisa Blanca, La Luisa Prieta and Batey La Luisa are located have been already populated and private lands are distributed.

Accordingly, the land use plan will be made for the 880-ha farmland areas in south in accordance with the inundation frequency by flooding and topographical conditions. (See to Table J.2.4 and Figure J.2.5.)

Agriculture and animal husbandry development in La Luisa should follow the above mentioned land use plan. Basic strategies and main land use classification for development are shown below.

Basic strategies	Main land use classification
1. Expansion of food production	A (rainfed), B, C, D
2. Introduction of commercial crops	A (irrigated), D (some parts)
3. Productivity improvement through the strengthening of extension services	A, B, C, D

- Land Use Classification A:

  This land type is flat with relatively low inundation frequency by flooding so the area is available for farming throughout the year. Therefore intensive agriculture for food crops and vegetables is possible. However, the availability of irrigation water is an important factor to decide the crops to be planted. For the areas without irrigation water, traditional food crops like cassava and pigeon peas that can grow with only rainfall are recommended. For the areas with irrigation water, some labor-intensive commercial crops such as melon and tomato are possible to be introduced. In La Luisa, the right bank of the Ozama River (the most southern part of the study area) is the probable area for commercial crop cultivation without new irrigation structures development. In the area, pump irrigation is possible from the Ozama River. For other two areas – next to La Luisa Blanca and La Luisa Prieta, development plan should be based on rainfed farming because there are no appropriate irrigation water resources in the surrounding areas.

- Land Use Classification B:

  In this area, the inundation frequency is low but the land is undulating to some extent. Accordingly, farming here is based on food crops like cassava and pigeon peas and fruit trees like banana and plantain. There are some creeks in the area where soil erosion is observed so careful cultivation and soil conservation that includes construction of hedges and drainage are necessary not to accelerate soil erosion. Within the creeks, some crops such as taros are possible to be planted.

- Land Use Classification C:

  For the area of land use symbol C distributed in southwestern part of the study area, inundation frequency is less but its terrain is hilly. Thus the area should be used as orchards or pastureland for animal husbandry rather than as field croplands from the viewpoint of soil conservation.

- Land Use Classification D:

  Although the area surrounded by three rivers – Ozama, Caoba and Mijo – is flat, inundation frequency is higher than other areas since elevation of the land is relatively low. Without considering the inundation frequency, it is impossible to make a farming plan. To avoid the damage risks by flooding, it is recommendable to develop the area as afforested area or pastureland. However some commercial crops like melon, eggplant, tomato and rice are possible to be cultivated with pump irrigation if flooding season can be avoidable.

J.2.3 Agriculture in Tamayo

(1) Present situations

Since the residential area for settlers are 4-km far from farmlands, people go there by donkeys or motorbikes. Some people who do not have a transportation means need to walk, so they go early in the morning and return very late. As compared to the neighboring area of Lot 1-3 (more flat and close to houses) distributed as AC-166, the area called Lot 4 has several disadvantages as shown below.

- It takes more time to go to farmlands.
- Because the area is located at the bottom of canal system, irrigation water is often very little.
- Soils are sandy in comparison with the loamy soils in Lot 1-3.
- Some farmlands contain much gravel.

One of the agricultural characteristics in Tamayo is that normal plants cannot survive without irrigation water due to its dry climate. In the area, the irrigable lands which is lower than the canal elevation are used as farmlands while other lands where is higher than the canal are not utilized at all. Even in the irrigable areas, some farmlands located in the downstream of lateral canals are not cropped due to water shortage.

Irrigation canal for Tamayo was constructed by INDRHI and intake is 12-3 km far at the village called Honduras on the Yaque del Sur River. INDRHI is in charge of the maintenance of main canal and water distribution to each Lot, but farmers themselves manage the water distribution within the Lot. Based on the field survey, the water is rotationally distributed from the Lot-1 to Lot-4 in order and the one term of irrigable days for Lot 1, 2 and 4 is 3-day while it is 8-day for Lot 3 where the area is bigger than others. This water distribution manner was not followed in the past but there are very few farmers who break the manner because the penal regulations become severer (a penalty of RD$500 and 3-day custody).

The crops cultivated are mainly fruits such as banana, plantain, papaya and so forth but maize and vegetables like bell pepper and melon are also cultivated. Most of these crops are purchased by middlemen who come to the fields and transported to major cities such as Santo Domingo and Barahona. As for livestock, people keep only small animals and poultry for self-consumption around houses so there are no commercial livestock farmers.

(2) Development plan

Agricultural development contributes to stabilize the livelihoods of farmers through the increase of agricultural income. In Tamayo, there are four approaches for the agricultural development plan: (1) rehabilitation or development of agricultural infrastructures, (2) increase of land use efficiency, (3) raising agricultural production efficiency, and (4) improvement of agricultural marketing system. The first and second approaches mainly intend to increase the production amount, while the fourth approach tries to increase farmers' income by cutting intermediary margins. The third approach includes two purposes, namely, the increment of production amount through better farming practices and the improvement of product quality. For the agricultural development plan in Tamayo, several points should be considered in relation to the approaches mentioned above.

Specific Conditions	Related Approaches	Reasons
The area has very dry climate and water resources are limited.	(1), (2), (3)	Without irrigation facilities, crops cannot grow, so farmland expansion without irrigation development is very difficult. Farming practices suitable for dry areas are also necessary.
Although irrigation canal exists, the area is situated in the tail of the irrigation system.	(1), (2)	Because the irrigation system is not appropriate (no water regulators nor check gates), water utilization is limited. Moreover irrigation water is not enough in downstream areas.
The access conditions to agricultural markets are not good.	(4)	Due to its location handicap, intermediary margins are high.
Some lands cannot receive irrigation water because the land elevation is higher than irrigation canal.	(1), (2)	If new irrigation facilities are developed, expansion of farmland is possible.

Present land use conditions are shown below.

- Irrigable area 852 tareas
- Not irrigable area (abandoned due to higher level than irrigation canal) 418 tareas

As for the not-irrigable area, it is impossible to use the land for farming under the dry environment unless irrigation facilities such as pumps are introduced. There are some farmlands where no crops are cultivated. It is important to clarify the reasons of no cultivation because appropriate measures will be drawn from the clarification. For instance, the improvement of present irrigation facilities and irrigation techniques are necessary if water shortage is a problem. The water distribution facilities and water application method on farm level particularly needs to be improved. Although main canal is concrete-lined, lateral canals are all in unlined. In some fields, basin irrigation is observed but it is not recommendable in terms of water use efficiency. It is possible to increase irrigated farmlands if the irrigation application methods are improved and irrigation water are saved. Moreover elimination of cobbles and gravels from farmlands is effective for the improvement of soil conditions and workability of farming practices. These measures enable to increase land use efficiency, which in turn increases production and farm income.

For a cropping plan, it is necessary to select proper crops such as cash crops for Santo Domingo or local markets and home consumption. For the cash crops, it is important to secure some marketable amount of quantity. It also needs to avoid monoculture by combining several crops for risk management at the same time. For the selection of crops, it is essential to consider the type of market or use as shown below.

- Crops for big markets (transportable and non-perishable crops such as plantain, papaya and melon)
- Crops for home consumption (small-scale vegetable production, plantain, etc.)
- Crops for local markets (small- to medium-scale fresh vegetables production)

Strengthening of extension services is also indispensable because farming techniques are still at low level. Taking these specific conditions into consideration, the targets of the agricultural development are summarized and short, medium and long-term programs are also summarized in the following tables.

Sector	Present Situations	Targets (15 years later)	Remarks
Crop production	Following crops are cultivated but only less than half of lands are under utilization. Crops: maize, green pepper, cantaloupe melon, plantain, banana, papaya, etc. More than half of farmlands are not being used due to the shortage of irrigation water.	Farmers select proper crops according to the types of market (large markets like Santo Domingo, local markets, self-consumption) and the field conditions. Farmers largely utilize their farmlands for farming.	The large area of right bank of the canal (about 418 tareas) is higher than irrigation water and the area is not presently utilized.
Livestock	No commercial livestock farming presently exists.	Farmers keep small animals for self-consumption and income generation near the community.	Natural vegetation is very little. Large-scale commercial animal farming is not targeted.
Agricultural marketing and processing	Intermediaries come to buy to the farm with trucks.	Farmers judge market information and sell their product by themselves.	Tamayo is very far from major agricultural markets.

Sector	Item	Short term	Medium term	Long term	Implementation body (approach)
		1-5 years later	6-10 years later	11-15 years later	
Crop production	Selection of proper crops for the market conditions	Establishment of the information system for agricultural produce market	Understanding and analysis of the market information Selection of promising crops for the farmlands in the Lot 4	Development of cultivation methods for the crops selected	Farmers' Organization (F.O.), SEA, IAD (3. strengthening of agricultural extension services)
	Selection of proper crops for the specific field conditions	Identification of the specific field conditions (e.g. climate, irrigation, gravel contents, farm road access, etc.) Selection of proper crops for the specific field conditions	Trial cultivation of the crops selected (irrigation methods, cultivation practices, etc.)	Development of cultivation methods for the crops selected	F.O., SEA, IAD (3. strengthening of agricultural extension services)
	Soil nutrients improvement and soil conservation	Diagnosis on soils in the area based on field survey	Soil nutrients improvement based on the diagnosis Introduction of manure application Introduction of soil conservation measures	Soil nutrient management with supplementary chemical fertilizer	F.O., SEA, IAD (3. strengthening of agricultural extension services)
Livestock	Introduction of small-scale livestock for home consumption and income generation	Selection of proper animal type for villagers Trial of breeding by selected or voluntary farmers	Establishment of raising methods Seeking markets for sales	Extension of animal raising in the village Expansion of marketing activities	F.O., SEA, IAD (3. strengthening of agricultural extension services)
Agricultural marketing and processing	Strengthening of marketing activities by groups	Securing a transportation means	Establishment of group activities for transportation and sales	Expansion of marketing activities	F.O., SEA, IAD (4. improvement of agricultural marketing system)

J.2.4 Agriculture in Esperanza III

(1) Present situations

To be precise, Esperanza III has an area of 6,000 tareas in total with several areas but the study area is one of these areas called Los Fernandez with 2,600 tareas.

One of the agricultural characteristics in Los Fernandez is contract farming with private tobacco companies. If farmers get a contract with the companies, agricultural materials such as seedlings, fertilizers and agrochemicals and technical assistance are provided by the companies. The results of field survey show that 76% (35/46) of the participants for workshop cultivate tobacco. However the farmgate price of tobacco, which was RD$3,500/QQ in 1998, has been recently falling (RD$1,500-2,000/QQ), so tobacco farming is no more profitable. One farmer told that he harvested 50QQ of tobacco from 25 tareas and received RD$76,000 (unit price: RD$1,520/QQ) but he got little profit after paying the fees for seedlings, chemicals and technical assistance to the tobacco companies.

Some other crops cultivated in the area include cassava, plantain, papaya, pigeon peas and so forth. The agricultural production data of the whole area of Esperanza III is shown below.

Table J.2.5 Agricultural production in Esperanza III (AC-336), 2000

(Unit: tarea)

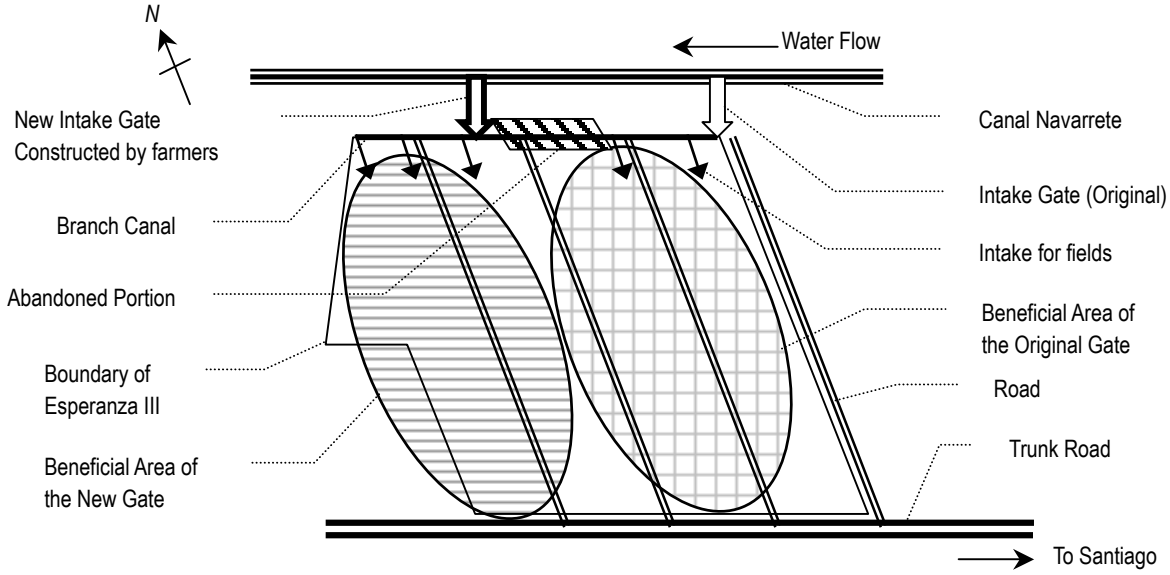
Crop	Existing Area	Planted Area	Irrigated Area	Harvested Area	Production	
Rice	787	1,018	1,018	1,266	5,352	QQ
Banana	436	138	138	1,000	8,891	bunch
Cassava	763	805	805	899	9,517	QQ
Pigeon pea	405	640	640	590	1,731	QQ
Tobacco	330	260	260	310	398	QQ
Maize	167	330	330	255	282	QQ
Papaya	32	62	62	122	38,961	pieces
Tomato (industrial)	85	135	135	70	1,410	QQ
Red beans	185	185	185	45	53	QQ
Plantain	650	345	345	33	100	thousand
Cucumber	25	55	55	30	250	QQ
Watermelon	60	60	60	30	20,000	pieces
Green pepper	7	32	32	25	30	QQ
Eggplant	-	25	25	25	238	QQ
Sugarcane (fresh)	60	-	-	7	8,080	pieces
Coriander (seeds)	5	25	25	5	20	QQ

Source: IAD Boletin Estadistico 2000, Vol. 26

These crops receive water from the main irrigation canal (Canal Navarrete). The volume of irrigation water delivered from one intake that was originally installed for this area was not enough to cover all requirements in the area. In particular, the western part of the area had faced shortage of water to be irrigated, because the water had taken in order from the upstream lateral at northeast point. To improve the water shortage, farmers constructed another new intake gate on the main canal that is located at about 500m downstream of initial intake gate. The second gate consequently got more irrigation water for the

western part. (See Figure J.2.6.)

Figure J.2.6 Diagram of the irrigation system in Esperanza III



Rice is the main crop in Cibao and commonly cultivated around the area but it is not popular inside Los Fernandez. The main reason for the unpopularity is the shortage of irrigation water. Inside the area, there are very few people living and livestock is self-consumptive scale.

(2) Development plan

For the area of Esperanza III, there are three approaches for the agricultural development plan: (1) rehabilitation or development of agricultural infrastructures, (2) strengthening of agricultural extension services, and (3) improvement of agricultural marketing system. The first approach mainly intends to increase the production amount, while the second approach includes two purposes, namely, the increment of production amount through better farming practices and the improvement of product quality. The third approach tries to increase farmers' income by the improvement of farm produce marketing.

The area receives irrigation water from the main canal (the Canal Navarrete of Yaque del Notre Irrigation System), where the farmers in the western part of the area constructed their own gate because the water from the INDRHI gate did not reach their farms. The reasons of water shortage in the western part were not clearly identified. However, there is neither serious water shortage nor problems on operation and maintenance at present.

The passive and dependent attitudes of the farmers that originated from the contract tobacco farming are characteristic in this area. Very few farmers are active and independent for the selection of crops and agricultural marketing. Taking these specific conditions into consideration, the targets of the agricultural development are summarized and short, medium and long-term programs are also summarized in the following tables.

Sector	Present Situations	Targets (15 years later)	Remarks
Crop production	Extensive farming is dominant in the area. Following crops are presently cultivated. Crops: tobacco, cassava, plantain, banana, papaya, pigeon peas, etc.	Farmers cultivate crops independently, not depending upon tobacco companies or governmental guides.	The effects of contract tobacco farming are still strong and the attitudes of farmers show dependency. Irrigation canal is available.
Livestock	No commercial livestock farming exists in the area.	-	Arable farming is preferable in this area.
Agricultural marketing and processing	Intermediaries come to buy to the farm with trucks.	Farmers judge market information and sell their product by themselves. Farmers sell their agricultural commodities to various markets.	The access to the farms is relatively good because the area is surrounded by roads.

Sector	Item	Short term	Medium term	Long term	Implementation body (approach)
		1-5 years later	6-10 years later	11-15 years later	
Crop production	Establishment of intensive and high quality production making use of the better conditions for agriculture	Demonstration of intensive cultivation methods in the area	Introduction of fresh vegetable production	Reform of farmers' attitude and strengthening of farmers' organization (independent from passive contract tobacco farming)	Farmers' Organization, SEA, IAD (2.strengthening of agricultural extension services)
	Soil nutrients improvement and soil conservation	Diagnosis on soils in the area based on field survey and other surveys	Soil nutrients improvement based on the diagnosis Introduction of manure application	Soil nutrient management with supplementary chemical fertilizer	Farmers' Organization, SEA, IAD (2. strengthening of agricultural extension services)
Agricultural marketing and processing	Active marketing activities according to the market information	Establishment of the information system for agricultural produce market Understanding and analysis of the market information	Strengthening of farmers' organization Expansion of markets for the product (local markets)	Expansion of markets for the product (direct sales to exporting companies, hotels, super markets)	Farmers' Organization, SEA, IAD (3. improvement of agricultural marketing system)

J.2.5 Agriculture in Los Hatillos I

(1) Present situtaions

The agricultural activity of Los Hatillos I composes both crop farming and livestock and they are extended in mixed 179 plots and 8,700 tareas. Major crop fields are distributed around gentle slope areas along Chocolate Stream (Arroyo) and its branches. Large private farms are located around the settlement area. Huge sugarcane fields are still operating in the vicinity.

The cultivation of upland rice is typical in Los Hatillos I. Interviewing survey revealed that the upland rice was introduced from Los Haitises where most settlers had lived before. It can grow by rain only. Several varieties (Mechello, Enano) are cultivated and they are planted in May/June and harvested 4-5 months later.

Some other crops such as maize, cassava, field pumpkin, plantain, okra, pigeon peas, mandarin, mango and so forth are observed during the field survey. IAD has a branch office that administrates Los Hatillos I and II (AC-430). The data of the branch office listed the plants of bell pepper, orange, yam, sweet potato and sugarcane in the area. The area has a Sigatoka disease problem for plantain cultivation, but resistant varieties are not widely extended.

Table J.2.6 Agricultural Production in Los Hatillos (AC-403 and AC-430), 2000

(Unit: tarea)

Crop	Existing Area	Planted Area	Irrigated Area	Harvested Area	Production	
Rice	400	250	-	140	93	QQ
Cassava	357	364	-	131	640	QQ
Okra	120	216	-	106	410	QQ
Maize	210	398	-	95	108	QQ
Passion fruits	90	30	-	82	120	thousand
Pumpkin	86	281	-	50	260	QQ
Plantain	80	-	-	30	33	thousand
Pigeon peas	-	60	-	15	30	QQ
Tomato	-	6	-	6	133	QQ
Bell pepper	13	-	-	5	18	QQ
Yam	36	35	-	5	40	QQ
Citrus	255	-	-	-	-	-
Black beans	155	405	-	-	-	-
Sweet potato	53	53	-	-	-	-
Sugarcane (fresh)	40	-	-	-	-	-
Red beans	20	65	-	-	-	-
Pineapple	10	10	-	-	-	-
Coriander	3	3	-	-	-	-

Source: IAD Boletin Estadistico 2000, Vol. 26

Since the area is close to Hato Mayor, there are no difficulties to procure agricultural materials. It was observed that a farmer was spraying agro-chemicals to upland rice. As for an agricultural credit scheme by Banco Agricola, it was functioned until 1998. The reason of the scheme suspension is that many credits for crop cultivation were not amortized. As the credit for livestock, its amortization seems to be better than that of crop cultivation.

Within the area, there are some farm lots managed by IAD officers and the lots play an important role as demonstration and experimental fields. SEA extension officers often come to the area from Hato Mayor but effective services are not provided.

The livestock activities, mainly milk production, are observed in undulated southwestern parts of the study area. As of March 2001, 413 cattle are kept in the area. The introduction of dual-purpose cattle for

dairy and beef is promoted.

(2) Development plan

In Los Hatillos I, there are four approaches for the agricultural development plan: (1) rehabilitation or development of agricultural infrastructures, (2) increase of land use efficiency, (3) strengthening of agricultural extension services, and (4) introduction of agro-processing. The first approach mainly intends to increase the production amount, but the components mainly include farm road improvement and the construction of water feeding sites for cattle. The second one also intends to increase the production amount by active utilization of uncultivated land. The third approach includes two purposes, namely, the increment of production amount through better farming practices and the improvement of product quality. The fourth approach tries to increase farmers' income through value added agricultural product by processing.

For the agricultural development plan in Los Hatillos, several points should be considered in relation to the approaches mentioned above.

Specific Conditions	Related Approaches	Reasons
Since the area is located in hilly area, there are no rivers suitable for irrigation development. Moreover, geological conditions are not good for groundwater development.	(1), (3)	Agricultural infrastructure development does not include irrigation development, but small-scale irrigation utilizing portable pumps is possible on several streams. Rain-fed agricultural practices are necessary.
There are some areas without utilization in eastern part.	(2)	If the area is not suitable for crop farming, livestock use is considered.
In the southern and western parts, livestock farming, mainly milk production, is practiced.	(1), (3), (4)	Both livestock facilities development and extension services are necessary. Processing of milk is also possible.

Taking these specific conditions into consideration, the targets of the agricultural development are summarized and short, medium and long-term programs are also summarized in the following tables.

Sector	Present Situations	Targets (15 years later)	Remarks
Crop production	Because the area has a variety of land conditions, both livestock and arable farming are practiced in the area. Following crops are randomly cultivated. Crops: upland rice, maize, cassava, pumpkin, plantain, okra, pigeon peas, citrus, etc.	Three farming types, namely livestock, cash crops and self-supporting crops, are well balanced in the area, based on the soil conditions. Farming practices considering soil and nutrient conservation are implemented.	The area has a wide range of land terrain - hilly, undulating and flat. Annual rainfall is relatively abundant, 1,600 mm.
Livestock	Cattle for milk are mainly raised in the southern and western parts of the area.	Stable livestock farming is practiced with the improvement of pasture and the extension of dual-purpose cattle.	Large-scale commercial livestock farming is not targeted because each farmer has a relatively small land. Group utilization of grazing land is recommendable.

Agricultural marketing and processing	Agricultural produce is transported to Hato Mayor by farmers, or is sold to intermediaries at farms. Milk is sold to milk manufacturing companies.	The access conditions to the eastern part are improved. Milk is processed and then sold.	The road conditions to the eastern part are not good and vehicles cannot pass after rainfall. Water quality in the residential areas is not good.

Sector	Item	Short term 1-5 years later	Medium term 6-10 years later	Long term 11-15 years later	Implementation body (approach)
Crop production	Appropriate land use planning and crop production system based on a variety of land conditions	Identification of the farmland capacities in terms of productivity (access, slope, irrigation and drainage, etc.) Planning of the land use plan based on the survey results	Selection of suitable crops for each land use type Trial cultivation of promising crops for each land use type	Development of cultivation methods for the crops selected Promotion of agricultural production based on the land use plan	Farmers' Organization (F.O.), SEA, IAD (2. utilization of abandoned land, 3. strengthening of agricultural extension services)
	Soil nutrients improvement and soil conservation	Diagnosis on soils in the area based on field survey and other surveys	Soil nutrients improvement based on the diagnosis Introduction of manure application Introduction of soil conservation measures	Soil nutrient management with supplementary chemical fertilizer	F.O., SEA, IAD (3. strengthening of agricultural extension services)
Livestock	Stable milk production and supplemental meat production	Construction of water-feeding sites based on the land conditions survey Introduction of dual purpose cattle	Improvement of pasture production system based on the land use plan	Expansion of dual purpose cattle	F.O., SEA, IAD (1. development of livestock infrastructures, 3. strengthening of agricultural extension services)
Agricultural marketing and processing	Introduction of small-scale agro-processing with milk	Needs survey of milk related processed products Training of processing technology	Trial of milk processing enterprise	Expansion of milk processing enterprise	F.O., SEA, IAD (4. introduction of agro-processing)

Figure J.1.1 Soil map of the La Luisa Area

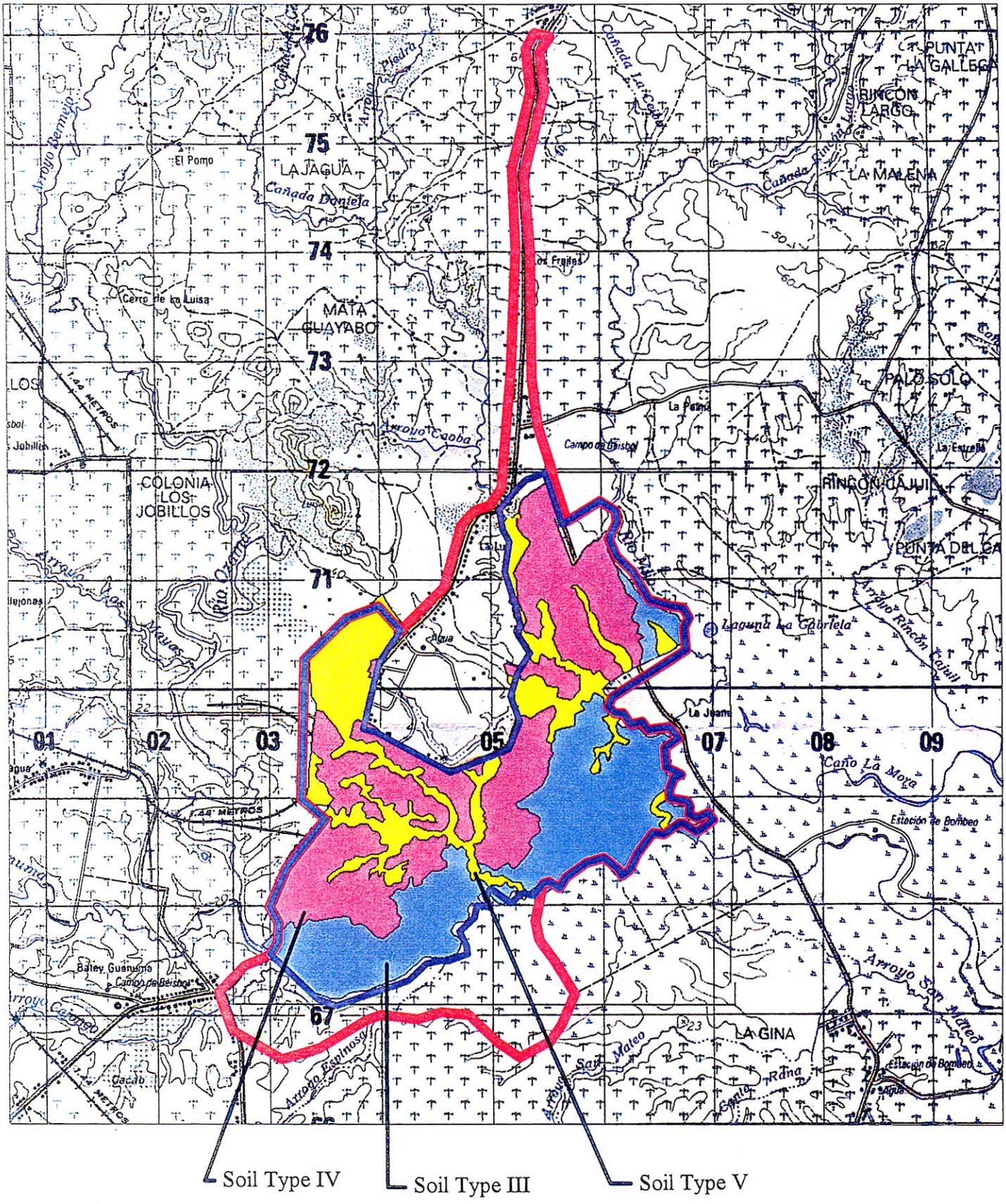


Table J.2.1 Harvested Area, Production and Yield of the Major Crops, 1989-1998

Harvested Area (tarea)

Crops	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rice	1,420,690	1,464,129	1,769,340	1,265,764	1,282,528	1,621,744	1,631,128	1,677,107	1,766,853	1,969,833	1,967,644
Corn	382,953	423,477	533,335	457,742	435,936	531,917	520,219	457,655	453,063	299,500	308,119
Sorghum	138,790	136,742	107,317	110,869	98,525	126,821	96,191	135,810	53,272	36,628	30,744
Sugarcane (a)	3,268,404	3,297,962	3,463,799	3,720,266	3,297,517	3,485,312	3,330,398	3,100,611	3,124,891	1,868,822	1,893,308
Tabacco (b)	193,426	291,091	284,935	169,500	178,081	242,267	312,926	299,310	487,696	194,937	24,300
Coffee	2,428,418	2,400,000	2,428,416	2,400,000	2,428,418	2,428,418	2,000,000	2,216,023	2,216,023	2,216,023	2,216,023
Cacao (grain)	1,705,330	1,827,139	1,948,948	1,936,645	2,012,561	2,438,185	2,176,657	2,252,289	2,436,185	1,737,144	2,436,185
Peanut	60,592	102,593	110,434	8,809	9,638	39,701	52,833	27,113	55,195	39,205	30,924
Dry coconut (1)	764,460	793,203	863,130	1,104,598	1,053,675	515,791	469,188	596,699	584,317	594,888	589,692
Red bean	599,639	816,479	509,646	612,393	620,666	654,332	674,274	429,151	446,961	336,101	374,017
Black bean	55,282	65,073	81,050	58,459	75,676	55,812	51,363	64,366	54,893	78,206	103,945
White bean	10,907	8,653	16,146	21,044	22,729	38,451	28,422	36,677	25,930	11,517	13,539
Pigeon peas	510,879	508,640	578,638	572,598	409,580	485,689	553,067	260,238	380,817	410,478	402,278
Potato	40,737	38,044	63,820	33,602	30,490	55,999	45,568	38,408	29,743	42,183	27,794
Sweet potato	92,715	103,905	135,090	90,522	99,280	142,417	132,860	93,649	125,837	136,072	96,665
Cassava	325,538	273,813	419,161	249,285	261,086	363,516	372,995	259,508	321,266	311,486	304,166
Yam	17,435	17,141	23,997	18,307	21,759	32,115	26,658	33,046	33,271	29,490	33,265
Taro	79,757	62,990	81,705	73,264	67,226	115,667	98,090	84,407	60,729	100,296	98,258
Onion	38,937	38,944	65,246	64,125	42,261	59,777	45,149	47,394	49,748	64,559	43,559
Garlic	17,003	10,710	12,062	14,236	18,030	16,634	10,825	11,464	15,490	10,402	10,575
Banana (2)	104,726	108,988	173,371	166,802	221,414	197,275	206,780	245,011	229,344	206,532	236,343
Tomato	14,886	13,392	14,180	16,499	10,831	14,000	11,528	9,312	11,133	18,449	14,573
Pumpkin	79,275	50,520	63,757	62,450	74,522	87,226	89,691	82,584	54,357	77,222	89,207
Chili pepper	39,078	30,752	49,390	46,517	54,364	63,797	68,649	44,684	36,627	63,329	46,534
Eggplant	18,879	26,036	29,712	23,352	32,527	31,565	32,271	22,904	22,974	28,766	25,739
Industrial tomato (c)	107,982	80,520	98,388	187,963	64,176	55,200	109,955	142,142	112,041	150,000	150,000
Plantain (3)	501,599	563,258	655,764	626,999	632,546	565,953	627,733	635,178	533,044	374,659	560,341

Production (qq)

Crops	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rice	6,127,633	6,680,195	8,098,924	6,391,000	5,373,665	6,922,636	6,772,366	7,292,999	6,803,740	8,117,905	8,203,221
Corn	875,119	952,577	1,017,513	895,236	621,430	1,035,009	888,627	746,833	816,700	668,427	527,305
Sorghum	462,053	365,862	382,443	333,772	276,423	427,804	279,659	479,556	178,338	172,597	106,208
Sugarcane (a)	142,934,249	150,900,835	151,161,220	162,444,033	137,958,334	119,984,760	135,155,957	145,375,270	112,366,037	98,157,204	99,443,024
Tabacco (b)	258,000	407,100	352,200	259,274	297,240	462,111	530,300	592,550	940,787	348,668	48,600
Coffee	1,057,800	990,000	947,083	1,019,935	721,240	934,912	1,055,900	749,498	1,255,365	763,000	1,004,100
Cacao (grain)	1,266,772	932,621	1,104,024	1,176,066	1,375,436	1,309,486	1,387,527	1,156,436	1,307,140	570,154	818,072
Peanut	91,890	108,065	155,922	11,413	17,070	61,036	61,607	38,887	141,800	116,829	50,306
Dry coconut (1)	162,963	178,602	247,182	245,060	211,051	268,211	231,891	340,729	218,063	271,080	249,935
Red bean	695,353	639,983	721,891	756,623	711,379	723,685	701,287	529,386	463,872	484,726	382,259
Black bean	46,519	67,142	81,235	73,871	83,319	53,290	52,975	51,868	50,235	72,755	94,449
White bean	7,729	11,301	14,470	19,549	26,295	31,553	23,709	23,443	20,617	10,913	9,794
Pigeon peas	410,052	1,046,531	569,281	540,482	469,879	670,025	369,376	335,628	442,560	509,991	560,922
Potato	670,937	653,224	763,518	458,379	514,014	804,114	515,173	490,472	375,357	646,438	548,794
Sweet potato	780,304	991,566	1,161,885	687,440	848,532	1,056,186	920,064	636,503	975,182	1,167,369	811,675
Cassava	2,911,292	2,951,430	3,144,107	2,070,600	2,177,846	3,126,768	2,755,426	2,137,613	2,788,129	2,789,481	2,756,759
Yam	125,067	169,100	181,742	144,978	146,723	238,006	318,110	234,047	285,167	243,512	299,420
Taro	631,304	429,588	622,606	614,081	758,315	956,591	937,001	971,208	567,821	1,069,381	1,081,226
Onion	356,125	378,354	482,661	549,999	468,225	577,327	568,599	530,663	531,475	869,335	697,302
Garlic	133,063	91,792	78,980	117,160	112,396	105,815	87,501	102,874	118,615	103,686	112,801
Banana (2)	9,125,934	8,886,377	16,897,303	18,788,225	18,290,929	14,740,074	16,071,006	15,894,909	13,054,483	17,637,705	17,241,688
Tomato	142,403	137,421	177,374	308,032	185,204	131,135	328,182	137,858	179,111	302,100	251,682
Pumpkin	352,040	292,141	253,973	370,032	420,598	374,443	340,000	455,487	361,731	471,353	528,587
Chili pepper	159,800	194,934	293,993	268,384	259,104	306,388	426,793	273,209	257,489	461,951	320,979
Eggplant	104,693	119,053	251,723	170,376	186,427	144,825	185,626	157,060	159,729	241,239	226,922
Industrial tomato (c)	2,447,790	1,431,629	2,072,609	1,729,000	1,637,754	1,932,000	1,185,136	5,455,000	4,175,060	5,886,300	6,044,600
Plantain (3)	1,165,632	1,430,458	1,220,991	1,547,469	1,060,021	1,188,832	1,130,215	1,075,965	1,053,969	856,888	1,241,369

Yield (qq/tarea)

Crops	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rice	4.31	4.56	4.58	5.05	4.19	4.27	4.15	4.35	3.85	4.12	4.17
Corn	2.29	2.25	1.91	1.96	1.43	1.95	1.71	1.63	1.80	2.23	1.71
Sorghum	3.33	2.68	3.56	3.01	2.81	3.37	2.91	3.53	3.35	4.71	3.45
Sugarcane (a)	43.73	45.76	43.64	43.66	41.84	34.43	40.58	46.89	35.96	52.52	52.52
Tabacco (b)	1.33	1.40	1.24	1.53	1.67	1.91	1.69	1.98	1.93	1.79	2.00
Coffee	0.44	0.41	0.39	0.42	0.30	0.38	0.53	0.34	0.57	0.34	0.45
Cacao (grain)	0.74	0.51	0.57	0.61	0.68	0.54	0.64	0.51	0.54	0.33	0.34
Peanut	1.52	1.05	1.41	1.30	1.77	1.54	1.17	1.43	2.57	2.98	1.63
Dry coconut (1)	0.21	0.23	0.29	0.22	0.20	0.52	0.49	0.57	0.37	0.46	0.42
Red bean	1.16	0.78	1.42	1.24	1.15	1.11	1.04	1.23	1.04	1.44	1.02
Black bean	0.84	1.03	1.00	1.26	1.10	0.95	1.03	0.81	0.92	0.93	0.91
White bean	0.71	1.31	0.90	0.93	1.16	0.82	0.83	0.64	0.80	0.95	0.72
Pigeon peas	0.80	2.06	0.98	0.94	1.15	1.38	0.67	1.29	1.16	1.24	1.39
Potato	16.47	17.17	11.96	13.64	16.86	14.36	11.31	12.77	12.62	15.32	19.75
Sweet potato	8.42	9.54	8.60	7.59	8.55	7.42	6.93	6.80	7.75	8.58	8.40
Cassava	8.94	10.78	7.50	8.31	8.34	8.60	7.39	8.24	8.68	8.96	9.06
Yam	7.17	9.87	7.57	7.92	6.74	7.41	11.93	7.08	8.57	8.26	9.00
Taro	7.92	6.82	7.62	8.38	11.28	8.27	9.55	11.51	9.35	10.66	11.00
Onion	9.15	9.72	7.40	8.58	11.08	9.66	12.59	11.20	10.68	13.47	16.01
Garlic	7.83	8.57	6.55	8.23	6.23	6.36	8.08	8.97	7.66	9.97	10.67
Banana (2)	87.14	81.54	97.46	112.64	82.61	74.72	77.72	64.87	56.92	85.40	72.95
Tomato	9.57	10.26	12.51	18.67	17.10	9.37	28.47	14.80	16.09	16.37	17.27
Pumpkin	4.44	5.78	3.98	5.93	5.64	4.29	3.79	5.52	6.65	6.10	5.93
Chili pepper	4.09	6.34	5.95	5.77	4.77	4.80	6.22	6.11	7.03	7.29	6.90
Eggplant	5.55	4.57	8.47	7.30	5.73	4.59	5.75	6.86	6.95	8.39	8.82
Industrial tomato (c)	22.67	17.78	21.07	9.20	25.52	35.00	10.78	38.38	37.26	39.24	40.30
Plantain (3)	2.32	2.54	1.86	2.47	1.68	2.10	1.80	1.69	1.98	2.29	2.22

Source: Diagnostico del Sector Agropecuario 2000, SEA

Note: (a) Data obtained from Instituto Nacional del Azucar (INAZUCAR)
(b) Data obtained from Instituto Nacional del Tabaco (INTABACO)
(c) Data obtained from Asociacion de Fabricantes de Conservas del Agro, Inc. (AFCONAGRO)

(1) thousand pieces
(2) bunches
(3) thousand

Table J.2.2 Comparison between total irrigated area and total harvested area since 1992

(Unit: 1,000 tareas)

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total Irrigated Area	2,493	3,940	3,995	4,120	2,072	2,447	2,677	2,921	2,833
Total Harvested Area of 27 Crops	14,580	14,112	13,556	14,466	13,775	13,303	13,722	11,407	12,128
Percentage of Irrigated Area	17.10%	27.90%	29.50%	28.50%	15.00%	18.40%	19.50%	25.60%	23.40%

Source: Diagnostico del Sector Agropecuario 2000, SEA

Table J.2.3 Changes of FOB export value of traditional farm produce (1992-2001)

(Unit: US$)

Year	Sugar and its products	Crude cacao	Coffee beans	Tobacco leaves
1992	156,043,546	33,236,207	26,395,173	8,569,990
1993	143,155,619	33,885,265	25,600,661	12,841,523
1994	141,003,042	51,380,994	62,431,932	11,497,600
1995	125,100,000	59,256,406	81,071,895	15,500,000
1996	166,700,999	57,714,131	61,781,853	22,916,714
1997	188,402,661	55,565,597	67,039,605	22,735,346
1998	141,642,241	78,144,190	63,499,681	19,175,900
1999	89,852,141	20,393,563	15,801,872	18,931,666
2000	92,577,483	20,887,914	12,311,765	12,168,825
2001*	86,851,779	38,812,347	10,259,603	12,390,000
Average	133,132,951.10	44,927,661.40	42,619,404.00	15,672,756.40

Note: 2001*- preliminary figures

Source: Diagnostico del Sector Agropecuario 2000, SEA

Table J.2.4 Land use classification in La Luisa

Flooding risks	Topography	Symbol	Major land use patterns	Major crops
Less	Flat	A	Upland field	Vegetables, Food crops
	Undulating	B	Upland field / Orchard	Food crops, Fruit trees
	Hilly	C	Orchard / Pasture	Fruit trees, Pasture
More	Flat	D	Pasture / Woodland	Pasture, Trees

Figure J.2.1 Changes of harvested area by crop (1989-2000)

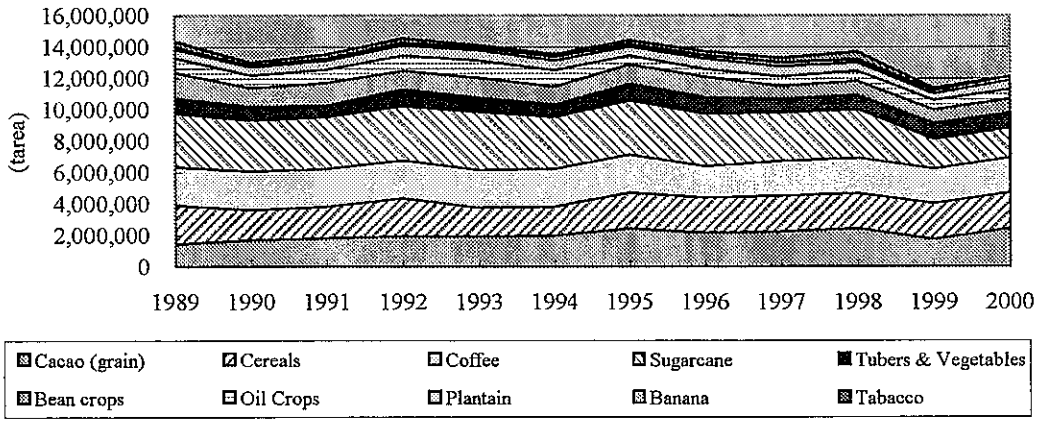


Figure J.2.2 Changes of harvested area of 10 major crops (1990-2000)

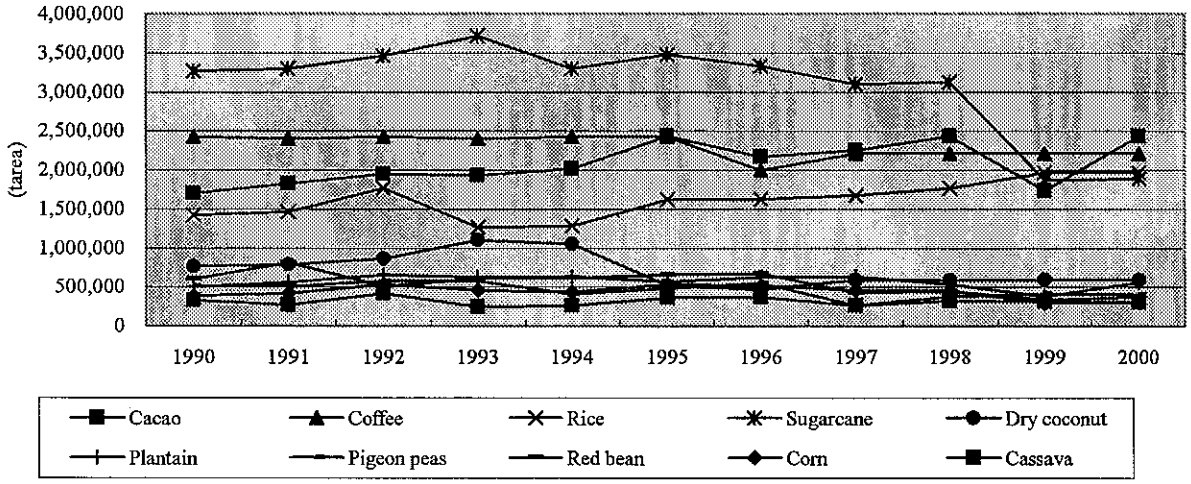


Figure J.2.3 Changes of Production of 10 Major Crops (1990-2000)

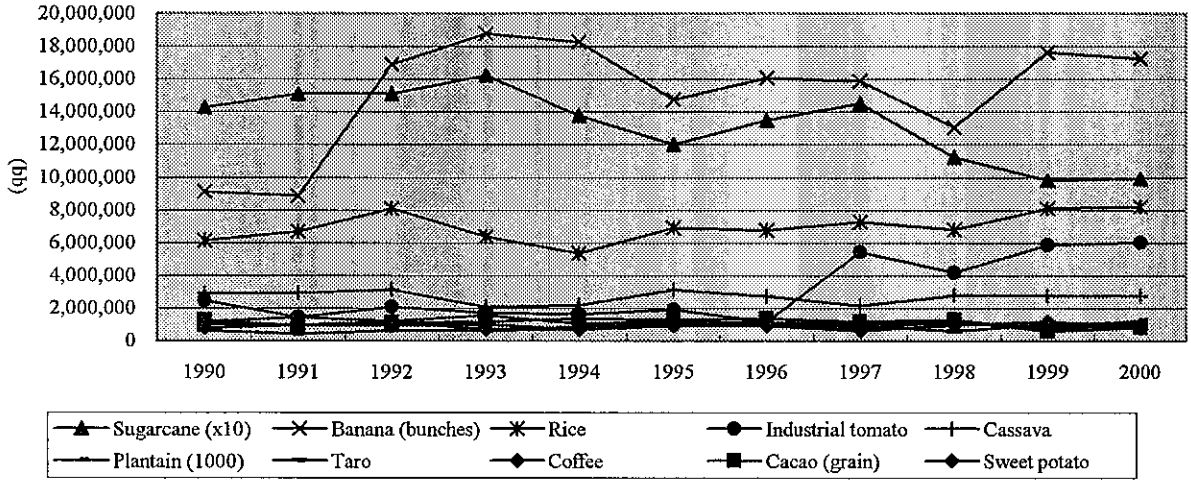


Figure J.2.4 Percentage of agricultural product import by item (1992-2000)

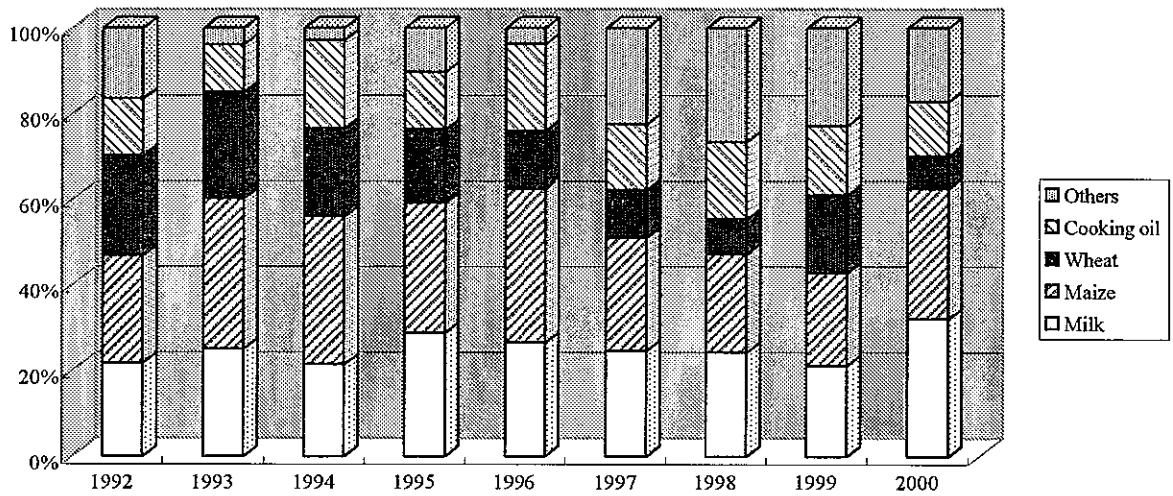


Figure J.2.5 Land use plan map of La Luisa Area