5.2.7 Pilot Project for Agricultural Infrastructure Development

(1) Outline of the Project

The project area is located along the national road No.1, Santo Domingo – Monte Plata road, however there are no passable access roads inside the farming area distributed. Farm road development together with drainage improvement aims to improve road conditions in the farming area. The layout of the roads is shown in Table 5.8.

Table 5.8 Pilot Project for Agricultural Infrastructure at La Luisa Area

Item	Description	Quantity
1. Main Farm Road		
1) Main Farm Road No.1	New construction	L= 1,980m
2) Road Crossing	Pipe culvert	7 no.
2. Branch Farm Road		
1) Branch Farm Road – 1	New construction	L= 806m
2) Branch Farm Road – 2	New construction	L= 539m
3) Branch Farm Road – 3	New construction	L= 697m
4) Branch Farm Road – 4	New construction	L= 729m
5) Branch Farm Road – 5	New construction	L= 331m
	Total	L= 3,102m
6) Road Crossing	Pipe culvert	10 no.
3. Drainage Improvement		
1) Dredging drainage ditch	50m at road crossing	L= 850m

(2) Progress of the Project

The farm roads were designed by the Study Team. IAD provided heavy machineries for construction and the Study Team was in charge of overall supervision for whole construction stages. The construction works was done between October 2002 and February 2003 during dry season.

5.2.8 Establishment of Experimental Farms

(1) Outline of the Project

Originally, three experimental farms were supposed to be established in La Luisa to collect basic data on the alternative crops to sugarcane. These farms were planned to be developed by the JICA Study Team and to be mainly managed and maintained by an expert dispatched by JICA to IAD. The initial plan composed of three 2-ha farms according to three soil types. Fruit trees were planned to plant in half of the area and hybrid acacia seedlings in another half for each site. However, the term of the JICA expert was unfortunately shortened and the original plan needed to be revised because the management of fruit trees was very difficult without the JICA expert.

In the end, the pilot project established two experimental farms and constructed a warehouse for agricultural machinery. Two demonstration farms (2.6 ha and 2.0ha) were established after getting consent from land

owners to use as an experimental farm. The larger farm was located next to the JICA-IDIAF Fruit Tree Gene Bank Plot and divided into halves: one part for hybrid varieties of *Acacia Mangium* (*A. mangium* x *A. Auriculiformis*) and the other part for Tahiti Lemon and guava seedlings. The smaller farm, which was next to the Ozama River, was fully planted with the hybrid varieties of Acacia on 13th and 14th October 2002, after the flooding season finished. These plantings were monitored by IDIAF and Sub-Secretaría de Estado de Recursos Forestales (SSERF).

(2) Progress of the Project

In January 2003, some livestock farmers cut the wire of the fence of the smaller farm plot with the Acacia trees and animals damaged about 80% of planted crops. A JICA expert worked with SSERF repaired the fence and planted seedlings again. In February or March, two cows jumped into the farm and damaged some Acacia trees so the JICA expert replanted seedlings again.

Based on the field observation on May 20, 2003, the growth of the Acacia seedlings varied from place to place. In the larger experimental plot, some Acacia trees grow up to 2-3 meter height. On the other hand, the Acacia trees along the Ozama River are generally smaller (some of them are about 0.5 meter height), probably because most seedlings were replanted after the damages by cattle in January and the competition with other plants is more severe due to vigorous weed growth there. As for fruit trees, most lemon and guava seedlings are taking roots into the soil and the tree height is about 1-2 meter for all of them. Some of the lemon trees have disease symptoms but the growth of guava trees looks good there.

5.3 Model Area of Group B : Los Hatillos I Area

5.3.1 Natural Conditions

(1) Topography and Geology

Los Hatillos I at the foot of Eastern Mountains, which belongs to Hato Mayor Province in the east of the Dominican Republic, is located at the 4km southeast of Hato Mayor where is the seat of the provincial office and at the 33km north of San Pedro de Macoris which is one of the principal cities in the country. The farmlands of the area are at longitude 69°13' W and latitude 18°44' N. The farmland areas are gently undulated hills within 60m to 100m in altitude. The area mainly consists of igneous rocks in the Cretaceous.

(2) Meteorology

The climate data of Hato Mayor meteorological station indicate that there is 1,600-mm annual rainfall in average. From April to November, it rains more than 100-mm per month and the rainfall exceeds 200-mm in May, August, September and October. Even in dry season, there is more than 50-mm rainfall. The maximum 24-hour rainfall, 237.3 mm, was recorded in August 1979.

The average temperature ranges from 30 to 34 degree Celsius while the minimum temperature is between 18

and 22 degree Celsius. Annual average temperature is 26.2 degree Celsius. The vegetation map indicates that Los Hatillos is a part of subtropical humid forest and there is rich natural vegetation around the study area.

Table 5.9 Climate Data - Hato Mayor

Month		1	2	3	4	5	6	7	8	9	10	11	12	Total
Rainfall	(mm)	65.8	45.5	63.2	133.3	230.1	156.8	113.7	212.8	203.5	228.6	115.0	66.2	1,634.5
Temp.-Max.	(degree)	30.4	30.7	31.8	32.3	32.7	33.5	33.9	34.0	33.5	32.8	31.6	30.5	-
Temp.-Avg.	(degree)	24.1	24.3	25.2	25.8	26.8	27.5	27.7	27.7	27.4	26.9	25.8	24.7	-
Temp.-Min.	(degree)	17.8	17.8	18.6	19.4	20.9	21.6	21.6	21.5	21.4	21.0	20.0	18.9	-

Note: Rainfall:1974-1990, Temperature:1953-1987
Source: Oficina Nacional de Meteorologia

(3) Water Resources and Groundwater

Because the area is hilly, there are no rivers that can be tapped for irrigation. There are some streams in farms but the water amount is limited. Groundwater development is also difficult due to the geological condition of the area that the impermeable igneous rocks appeared at shallow depth of ground. In residential areas, there are some shallow wells but they are not used for potable water because of bad water quality.

(4) Soil

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 to the survey for farmland zoning done by SEA in September 1999, the area around Los Hatillos is classified into V (relatively low productivity and poor drainage but possible to increase productivity).

5.3.2 Socio-Economic Conditions

(1) Demography

The population of Los Hatillos, according to the 1993 Census, is 70 because the settlement had not been implemented. The ONE estimates that the population growth rate of Hato Mayor Province is about 1.1% per year. Based on the investigation of the Study Team, the population of Los Hatillos is estimated to be 2,705 in 2001.

(2) Income and Expenditure

The ONAPLAN "Focusing on Poverty" survey indicates that the share of poor households in Los Hatillos is 100%, and 78.9% in Hato Mayor as a whole.

The household survey of this Study shows that an average monthly personal income is RD$3,450, which is slightly lower than the average monthly household income of RD$4,285. The minimum wage is now

officially set between RD$2,075 to RD$3,415 depending on the size of company. Thus, the income of Los Hatillos is a little higher that the minimum wage.

(3) Industry Structure

1) Agriculture and Animal Husbandry

The agricultural activity of Los Hatillos I composes both crop farming and livestock and they are extended in mixed 179 plots and 551 ha (8,770 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 5.10 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. Agricultural credit scheme has been provided by Banco Agricola until 1998 when credit schemes were suspended due non payment of creditors.. Credit for livestock is more viable as payment rates are higher.

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) Other Industry

In the municipality of Hato Mayor of Hato Mayor Province to which Los Hatillos belongs, a Free Zone was established in 1990. Now, three sewing companies are operating in the Zone. As of 2000, it employs 518 persons. Outside the Free Zone, there are also small companies that produce construction materials and food products, such as breads, cheese, etc. The household survey conducted in the Los Hatillos area indicates that 30.9% of the residents are employed in agriculture and 27.3% in commerce.

With some duplicated sales channel, about half of the farmers sell crops to middlemen, and half sell to local market including public market of Hato Major and San Pedro de Macoris. Few trade for export and to a supermarket in Santo Domingo. About 40% go to local market by their own vehicle or rent truck.

(4) Social Infrastructure

1) Road

The road from the National Road No.4 (San Pedro De Macoris - Hato Mayor) to the community is paved (length 1.1 km, width 7.5 m). The local access roads inside the community are not paved (width: ~ 7.3 m). The road inside the Asentamiento extending to the southeast is not paved with the width of 6 m.

2) Domestic Water Supply

Los Hatillos has two water supply systems constructed in 1993. One system covering east side of the town provides water to people from the filtration plant of Iguamo River, which is about 8km south of the community. The water is stored in an elevated tank near school, and then delivered to each house. However, the system had been functional only for six months after the completion of construction in 1993 due to lack of pressure. For another system covering west side of the community, water was supplied from two wells using submersible pumps. The system is also not functional as one well broke down three years ago. At present, only one well servicing 40 houses is functional. Since water quality of the well is not good for drinking, the water delivered is utilized for washing and bathing only. Each of four to five households has

one shallow well for washing and bathing. Rainwater is also important water source for households. Most of the households pay RD$20 per 5 gallons of potable water, so that expenses for potable water is a big burden to the household budget.

3) Sewerage

Basically each house has flush toilets connected to sewerage system. The sewage is collected with pipe and treated in a biological treatment pond.

4) Electricity

The electricity comes from Hato Mayor. The local electricity supply lines with 110 V are distributed all over the community. The transformers are also located at regular interval.

5) Telephone

Telephone service is available. Public telephones are located e.g. in front of the police office.

6) Housing

The settlement of Los Hatillos were planned and constructed by public sector, including roads, housing lots, water supply, sewerage and public facilities (school, clinic). Most houses of block structure were built by public sector in the same project. Some on the houses along the fringe of the community are simple wooden houses.

7) Public Health

There is a Rural Clinic in Los Hatillos, providing consultation, primary medical care and some medicines, staffed with one doctor, one nurse and an assistant nurse. The doctor daily receives 35 to 40 persons for consultation. Types of diseases for consultations are 1) flu and respiratory diseases (80%), 2) gastrointestinal diseases, including parasitic ones (10%), and 3) others (10%). The doctor and nurses sometimes coordinate vaccination carried out by health promoters and provide health education, such as family planning. According to the doctor, major problems of the clinic are 1) limited space, 2) insufficient medicines, such as antipyretics, anti-inflammation, or antibiotics like penicillin, and 3) no worker for cleaning and washing.

There is a botica popular in the same building of the rural clinic and managed by another person than those working for the clinic. More than 55 types of medicines are stored in the botica popular at the time of the visit. The clerk said that sometimes antipyretics, medicines for epilepsy and gastrointestinal diseases and vitamins are out of stock.

According to the reported occurrence of diseases during the period from April 29 to June 2 of 2001 by the rural clinic, 64% of the diseases are high fever and respiratory, while 16% and 11% are accounted by

diarrhea and vaginal illness. 44% cases of diarrhea are reported as those of children of less than five years old (7%-less than one years old, and 37% - one to four years old).

There are nine health promoters and a supervisor employed by SESPASS in Los Hatillos and they carry out health investigations, vaccination and some health education in the area. There is a health committee with 15 members. The committee sometimes cooperates with health promoters, and participates in health education and request some projects to NGOs, such as Medicus Mundi Madrid (Spain), ADOPLAFAM (domestic) or to Red Salud (USAID). In the area, coordination and cooperation among the rural clinic, health promoters and the health committee seem to be comparatively well organized.

Almost all houses have individual flash toilet and sewerage system connected with pipes (most of the residential building were provided at the time of the resettlement and they are quite standardized in terms of floor area, number and layout of rooms, employed materials and appearance). However, people have to bring water to their toilets to flash because the water supply system is not working properly. There is no waste collection service in the area. Every household burns or throws garbage near the house.

8) Education

There is a large Centro Educativo de Los Hatillos in the community, which serves as a basic level school in daytime (morning and afternoon shifts) and as a school for adult education at night. Outlines of the area are as follows.

- Number of Pupils for Basic Level

Grade	Pre-primary	1st	2nd	3rd	4th	5th	6th	7th	8th	Total
Classes	4	5	6	5	4	3	2	2	1	32
Students	128	173	273	183	169	121	87	56	40	1,230

- 32 shifts of teachers with 16 teachers
- 16 classrooms, and a library with electricity supply
- Water supply system (nor working now), flash toilets
- Site area: 11,017 sq.m, Floor area: 746 sq.m
- Number of students for Adult Education (at nights, 18:00-21:30) (1999-2000)

Grade (Corresponding grade at Basic Level)	1st cycle				2nd cycle				3rd cycle		Total	
	1st year		2nd year		1st year		2nd year					
	(1 – 2)		(3)		(4 – 5)		(6 – 7)		(8)			
	M	F	M	F	M	F	M	F	M	F	M	F
Students	7	21	9	20	8	20	8	21	7	15	39	97
	28		29		28		29		22		136	

- Five teachers for adult education

According to the director, problems of the school are, 1) number of classes(rooms) and teachers are not enough, 2) no meeting room, 3) few teaching materials and little number of books in the library, 4) no water supply (currently supplied by the fire fighting brigade). According to the person in charge of social

development at IAD project office, largest educational problem in the community is "no secondary (medium level) in the community".

5.3.3 Development Plan

(1) Income Generation Approach

1) Agricultural 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) raising agricultural production efficiency, 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.

2) Micro-industry Development

Los Hatillos is located near Hato Mayor, which is the capital city of Hato Mayor Province. Additional income generation depends on how to take opportunity for employment in Hato Major and at existing factories or those located in future near the city. Introduction of technical course of the medium level education may contribute to getting employment opportunity. In addition, vocational training by INFOTEP shall be promoted through the regional office in Hato Mayor.

(2) Living Conditions Improvement Approach

In order to secure the basic living conditions and improve living conditions, the following plans are proposed..

1) Road

Paving of the road is considered in a long period. Public transport service should be introduced to facilitate transportation to Hato Major for school and business.

2) Domestic Water Supply

It is required that safe water should be regularly available utilizing the existing water supply system of INAPA.

3) Public Health

To solve the problem of small space, a residence for a doctor should be constructed. Additional medicine and material stock as well as equipment should be provided by SESPAS.

The serous problem on public health in the area might be water borne diseases, such as diarrhea. Rehabilitation of the water supply and education and promotion of sanitary behaviors with water and foods should be implemented immediately. Taking advantages of well organized cooperation for health promotion activities among the clinic, health promoters and heal committees, effective health promotion activities should further be enhance to solve complicated problems, such as prevention of women's diseases or family planning (some families has many children with small age-interval in the area).

4) Education

Completion of basic-level education by all children is the common goal of the plan. To meet the standard of SEE for the estimated population of Los Hatillos in 2015, 23 classrooms and 46 shifts of teachers will be required by 2015, while current numbers of classes by grade vary from one (8th grade) to six (2nd grade). Recommendable plan is to set up five classes from initial level to the 8th grade of the basic level, or to increase by seven classrooms and by 14 shifts of teachers. Construction of a meeting/conference room is also proposed for the school to play a core role in promotion of information exchange and mutual edification activates among teachers in neighboring areas.

As for the medium level education, introduction of a technical course can be proposed to promote industries and to correspond to higher demands for the quality human resource. Establishment of industrial courses of the medium-level education can be recommended for the industrial development of the area and for meeting with requirement for higher level of labor force in future. It is recommended that the location of the establishment be somewhere in Hato Major. As educational development plan of the area, measures for better access to the course located in Hato Major are proposed. Adult education has been already carried out by SESPAS in Los Hatillos. In the future, lifetime learning should be promoted to acquire practical knowledge and skills, such as computer or English conversation lessons, or to enjoy cultural courses. The promotion might be done based on voluntarism and self-help.

5) Sewerage

According to the water quality of treated discharging water, the existing sewerage system should be rehabilitated and improved.

6) Solid Waste Management

Recycling should be promoted in order to decrease discharged amount of solid waste and to utilize resources efficiently. Recycling can be profitable business selling metals, glass etc. It is indispensable to have cooperation of residents and separation of waste. In the first step, someone or NGOs should guide and educate local people to understand importance and way of recycling.

7) Electricity

Expansion of regular and reliable electricity system should be recommended.

8) Telephone

Improvement of telephone system is recommended.

9) Housing

Housing is the place for basic life and is basically of individual responsibility. Public sector should promote and guide people to be able to have safe and sanitary houses. Among housing policies, provision of housing loan and enforcement of standard building regulation will be effective.

5.3.4 Selection of pilot projects

Through a series of workshops held with farmers in Los Hatillos I, safe water supply, pasture improvement, vaccination of cattle, soil analysis, education, local industry development were finally proposed. These alternatives were examined from the viewpoint of the selection criteria of pilot projects. Land use planning with small scale cultivation experiments using topographic maps made by the Study Team after soil analysis was selected as the most essential for the farmers in Los Hatillos I. Safety drinking water treatment was also an urgent problem to be solved. These two projects, "the land use plan" and "the safety drinking water " were selected.

5.3.5 Pilot Project for Land Use Planning Support

(1) Workshop on Set-up of the Project

To set up the Pilot Project for Land Use Planning Support in Los Hatillos I, people carried out a series of workshops in June 2002 with attendants in the range of eleven to twenty farmers.

(2) Outline of the Project

During the series of workshops from May to November 2001, the farmers propose to have necessary

information on the appropriate land use. In Los Hattilos area, the land was distributed without any soil survey, where land conditions differ area by area with prevalence of thin topsoils. The objective of the pilot project, is: (1) to have a proper information on land and soils, (2) to support the farmers and IAD/SEA extension staff about land use planning (preparation of design on land use improvement for model farms by type of land use) , and (3) to design improve land (improved farming system). The Pilot project in the study shall cover (1) to (3). However, it is proposed that farmers will implement the demonstration activities themselves with necessary support from SEA/IAD. Item of (3) was added to the originally prepared Pilot project with a series of discussion between IAD and Study team. The summary of the original project plan made in December 2001 is shown below.

Beneficiaries:

All settlers in the Los Hatillos area.

Contents:

To conduct soil survey and to classify the land in entire Los Hatillos I area, and to prepare the design on the establishment of demonstration farms with participation of farmers' group. Following activities are included.

- Soil survey and land classification with preparation of maps on slope, present land use, soil taxonomy and land classification by typical land use
- Questionnaire survey on present land use and intention on improvement of land use
- Design of demonstration farms for selected typical land use

(3) Progress of the Project

According to the idea of the Study Team, JAD carried the auger soil survey for 79 parcels out of 148 parcels in the entire area. Physical and chemical soil analysis was made for four representative soil type which were identified in the soil auger survey. The maps of slope, present land use, soil taxonomy and land classification were produced. Working committee on the Pilot project was formed with about 20 members. They are eager to learn and attend every workshop. Basically the members of the committee accepted the ideas. During workshop, the implementation plan of the Pilot project was formulated with emphasis on the full participation of farmers' group, not only to attending in soil survey for individual plot, but also to group activities for identification of problems and remedy in their land use. However, most farmers are not so cooperative in the project activities. One the significant reason maybe the farmers' antipathy to IAD since establishment of the settlements.

Finally three types of land classification maps were prepared for vegetables cum annual crops, orchard and pasture with the soil survey under the Pilot project. Based on the land classification maps, six pots of demonstration plats, every two plats for three kinds of lands use were selected according to land classification.

Then the Planning Office of IAD central office undertook tthe formulation of the plan to establish demonstration plot, which include following items (refer to Figure 5.11 to Figure5.15);

- Cultivation plan(cropping plan with requirement of farm inputs)
- Cost estimation on development of farm land (the development cost of small-scale pumping irrigation facilities)
- Cost and return

The Department of Production and Planning made a field survey together with Department of Engineering regarding the establishment of the demonstration farms. They recommended that the demonstration farms of orchard and pasture shall be established as soon as possible and observed that the establishment of demonstration farms for vegetables cum annual crops takes time in preparation of the implementation plan. A proposal was made by IAD that the farmer-cooperatiors for orchard and pasture will be provided with production credit from Agricultural Bank with a special arrangement by IAD. However, the farmers rejected the proposal because most of the farmers were indebted or are not interested in getting credit. Then, IAD office in Los Hatillos tried to secure support from IAD central office and SEA office in Hato Mayor. Unfortunately almost no support were extended to the farmers except for 50 gallons of fuel from IAD and provision of rental tractor from SEA because IAD has no budget to implement the demonstration farm. The farmer-cooperators for pasture prepared land and establish improved pasture at their own expense. The farmer-cooperators for the orchard was still waiting for the financial and technical support from IAD in the period of field survey on final evaluation.

5.3.6 Pilot Project for Improvement in Water Use and Supply

(1) Workshop on Set-up of the Project

The pilot project of Improvement in Water Use and Supply has two components:

- Health Education.
- Drilling for the construction of deep wells.

The community members that participate in the project were mostly women. The women are members of the Club de Madres and Asociación de Mujeres and it looks as if exist differences among both organizations. A committee was selected to be integrated to the works of the pilot project and they were chosen members of both groups. In some occasions the participants in the workshops belong to one of the two organizations and in the best cases they mixed in a very uneven proportion. Although the associations stay active and they participate in good number in their internal meetings, in most of the cases the attendance to the workshops was low, attributable partly to the differences between the associations. In successive workshops it was explained continually that the study of the availability of underground waters would only be made, but that will not be installed any system of supply neither of pumping. In spite of knowing that drilling would only be made, the community maintains the enthusiasm because in the place a strong necessity of drinking water

exists.

(2) Outline of the Project

Before formulation of plan of operation, the scope of the pilot project; i.e., major components were designed for improvement of water use and the component for improvement of water supply is limited to test boring to investigate availability of groundwater; was explained to the participants of the set-up workshop. The following process for the project was proposed by the Study Team and agreed by the participants of the workshop.

1) Survey on Current Water Use Conditions 50 to 100 households
   - Questionnaire Survey on Manners of Water Use and Water-related Diseases
   - Water Quality Tests in Houses

2) Trial of Individual Water Treatment and Good Manners of Water Use
   - Seminar on Water and Health
   - Workshop on the Results of the Survey and Good Manners of Water Use
   - Demonstration of Individual and Communal Water Treatment (Chlorination, Boiling or Filtering) and Other Good Manners of Water Use
   - Trial Individual and Communal Water Treatments (two to three months) and Other Good

3) Manners of Water Use
   - Workshop on Evaluation of Trial Individual and Communal Water Treatments and Other Good Manners of Water Use

4) Workshop on the Plan of Operation for Individual and Communal Water Treatments and Other Good Manners of Water Use

During the workshops for formulation of plan of operation, participants showed intention to carry out questionnaire survey themselves, and activities for discussion of the survey items and training for the survey were added in the plan of operation.

For water treatment in public facilities, installation of filters was discussed with the conditions of 10% contribution of initial costs and establishment or nomination of an organization for operation and maintenance of each of the filters. Installation in the school, the rural clinic and the pre-school/meeting house for women's association was agreed.

(3) Progress of the Project

1) Improvement of Water Use

An implementing organization was established in the set-up workshop.

Based on plan of operation formulated during the set-up workshops, technical specification was prepared and explained to NGOs. After the submission of quotations from NGOs, an NGO named CEDEE (Centro

Dominicano de Estudio de la Educación) was selected. A contract was concluded with the NGO for the implementation of the project. The selected NGO implemented the project under the supervision of the Study Team and the participation of IAD counterparts.

(a) Survey on Current Water Use (Questionnaire survey on manners of water use and water-related diseases)

In late July 2002, a questionnaire survey with 90 households was carried out to understand the current conditions (before the implementation of the pilot project) of water use within houses. Questions included family composition/income/expenditure, volume of water used in rainy/dry seasons, manners of storing water in houses, water treatment within houses, morbidity of families.

At set-up meeting members of the Executive Committee expressed an opinion that they wand to participate the questionnaire survey, and all parties (CEDEE, IAD and JICA Study Team) agreed the participation by volunteers from the two women's associations. Before visiting houses for interviews, explanations of the questionnaire and modifications for easy and proper interviews by the volunteer participants were made, followed by training for the questionnaire survey, such as exercises with other volunteers and additional explanations and instructions. Interviewers worked in pairs. The results of the questionnaire survey are summarized below.

Income/Expenditure: Major portion of the households earn RD$ 1,200-2,500 or RD$ 2,500-5,000 in a month. Around a half portion of the houses spend less than RD$ 100 to obtain drinking water. More than one fifth of the households spend RD$ 200-500.

Volume of Water Consumed: In rainy and wet seasons, almost constant volume of water, as much as 235 liter/day/household, is consumed, 0.5% higher in dry seasons. Shares in volume by type of water source are given below. Naturally, used of rainwater is quite limited in dry seasons. Considerably smaller volume of well water is consumed in dry seasons, compared with wet seasons. People have to buy expensive water from tank track or bottled water in dry seasons. Rainwater is an important source of drinking water and peopled have to buy bottled water in dry seasons.

More than half of the households responded that main source of drinking water was rainwater in rainy seasons and bottled water in dry seasons.

Storing Water in Households: Drinking water is stored in Plastic (90%), Aluminum (7%) or Pottery (3%) containers. The containers for drinking waters are placed in Kitchen/Dining (64%), Living Room/Family Room (20%), Other Rooms in the House (14%), or Outside the House (2%). The container for drinking water has Lid/Top/Cap (90%), and covered with lid/top/cap (78%) at the time of the interview. Besides, the container for bathing water is placed Outside the house (44%) has Lid/Top/Cap (26%) and was covered with lid/top/cap (22%) at the time.

Water Treatment in Households: Majority of the households (79%) treated water, of which 86% (or 68% of the total) treat water with chloride. However, 38% of the households that treated water (or 30% of the total) treat water one in a week, and 7% (or 5.5% of the total) treat with aspirin. There might have problems in methods and frequency.

Morbidity of Family: It would be difficult to identify that some diseases are caused by bad water quality or by other reasons such as bad conditions of foods, especially those diseases are faecal-oral ones. It would also be difficult to get reliable information from answers of the residents through the interviews by volunteer interviewers. Therefore, questions for morbidity were made quite simple. In the last year, 70% of the households answered that some member of the family had some disease. In the same period, 57% of children, 24% of adult women and 13% of adult men affected some diseases.

(b) Water Quality Analysis

Various types of source water were analyzed, including Individual/Communal Wells (5 samples), Tank Truck (2 samples), Bottled Water (just after opening, 2 samples), Bottled Water (opened before a while, 2 samples), Small Packed Water (Agua en Fundita, 1 sample, normally sold in RD$ 1 and children frequently buy and drink), Lagoon/Dominican Spring (manantial dominicano) (2 samples), and Water stored in households (22 sample).

Faecal Coliform (Coliformes Faecales) was detected in 84% (76 samples), including one sample of bottled water just after opening. Pseudomonad (Pseudomonas) was not found in any samples. All water form wells, including those stored in households has Hardness of more than 300mg/liter. Samples of water from tank truck had hardness of 274 mg/liter or 306mg/liter. The limit of hardness in Dominican Drinking Water Standards is 500mg/liter and no samples had higher hardness than the limit.

2) Improvement Activities

"Workshop on Results of the Survey and on Good Manners of Water Use" was held before "Seminar on Water and Health" not according to the original plan.

(a) Workshop on Results of the Survey and on Good Manners of Water Use

Workshops for presentation of results of questionnaire survey and discussion of ways of analysis, as well as for formulation of action plan were held from middle to late August 2002. An action plan formulated in the workshop is shown below. The results of the water analysis were not presented before the planning workshop due to delay in works for water quality analysis.

As a result of the planning workshop, original process of 'Trial – Evaluation – Plan for Full Implementation – Full Implementation' was change to 'Plan – Promotion/Campaign for Full

Implementation.

Action	Contents	Objective	Responsibility	Resource	Month
Workshop to improve sensitivity on water quality	Results of the survey	To know conditions of water use and to improve them	CEDEE, IAD, Women's Assoc.	Survey Results, etc.	Sept.
Educational visits family by family to improve water use	Methods to improve water use and environment	To identify manner water use and maintenance	CEDEE, Women's Assoc. PTA	Educational Materials	Oct. – Nov.
Training and supply chlorides, etc.	Information for adequate use of chlorides in household	To use chlorides adequately in each households	Women's Assoc. IAD Students	Chlorides Drips Sticker	Oct. –
Promotion/campaign and health education in each family	Methods and recommendations to reduce contamination	To apply know-how to prevent diseases and to improve environment	Those related to the School Women's Assoc. Health Group	Educational Materials	Nov.
Installation of filters to purify water	Use and maintenance of filters	To make contribution and to install filters	CEDEE	Team for Operation	Nov.

(b) Seminar on Water and Health

On September 7, Seminar on Water and Health was held and results of questionnaire survey and water quality analysis were made public. A theatrical company invited to the seminar played a social drama on water use. Presentation on water and health were also carried out. As many as 82 persons, including members of the two women's associations, IAD, CEDEE as well as director of the school participated the seminar.

(c) Workshops and Education for Improvement of Water Use.

The following activities were undertaken from early September to early October. The option of Boiling was not applied due to hardness of water and higher costs.

i) Workshop of Self-esteem and control of conflicts
ii) Workshop for discussion on how to implement campaigns (Creative Workshop)
iii) Workshop for promotion of organization activities
iv) Meetings with the director of the school to discuss on participation of the school students to the campaign and on installation of a filter.
v) Workshop on improvement of water use
vi) Workshop on collection of residents' contribution of filters
vii) Workshop for formulation of implementation plan of promotion and campaign
viii) Workshop for formulation of implementation plan of promotion and campaign

(d) Workshop on water treatment (chlorination)

A workshop for education on water and diseases, on training and delivery materials for chlorination

was held on October 11. Number of participants, both men and women, reached to 66 persons.

(e) Promotion/campaignngn for better water use

Following promotion activities and campaigns were carried out from middle October to early November.

i) Many students delivered brochure, explained importance of improvement in water use and how to chlorinate, and put stickers on the walls of entrances of houses, applying class hours of public services in social study of the eighth grade, on October 12 and 13. Members of the health committee also participated.

ii) Surveillance for monitoring chlorination in each of houses.

iii) Participation to the town festival (fiesta patronales, playing social drama on water use by a theatrical company). Approximately 400 persons (200 men, 100 women and 100 children) watched the play.

vi) Wall paint in the community center and the school.

vii) Paining/drawing posters for the campaign by school students.

viii) Composing Poems

3) Installation of Filters

At the early stage, filter installation was planed in the school, the rural clinic and the kindergarten (pre-escolar)/meeting room of a women's association. However, installation in the rural clinic was not undertaken because of the difficulty in collection of the contribution. No filter was not installed in kindergarten/ meeting room because of the problem of security, maintenance, obtaining source water and collection of the contribution and maintenance cost. A large system of filter, with purification capacity of 12 gallon/minute and auto-cleaning system, was installed. Contribution of 10% was spent as a part of costs for purchase and installation works.

For supply of source water of filter system, use of a well drilled by JICA was determined. Another NGO, named Ce-Muher, undertook the work as a part of project of water supply in the school and neighboring houses, after knowing the data on safe yield and water quality (problems of hardness and coliform).

4) Construction of test wells

Workshop for construction of test wells was held in Los Hatillos on 3 July 2002. A member of the JICA study team explained contents of the construction plan to the participants of the workshop. In the workshop, they formed a committee for the project and the plan of operations by themselves. Responsibilities of the committee in each progress of construction work, such as selection of proposed drilling sites and

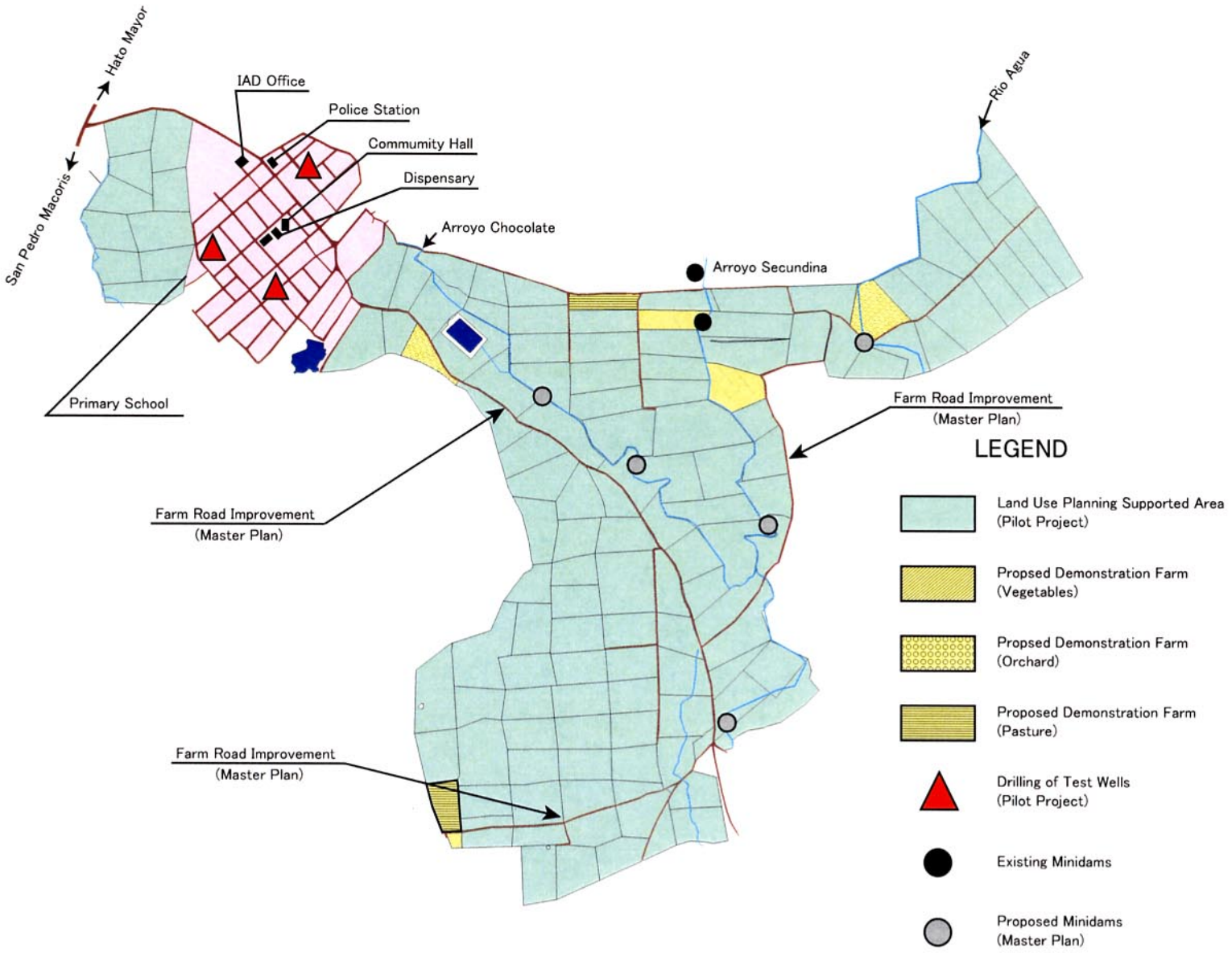

Figure 5.11 Location Map of Pilot Projects , Los Hatillos I Area

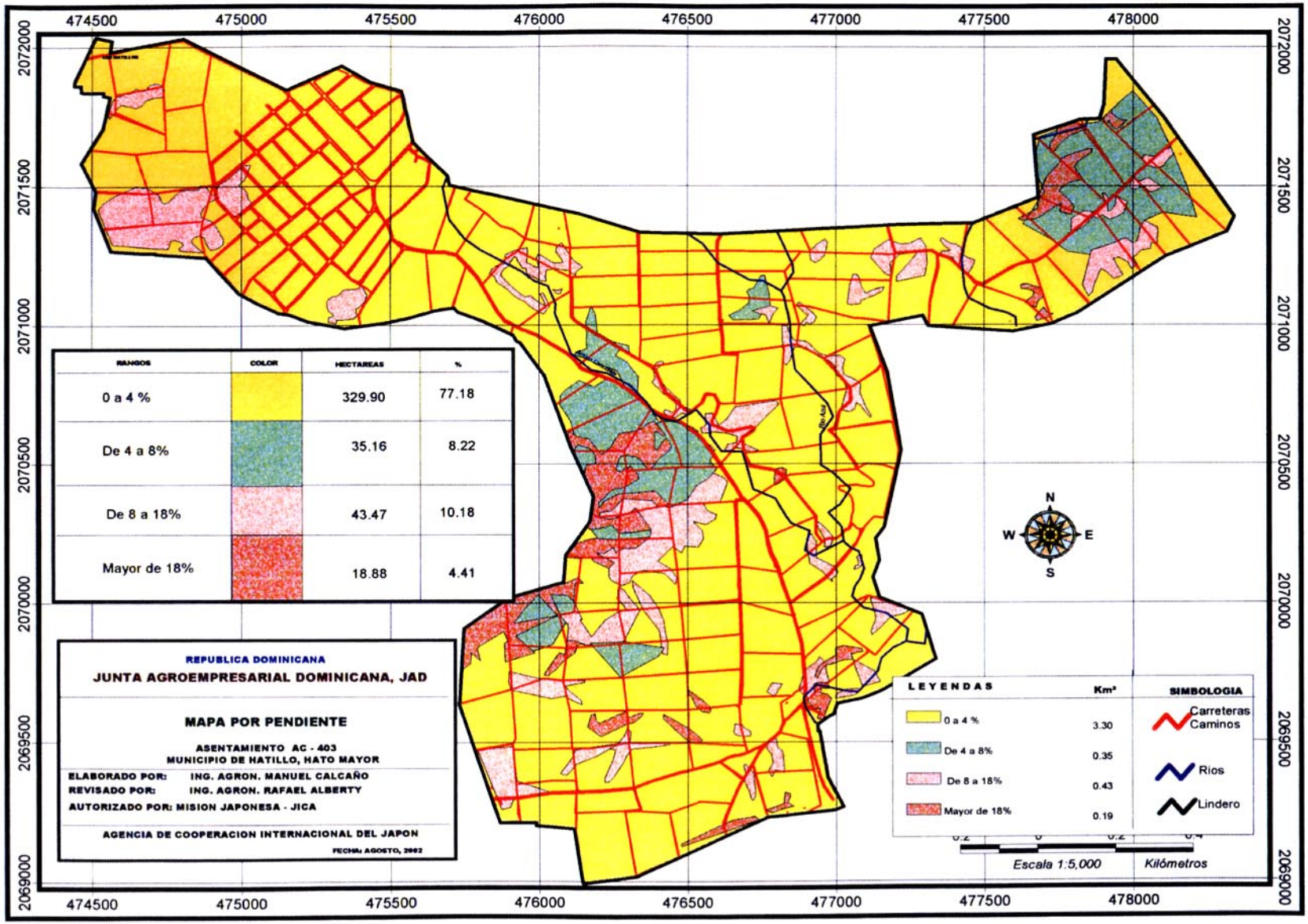

Figure 5.12 Map of Slope, Los Hatillos I Area

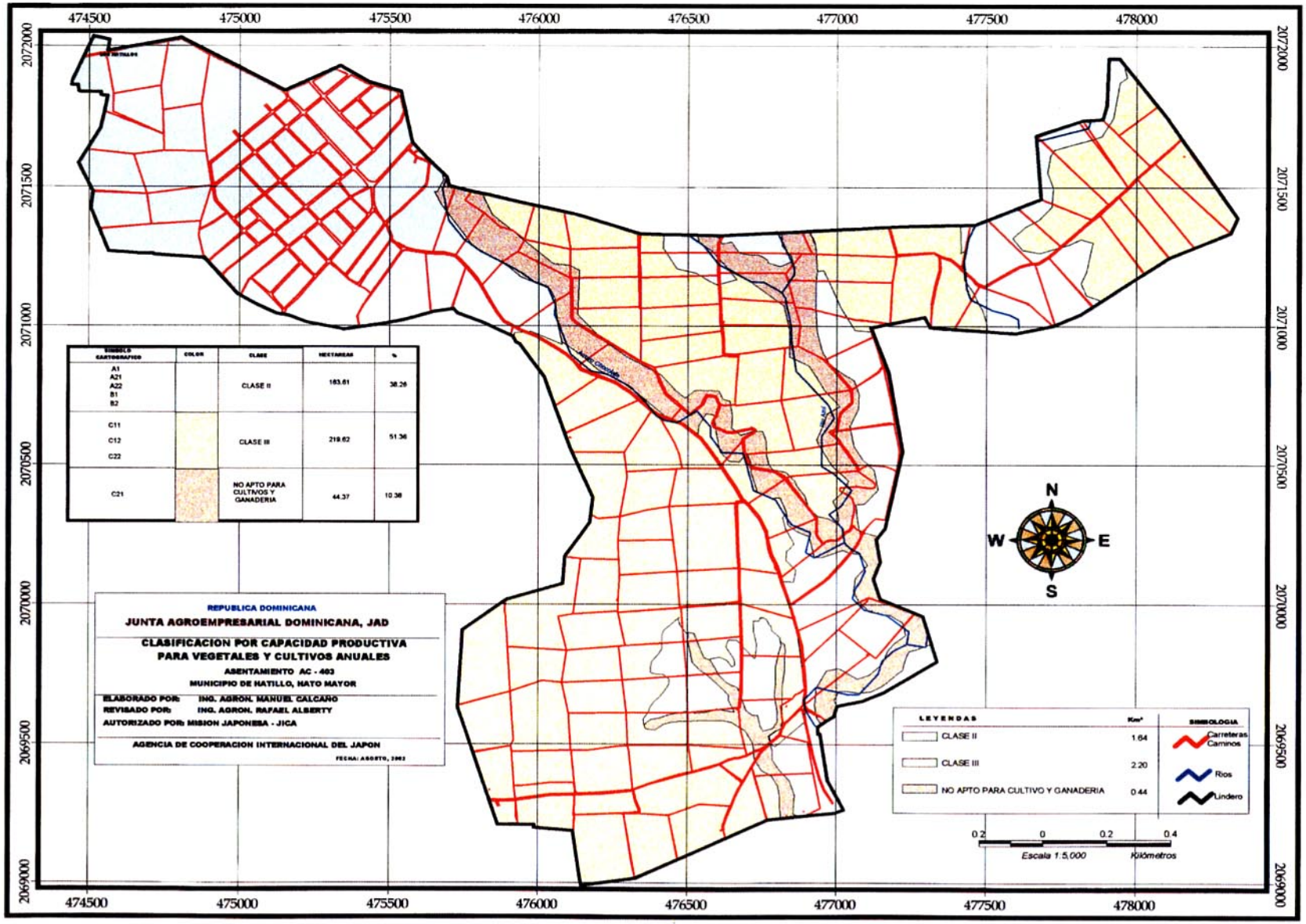

Figure 5.13 Map of Land Classification, Vegetables and Annual Crops in Los Hatillos I Area

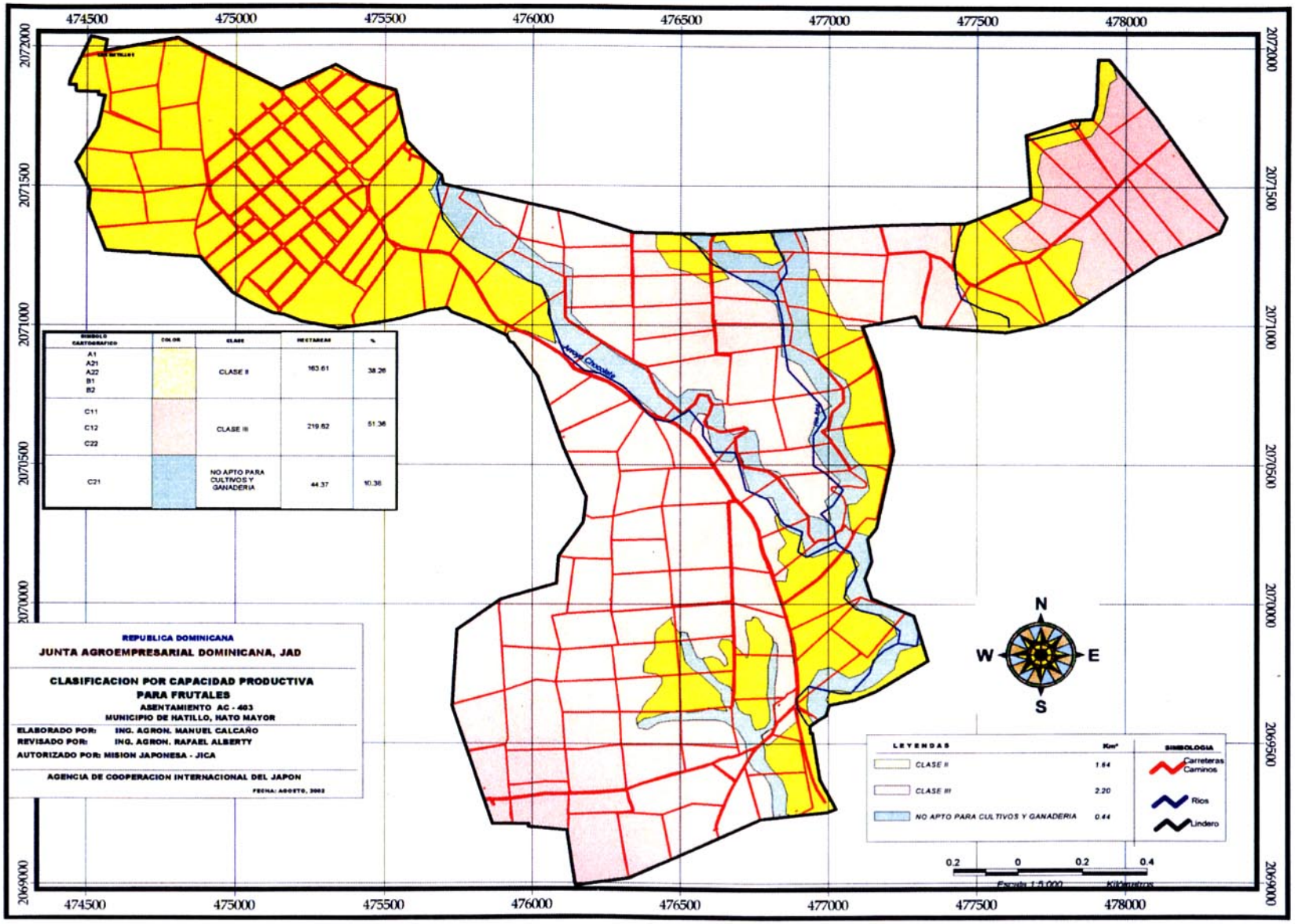

Figure 5.14 Map of Land Classification, Orchard in Los Hatillos I Area

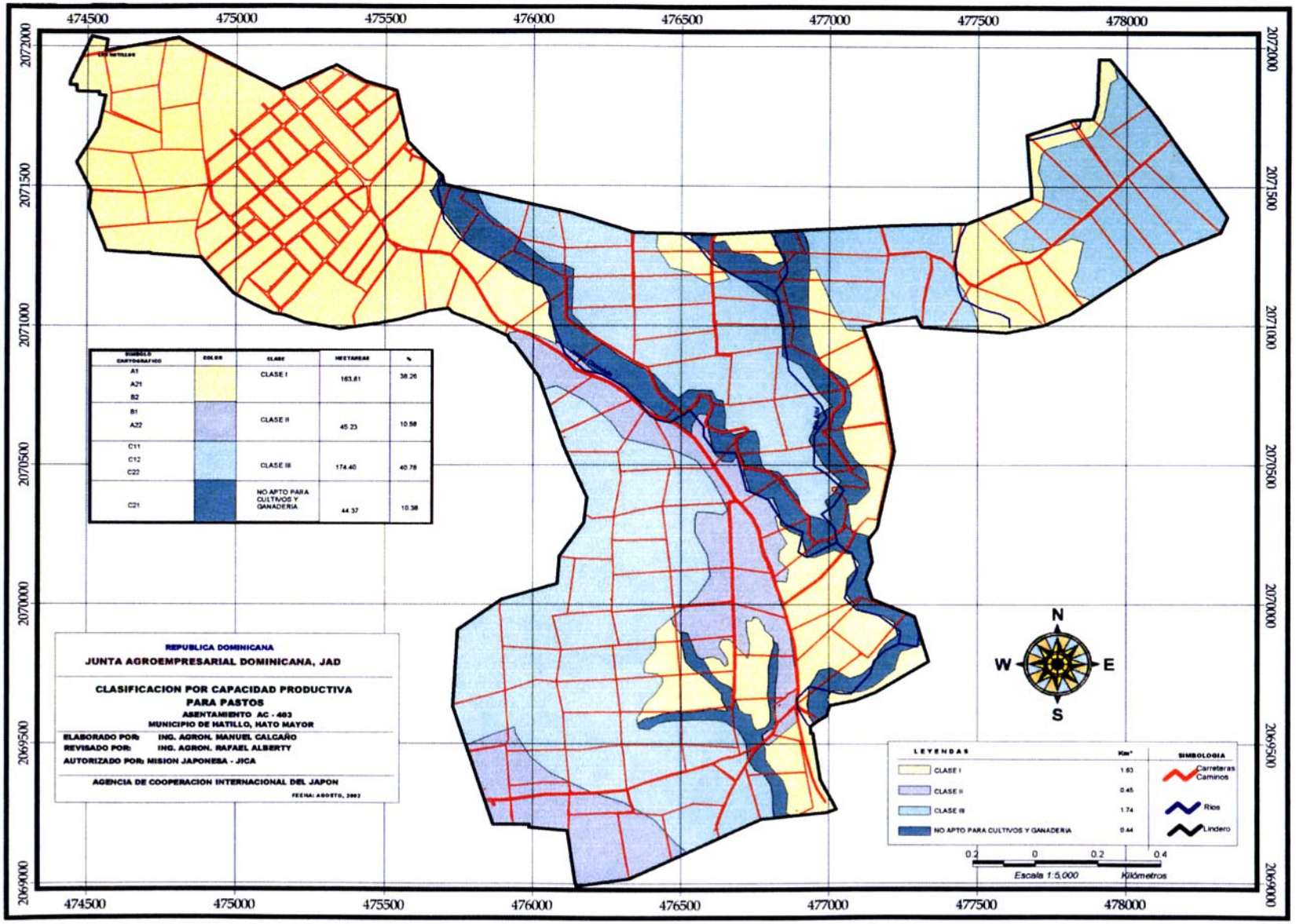

Figure 5.15 Map of Land Classification, Pasture in Los Hatillos I Area